Overcoming the hurdle

How should capital be allocated to different business lines in a financial institution? Thomas Wilson explores this question from an investor's perspective by constructing a statistical model that measures the risk of individual business types. The results suggest that capital allocation decisions that ignore variations in the cost of capital are erroneous

This article makes a simple but important assertion: many financial institutions systematically overvalue higher-risk businesses (such as investment banking) and undervalue lower-risk businesses (such as retail banking and personal lines insurance), and, as a direct consequence, implement corporate strategies that fundamentally destroy shareholder value.

This assertion is based on the industry's standard practice[1] of using a common hurdle rate or cost of capital across all business lines. This practice is often justified by arguing that, because capital is allocated to each business unit based on its risk profile so as to bring it to a common probability of default or rating standard[2], differentiated hurdle rates are not needed and would be punitive. Alternatively, some argue that, even if theoretically correct, differentiated hurdle rates are difficult to implement for three reasons: first, they are difficult to estimate with any accuracy; second, the economic impact would not be significant; and, finally, management buy-in would be low.

Recent theoretical work suggests these arguments are incorrect. More specifically, while debt-holders may be concerned about solvency levels, shareholders nonetheless value businesses based on their systematic risk, implying that the use of a common hurdle rate is inappropriate even if they are capitalised to a common probability of default.[3] In this article, we take the theory to its logical conclusion and use cross-section and time-series data to answer three important questions:

- First, is there empirical evidence that shareholders require different hurdle rates for different businesses, even if each business is capitalised to a common rating standard? We call this the 'differentiated cost of capital effect'. This effect, strongly supported by the data, has strong implications for valuing the performance of different business lines that reside under a common corporate umbrella.
- Second, is there empirical evidence that, all else being equal, shareholders require a premium from firms that have higher leverage, and therefore a higher probability of default? We call this the 'leverage or default effect'. This effect, strongly supported by the data, has strong implications for capital adequacy decisions and rationalising shareholder and debt-holder perspectives.
- Third, is there empirical evidence that, all else being equal, shareholders place a premium on firms that have less idiosyncratic risk and can therefore afford greater leverage? We call this the 'idiosyncratic risk cost'. This effect, weakly supported by the data, has potentially strong implications on corporate portfolio diversification decisions.

In Wilson (2002), we approximate a theoretical model based on Merton (1974) and Crouhy, Turnbull & Wakeman (1999) for a firm's levered beta, β_E, that can be empirically estimated. The estimable equation, described later, is given by:

$$\beta_E \cong \left(1+\kappa_1 p^*\right)\sum_{i=1}^{N}\omega_i\beta_i + \kappa_2 p^* \sigma_I^2 \tag{1}$$

where p^* is the firm's probability of default, β_i the un-levered beta of business i, ω_i its business mix and σ_I^2 its idiosyncratic risk, and where we interpret $\{(1+\kappa_1 p^*), \kappa_2 p^*\}$ to represent the 'leverage' and 'idiosyncratic risk cost' effects, respectively, for reasons made clear later in the article.

Using cross-section and time-series data for approximately 50 of the world's largest financial institutions, we find strong empirical evidence to support each of these propositions. In the process, we estimate the levered asset betas (for example, $\hat{\beta}_i$) for retail and commercial banking, equity and fixed-income investment banking, asset management, and property and casualty and life insurance activities. We also estimate the pure default or leverage premium (for example, $(1+\hat{\kappa}_1 p^*)$) and the pure cost of idiosyncratic risk (for example, $\hat{\kappa}_2 p^*$).

