Extremely well adjusted

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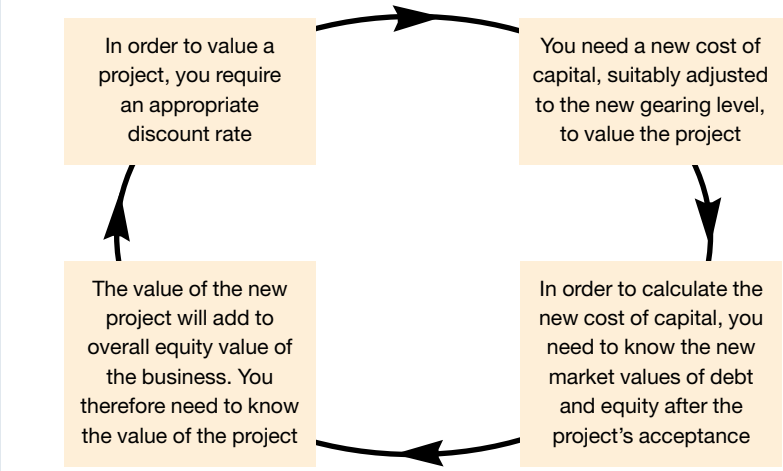
The third and final article explaining the many aspects of cost-of-capital theory

The first two articles in this series established the importance of the cost-of-capital concept and then discussed the theories of Modigliani and Miller (M&M) and the capital asset pricing model (CAPM) as ways of modifying the basic cost of capital for different levels of financial and business risk respectively.

It would seem that these models give us the theoretical ability to alter the basic formula of the weighted-average cost of capital (WACC) to handle differing risk profiles and to create suitable risk-adjusted costs of capital for any occasion. But one big problem remains. In order to apply these theories we need to know what the new capital structure will be after the new project is accepted. This leads us into a circular argument: if we want to value the project we need a new cost of capital, but to obtain the new cost of capital we need to know the value of the project (*see figure 1, right*).

Figure 1 The circular argument of capital structure



The only sensible solution is a "divide and conquer" methodology based on M&M's capital structure work in 1963. Adjusted present value (APV) is the project-specific version of Vg = Vug + PVts. The value of a project is calculated as if it were all equity-financed. The value of any financial side-effects is then added to this, usually limited to the tax shield on debt financing and any issue costs associated with new finance.

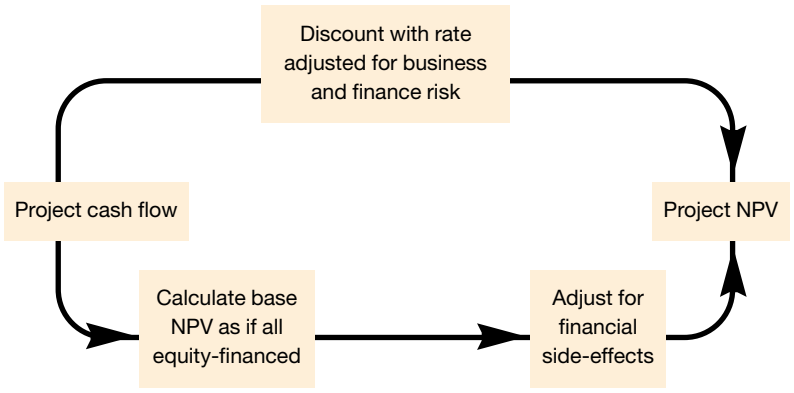
The reason why this works is that it does not rely on the calculation of one overarching cost of capital adjusted for business and financial risk. Each element contributing to value is discounted using a rate appropriate to its particular risk profile (*see figure 2, left, and figure 3, opposite*).

Cost of capital is possibly the most technical area of FLFS. Its precise calculation is, as we have seen, a highly technical process. In practice, though, firms rarely go into the depth of analysis covered in this article – there are simply too many unknowns in the real world.

Cost of capital is not the property of the finance department. Everybody in the organisation responsible for creating value needs to understand its implications. Explaining the concept to non-finance staff in a language they will understand is far more important than calculating it to three decimal places. This is the real challenge for the financial manager. ■

Figure 2 Adjusted present value

Adjusted cost-of-capital approach



APV approach

Vg	=	Vu + DT	(firm-wide)
APV	=	Base NPV + PV financial side-effects	(project-focused)

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Clarification

In figure 2 of last month's article, the beta of XYZ plc's corporate debt should have been given as 0.2. We apologise for any confusion caused.

Figure 3 APV illustration

PQR plc is considering investing in a new project that would cost £20 million. The project is expected to generate cash inflows to perpetuity of £4 million a year. Half of the necessary finance would be provided from retained earnings. The other half would come from a non-traded irredeemable debenture with a coupon rate of 7 per cent.