The intuition

To motivate equation (1), consider the standard capital asset pricing model (CAPM)[4] as a pedagogical device:

$$\begin{aligned} R_E &= R_f + \beta_E\left(R_m - R_f\right) \\ \beta_E &= \left[\frac{E+D}{E}\left(p^*\right)\right]\beta_A = \left[\frac{E+D}{E}\left(p^*\right)\right]\sum_{i=1}^{N}\omega_i\beta_i \end{aligned} \tag{2}$$

The first equation represents the securities market line from the CAPM, where R_E is the expected return on equity, R_f is the risk-free rate, R_m is the expected market return and β_E is the firm's levered equity beta. Intuitively, the higher the firm's risk as measured by beta, a measure of systematic risk, the higher its expected return. The second line is a standard approximation of a firm's levered beta, where β_A is the firm's asset's un-levered beta, ω_i is the proportion of the assets in industry i, β_i is the un-levered beta of industry i, and E and D are the market value of equity and debt. Implicitly, the firm's leverage ratio $(E+D)/E$ is a function of the firm's probability of default, p^*, where $\lim_{p^*\to 0}(E+D/E) = 1$ and $\partial(E+D/E)/\partial p^* > 0$.

This equation directly supports the differentiated cost of capital effect in that, holding probability of default constant, a firm's levered beta (and therefore cost of capital) nonetheless depends on its business mix. Further, it supports the leverage effect in that, for a given business mix, the higher the leverage, the higher a firm's levered cost of capital. If the firm is 100% equity financed, $\beta_E = \beta_A$ with β_E increasing as leverage increases.

To test the intuition, consider table A(i), which gives the average beta for selected 'monoline' insurance companies and investment banks with ratings between AA and A+. The table indicates how absurd the common cost of capital assumption really is: investment banks have levered betas that are almost three times as high as insurance companies, implying a cost of capital 10–13% greater (depending upon the market risk premium and risk-free rate). Note that this is even after 'adjusting' for the level of risk capitalisation and probability of default by comparing similarly rated institutions.

Now, consider the leverage or default effect. Table A(ii) gives the individual and average betas for selected 'universal' banks, sorted by rating category. As the table indicates, the average levered beta increases as the probability of default increases (as measured by the firm's rating class), holding business mix roughly constant. The table indicates how strong the leverage effect is: a 0.8 difference in beta between the AA+ and A+ institutions leads to a 4–5% difference in the firm's cost of capital.

[1] In a recent survey of more than 50 global financial institutions, we found that more than 60% of the respondents used very little or no differentiation in the hurdle rates across businesses. See OWC (2002)

[2] See, for example, Zaik et al (1996), Jorion (1997), etc

[3] See, for example, Merton & Perold (1993), Froot & Stein (1998a, 1998b) and Crouhy, Turnbull & Wakeman (1999) for a formal, theoretical treatment. See Hall (2002) and Matten (1996) for an intuitive discussion

[4] See, for example, Copeland, Koller & Murrin (1994). It is straightforward to demonstrate that, if the Modigliani-Miller theorem holds, then the following relationship holds (see Copeland, Koller & Murrin): $\beta_A = E/(E+D)\beta_E + D/(E+D)\beta_D$. Under the assumption that there is a low probability of default, then $\beta_D \cong 0$. Rearranging the equation gives the desired result

A. Comparison of betas

(i) Differentiated cost of capital

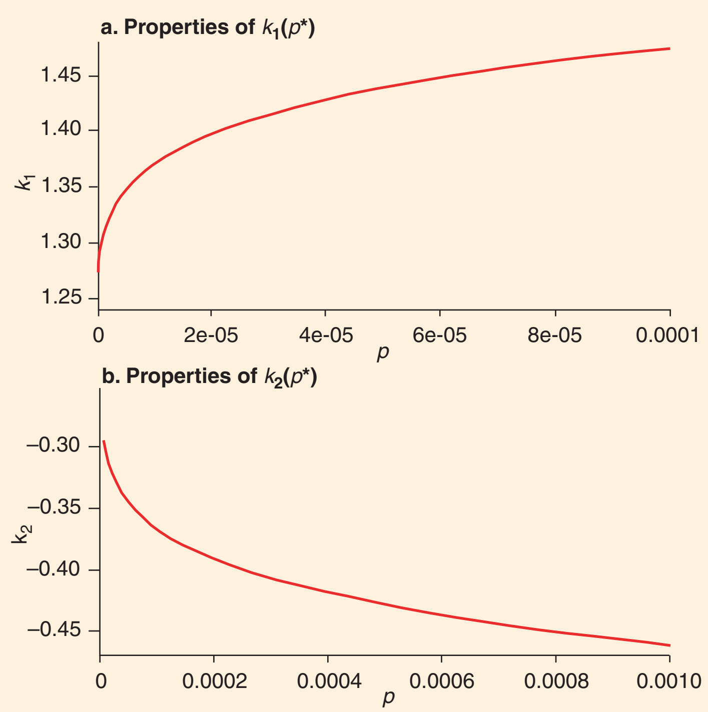
	AA to A+ firms	Beta range (average)
Insurance	AEG, CGNU, AXA, AS	0.81–1.29 (1.03)
Investment banking	ML, MS, GS, LB	2.34–3.78 (2.90)

(ii) Leverage effect

Rating	AA+	AA	AA–	A+
Universal banks	DB – 0.94	DRB – 1.01 NBA – 0.92 COM – 0.72	BHV – 0.93 SG – 1.23 BBVA – 1.22 BSCH – 1.25 FB – 1.19	BNP – 1.56 JPM – 1.95 RBS – 1.70 BA – 1.76
Average	0.94	0.88	1.16	1.74

Note: average domestic betas and blended public rating (Moody's, Standard & Poor's) when available, 1990–2001; AEG = Aegon, ML = Merrill Lynch, AS = Allstate, MS = Morgan Stanley, GS = Goldman Sachs, LB = Lehman Brothers, DB = Deutsche Bank, DRB = Dresdner, NBA = National Bank of Australia, COM = Commonwealth Bank of Australia, BHV = Bayerishe Hypo-Vereinsbank, BSCH = Banco Santander Central Hispanoamerica, FB = FleetBoston, BNP = Banque Nationale de Paris, JPM = JP Morgan, RBS = Royal Bank of Scotland, BA = Bank of America

1. Properties of the leverage and diversification parameters



What is the intuition behind the differentiated cost of capital effect? Intuitively, shareholders are interested in valuing the residual profits in excess of debt-holders' claims. These depend upon the systematic risk of each individual business line that contributes to it. This reflects the shareholder's perspective. The fact that each business unit is capitalised to a common rating standard does not change this fact, but rather affects the firm's cost of capital through the firm's corporate leverage. This reflects the debt-holder's perspective. This intuition is consistent with the heuristic models in Hall (2002), Matten (1996) and Wilson (1992), although we formalise it here in an internally consistent model. It is also consistent with the theoretical models of Crouhy, Turnbull & Wakeman (1999) and Froot & Stein (1998a, 1998b).

What is the intuition behind the leverage or default effect? Financial firms make money through leverage: banks' equity is geared with customer deposits used to finance a much larger balance sheet of loans; insurance companies' equity is levered by policy-holders' claims in order to support a much larger balance sheet of investment assets. Without a solid credit rating, such gearing would not be possible. Clearly, a financial institution's credit quality, and probability of default, is an important factor in determining the return to shareholders. Taken to its logical conclusion, this implies that, after adjusting for business mix, a firm with higher leverage should have a higher cost of levered capital. This 'leverage effect' is consistent with the models of Crouhy, Turnbull & Wakeman (1999) and Froot & Stein (1998a, 1998b).

Our third proposition is that, all else being equal, shareholders require a premium from firms that have more idiosyncratic risk. The intuitive rationale is related to the leverage effect: firms with more idiosyncratic risk but the same business mix cannot leverage equity as much for the same probability of default since debt-holders are concerned with both a firm's systematic as well as idiosyncratic risk. This intuition is not lost on rating agencies: Standard & Poor's (1999) explicitly recognises a company's diversification as one of the most important criteria when assigning a financial strength rating.[5] AM Best (2000) also includes diversification as an important criterion when evaluating an insurance company's ability to leverage.