Companies within the new projects industry have an average gearing level of 60 per cent equity to 40 per cent debt by market values and an average equity beta of 1.4. The return on the risk-free investment is 5 per cent, the market premium is 5 per cent, the beta of debt is zero and the marginal corporation tax rate is 35 per cent. In order to calculate the adjusted present value of the proposed project, the base case NPV must be calculated as if the business were fully equity-financed.

$\beta_g = \beta_u + (\beta_u - \beta_d)(1 - T)D/E$
$1.4 = \beta_u + (\beta_u - 0)(1 - 0.35)40/60$
$\beta_u = 0.98$

$r_{eu} = r_f + \beta_u(r_m - r_f)$
$r_{eu} = 5 + 0.98(10 - 5)$
$r_{eu} = 9.9$ per cent

Base case NPV = – 20 + 4/0.099
= £20.4 million

The present value of the financing side-effect must now be calculated, being the tax shield on perpetual debt. The annual tax saving is first calculated and then discounted as a perpetuity using the cost of debt as the discount rate.

Annual tax saving on interest
= D x i x T
= 10 x 0.07 x 0.35
= £0.245 million

Present value of savings to perpetuity
= 0.245/0.07
= £3.5 million

Adjusted present value
= £20.4 million + £3.5 million
= £23.9 million

Figure 4 Weighted-average cost of capital in practice

Since the capital asset pricing model (CAPM) was expounded by William Sharpe *et al* in the 1960s, it has dominated the academic and practical worlds of investment appraisal. Perhaps because the ideas behind it are so simple, its assumptions are the most tested in the history of finance.

Two key areas of CAPM theory are particularly worthy of note:

- **The value of the risk premium**. The market risk premium – ie, the excess return of the market portfolio over the risk-free rate of return – is usually estimated by looking at long-term historic average returns in the marketplace. A survey by Barclays Capital in 2000 calculated the 100-year average to be 4.7 per cent.
  The usual practice is to take a long-term average to reduce the effects of year-on-year "lumpiness". The problem, of course, is the further back you look in time the more removed from current market conditions you become. Depending on the study and the timescale used, the premium has been calculated to be as high as 8 per cent. In the late 1990s certain academics and practitioners suggested that a more appropriate current risk premium could be as low as 2 per cent. They pointed to the conquest of inflation, increased diversification and the long bull run to suggest that equities were barely more risky than gilts. Given the current market volatility, the true value of the risk premium is anyone's guess.
- **The concept of a single-factor model**. Many studies have been conducted to identify how well correlated betas seem to be with market returns. The results are spectacularly inconclusive. Certain studies show a good correlation, others find no correlation at all. The pragmatic answer seems to be that the beta is an important factor driving returns, but not the only one. This conclusion has led academics to propose multi-factor models to explain security return. The most famous of these is arbitrage pricing theory (APT). Developed by Stephen Ross in 1976, APT suggests that a number of systematic risk factors are required to explain a securities return. Rather unhelpfully, APT does not specify how many factors there are – or indeed what they are. Research continues in this area.

The inherent uncertainties in CAPM do not seem to have stopped its widespread use in calculating corporate cost of equity. Probably because of CAPM's simplicity and the wide availability of its data inputs, a recent survey suggested that 70 per cent of firms calculating their cost of capital for investment appraisal purposes use CAPM for the cost of equity element. The view from practice seems to be an understanding that CAPM, while not perfect, is good enough.

M&M gave us the mathematics for understanding how WACC changes with different gearing levels. If new projects affect a firm's gearing, its current WACC will not be appropriate for discounting the new project. A more practical solution to this problem is to realise that firms tend to set a target long-term gearing level that's suited to their own circumstances. Individual project finance may affect gearing in the short term, but a long-term target can be used in WACC calculations.

Companies seem less certain about how to deal with the financing issue. The Barclays Capital survey found that, for companies that calculate the WACC to appraise investment projects, only 30 per cent use a long-term target gearing ratio while 44 per cent use the current market value gearing ratio. A further 26 per cent use current book value gearing.

Anyone who tells you they can calculate a firm's cost of capital to two decimal places is lying. More important than a precise answer is a deep understanding of the assumptions and limitations underlying the models, and some sensible sensitivity analysis based on this.

One last observation is that firms tend to be highly pragmatic about the depth of analysis they perform in calculating the cost of capital. For instance, there's no point making a 0.1 adjustment in your beta to account for a differing gearing level if you can't decide whether the market risk premium is 2 per cent or 7 per cent.