The impact of idiosyncratic risk on the cost of capital may seem counterintuitive in a CAPM world, where idiosyncratic risk is diversifiable, and in a Modigliani-Miller world[6], where there is no dead-weight loss due to insolvency or asymmetric information and therefore no optimal capital structure. This paradox can be resolved when one considers that, although idiosyncratic risk has no effect on the firm's total asset returns, the level of idiosyncratic risk will affect the firm's ability to leverage its equity and therefore how those returns are split between shareholders and debt-holders. Similar to Crouhy, Turnbull & Wakeman's (1999) model, it is through this leverage effect that idiosyncratic risk can affect a firm's levered cost of capital. The models of Merton & Perold (1993) and Froot & Stein (1998a, 1998b) generate a qualitatively similar result but, by introducing dead-weight losses and/or information asymmetries, imply that idiosyncratic risk has a real cost, affecting the total returns of the firm's assets directly.

The theory and evidence

In Wilson (2002), we develop an estimable relationship between a firm's expected return on equity, rating aspirations and business portfolio that exhibits the differentiated cost of capital, leverage and idiosyncratic risk effects. Here, we outline its derivation. In this simple model, equity is a call option on the assets of the firm. The expected return on this option depends on the firm's asset volatility, business mix and probability of default:

$$R_E = \ln\left[\frac{E\left[S(T)\right]}{S(0)}\right] = G\left(R_A, \sigma_A^2, p^*\right) = G\left(\beta_A, \sigma_I^2, p^*\right) \qquad (3)$$

where $R_E = E[S(T)]/S(0)$ is the expected return to holding levered equity over the time period T, R_A is the expected return on the firm's assets, σ_A^2 is the variance of the firm's asset returns, σ_I^2 is the variance of the firm's idiosyncratic risk and p^* is the firm's target probability of default.[7] The value of equity depends on the expected asset returns (as opposed to the

[5] Other important criteria recognised by Standard & Poor's include economic risk, industry risk, market position, management and strategy, credit risk, market risk, funding and liquidity, capitalisation, earnings, risk management and financial flexibility

[6] See Copeland, Koller & Murrin (1994) for a discussion of the Modigliani-Miller theorem and its application to a firm's cost of capital

risk-free rate of return) and probability of default, as these determine the firm's capital structure.

The third equality follows under the assumptions of the CAPM relating asset returns and asset beta (equation (2)) and the firm's total asset volatility and idiosyncratic volatility, for example, $\sigma_A^2 = \beta_A^2\sigma_M^2 + \sigma_I^2$. Taking a Taylor series expansion of G() around an arbitrary β, σ_i^2, we get the following approximation:

$$\begin{aligned} G\left(\beta_A,\sigma_I^2\middle|p^*\right) &\cong G\left(\beta,\sigma_i^2\middle|p^*\right)+\frac{\partial G}{\partial \beta_A}(\beta_A-\beta)+\frac{\partial G}{\partial \sigma_I^2}\left(\sigma_I^2-\sigma_i^2\right)\\ \frac{\partial G}{\partial \beta_A} &= \frac{\partial G}{\partial R_A}R_P+2\frac{\partial G}{\partial \sigma_A^2}\beta\\ \frac{\partial G}{\partial \sigma_I^2} &= \frac{\partial G}{\partial \sigma_A^2} \end{aligned} \tag{4}$$

Evaluating equation (4) at the risk-free rate of return, for example, $(\beta, \sigma_i^2) = (0, 0)$ and rearranging, the theoretical model yields an equation that is remarkably similar to equation (2) with the exception of an additional term:

$$\beta_E \cong \kappa_1\left(p^*\right)\sum_{i=1}^{N}\omega_i\beta_i+\kappa_2\left(p^*\right)\sigma_I^2 \tag{5}$$

where $\{\beta_E, \beta_i, \omega_i, \sigma_I^2\}$ are as defined before, $\kappa_1(p^*) = \partial G/\partial R_A$ at $\beta_A = 0$ and $\kappa_2(p^*) = \partial G/\partial\sigma_A^2$, evaluated at $(\beta, \sigma_i^2) = (0, 0)$. As will become clear later, we interpret $\{\kappa_1(p^*), \kappa_2(p^*)\}$ as the leverage and idiosyncratic risk effects, respectively.

There are two differences between equation (5) and equation (2). First, the term $\kappa_1(p^*)$ in equation (5) replaces the term $(E + D)/E$ in equation (2). The theory predicts that $\kappa_1(p^*) \geq 1$ with $\lim_{p^*\to 0}\kappa_1(p^*) = 1$ and $\partial\kappa_1/\partial p^* > 0$, as shown in figure 1. These properties are also generally true for $(E + D)/E$. As such, we interpret $\kappa_1(p^*)$ to be the 'leverage effect'.

The second difference between equations (2) and (5) is the addition of the $\kappa_2(p^*)$ term multiplying the variance of the firm's idiosyncratic risk, σ_I^2. This term satisfies $\kappa_2(p^*) \leq 0$ with $\lim_{p^*\to 0}\kappa_2(p^*) = 0$, as indicated in figure 1. We interpret $\kappa_2(p^*)$ as the 'idiosyncratic risk discount'. Intuitively, for a higher level of idiosyncratic risk, the firm can afford less leverage in order to maintain its probability of default. Hence, shareholders' levered returns are lower due to lower leverage.

In the rest of this section, we present our empirical results from estimating a series of nested models (see table B). The final model is an estimable version of the most general model given by equation (5), which tests for all three effects simultaneously, for example, the differentiated cost of capital, leverage and idiosyncratic risk effects.

Note that model 1 does not test for either the leverage or the diversification effect as we restrict $\kappa_1(p^*) = 1$ and $\kappa_2(p^*) = 0$. Inspection of the residuals (figure 2) indicates that they depend upon the country of domicile, being on average higher for the US and the UK and lower for continental European countries. One possible explanation of this is that the capital markets in continental Europe may be less developed, with corporate firms more likely to fund themselves via loans rather than public equity. As a consequence, financial firms constitute a larger percentage of the market index. In the limit, if the only firm listed on the index were a financial firm, it would have a beta equal to one regardless of its business portfolio.

Model 2 allows us to test whether this country-of-domicile effect is significant through the addition of the European dummy variable and regression constant terms (for example, (k_0, d)). Based on our intuition, we would expect k_0 to have a negative sign, implying that the betas for Europe-domiciled companies are 'pulled' closer to one as they represent relatively more of the market index.[8]

Model 3 tests for the leverage effect by adding the term $k_1(p^*) \approx (1 + k_1p^*)$, a simple functional form that satisfies $\lim_{p^*\to 0}k_1(p^*) = 1$ and $\partial k_1(p^*)/\partial p^* > 0$. Based on the theory, we would expect $k_1 > 0$. Model 4 tests for both the leverage and idiosyncratic risk effects by adding the term $k_2(p^*) \approx k_2p^*$, a simple functional form that satisfies $\lim_{p^*\to 0}k_2(p^*) = 0$ and $\partial k_2(p^*)/\partial p^* < 0$.

B. Overview of nested models

1. Standard approach

$$\beta_t^l = \sum_{i=1}^{N}\omega_{i,t}^l\hat\beta_i+\varepsilon_t^l$$

2. Country-of-domicile

$$\beta_t^l = \sum_{i=1}^{N}\omega_{i,t}^l\hat\beta_i^{(1+k_0d)}+\varepsilon_t^l$$

3. Leverage effect

$$\beta_t^l = \left(1+k_1p^*\right)\sum_{i=1}^{N}\omega_{i,t}^l\hat\beta_i^{(1+k_0d)}+\varepsilon_t^l$$

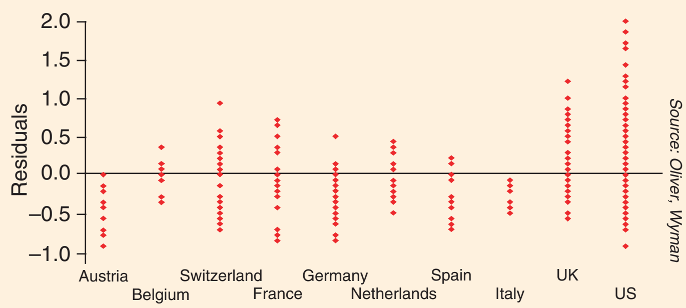
4. Full model, including leverage and diversification effects

$$\beta_t^l = \hat\kappa_0+\left(1+\hat\kappa_1p_t^l\right)\left(\sum_{i=1}^{N}\omega_{i,t}^l\hat\beta_i\right)+\hat\kappa_2p_t^l\left(\sum_{j=1}^{N}\omega_i\hat\beta_i\right)^2\left(\frac{1}{R_l^2}-1\right)+\varepsilon_t^l$$

where:

- β_t^l is the 'observed' levered and diversified beta for company l at time t
- $\omega_{i,t}^l$ represents the percentage of company l's business in segment i at time t, based alternatively on an earnings and economic capital basis, with $\Sigma\omega_t^l = 1$ for all t
- $\hat\beta_i$ are the industry betas to be estimated
- (k_0, d) are the dummy variable and constant term to be estimated for continental European companies, respectively
- $\hat k_1$, p^* are the leverage effect parameter to be estimated and the three-year cumulative probability of default based on the companies rating, respectively. We use a three-year cumulative probability of default because it provides greater differentiation between investment grades and to reflect a medium-term horizon
- $\hat k_2$ is the diversification effect parameter to be estimated where we have subsumed the market variance term into the $\hat\kappa_2$ parameter
- $R_{l,t}^2$ is the adjusted R-squared of the time t beta regression
- ε_t^l is the regression error term for company l at time t. These error terms are assumed to be normally distributed and independent over time and across the different firms, implying a diagonal covariance matrix.

2. Model 1 residuals: country-of-domicile effect



[7] *As with Crouhy, Turnbull & Wakeman (1999), this model obeys the Modigliani-Miller theorem, implying that there is no endogenously determined optimal capital structure. This is in direct contrast to the models of Froot & Stein (1998a, 1998b) and Merton & Perold (1993), which use deadweight losses and/or asymmetric information to derive an optimal capital structure endogenously*

[8] *As a side note, another approach would have been to estimate the equation using international betas as opposed to domestic betas. We did not pursue this analysis as the international beta estimates were significantly 'weaker' than the domestic betas and were dominated by longer-term deviations from purchasing power parity as opposed to equity market innovations*

C. Estimation results

Parameter estimate (standard error)	Adj-R^2 F-stat	k_0 Europe dummy	k_1 Leverage effect	k_2 Divers. effect	β_1 Comm. bank	β_2 Retail bank	β_3 Asset mgmt.	β_4 Life ins.	β_5 P&C ins.	β_6 Equity I-Bank	β_6 FI I-Bank
Model 1:	87.9%				1.21**	1.23**	1.67**	0.94**	1.05**	4.34**	1.50*
Standard approach	466***				(0.14)	(0.09)	(0.11)	(0.09)	(0.12)	(0.85)	(0.70)
Model 2:	88.8%	–0.55***			1.49**	1.28**	1.79**	0.89**	1.09**	4.56**	1.54*
Country of domicile	461***	(0.09)			(0.16)	(0.09)	(0.11)	(0.12)	(0.18)	(0.85)	(0.68)
Model 3:	89.1%	–0.56***	70.2***		1.36**	1.02**	1.44**	0.87**	0.93**	3.85**	1.41*
Leverage effect	441***	(0.13)	(16.4)		(0.13)	(0.09)	(0.11)	(0.11)	(0.16)	(0.93)	(0.57)
Model 4:	89.1%	–0.63***	89.0***	–4.38**	1.46**	0.99**	1.43**	0.84**	0.92**	3.58**	1.62*
Leverage and divers.	409***	(0.12)	(17.6)	(1.29)	(0.14)	(0.09)	(0.11)	(0.11)	(0.17)	(0.79)	(0.62)

* Significant at a > 10% confidence level; ** Significant at a > 5% confidence level; *** Significant at a > 1% confidence level

D. Differentiated cost of capital: impact for AA– US/UK representative firms

Representative firm	Share	Levered beta	Cost of capital	P/E multiple
Regional bank				
Retail banking	60%	1.05	9.3%	24.60
Commercial banking	40%	1.58	12.2%	14.62
Average	100%	1.26	10.4%	19.32
Multiline insurance				
Life insurance	40%	0.90	8.4%	30.56
P&C insurance	40%	0.99	9.0%	26.44
Asset management	20%	1.55	12.0%	14.99
Average	100%	1.07	9.4%	24.06
Investment bank				
Asset management	20%	1.55	12.0%	14.99
Equity investment banking	40%	3.90	25.0%	5.26
Fixed-income investment banking	40%	1.77	13.3%	12.72
Average	100%	2.58	17.7%	8.27
Universal bank				
Retail banking	40%	1.05	9.3%	24.60
Commercial banking	30%	1.58	12.2%	14.62
Asset management	10%	1.55	12.0%	14.99
Equity investment banking	5%	3.90	25.0%	5.26
Fixed-income investment banking	15%	1.77	13.3%	12.72
Average	100%	1.51	11.8%	15.44
Diversified financial services firm				
Retail banking	25%	1.05	9.3%	24.60
Commercial banking	20%	1.58	12.2%	14.62
Asset management	15%	1.55	12.0%	14.99
Life insurance	15%	0.90	8.4%	30.56
P&C insurance	5%	0.99	9.0%	26.44
Equity investment banking	10%	3.90	25.0%	5.26
Fixed-income investment banking	10%	1.77	13.3%	12.72
Average	100%	1.56	12.1%	14.81

Note: risk-free = 3.5%, risk premium = 5.5%, growth = 5%

Based on the theory, we would expect $k_2 < 0$. Rather than specifying a functional form for σ_I^2 and jointly estimating it within the beta equation, we instead use a two-stage approach, estimating the relationship between idiosyncratic and systematic risk using the R^2 of the original beta regression:

$$R^2 = \frac{SSR}{SSR + SSE} = \frac{\beta_E^2 \sigma_m^2}{\beta_E^2 \sigma_m^2 + \sigma_I^2} \propto \frac{\left(\Sigma\omega_i\beta_i\right)^2}{\left(\Sigma\omega_i\beta_i\right)^2 + \sigma_I^2}$$
$$\text{implying } \sigma_I^2 \propto \left(\Sigma\omega_i\beta_i\right)^2 \left[\frac{1}{R^2} - 1\right] \tag{6}$$

where *SSR* is the regression sum of squares and *SSE* is the sum of squared residuals from the regression. The second equality follows from the CAPM assumption. Intuitively, the *R*-squared gives us an estimate of relative proportion of systematic risk to total risk for each company.

Table C shows that, in all cases, our hypothesis regarding parameter signs is confirmed. We also see that the estimated betas are significantly different from one another in most instances, confirming the differentiated cost of capital effect. Finally, we also see that the parameter estimates are significant, leading us to conclude that the leverage, diversification and country-of-domicile effects are significant.

The impact

These effects have important corporate strategy implications, for two reasons. First, because the differences in asset betas can be very large (for example, US equity investment banking at 3.58 versus US life insurance at 0.84), implying a large difference in the cost of capital. Second, because even small errors in the cost of capital (CoC) can have a big impact on corporate strategy. To see this, consider a simple model of the price/earnings (*P/E*) multiple that depends only upon the firm's CoC and growth rate (g), for example:

$$\frac{P}{E} = \frac{(1+g)}{(CoC - g)} \tag{7}$$

This is the formula for the discounted value of a growing perpetuity earnings stream. Looking at the denominator, a small error in the absolute cost of capital can lead to a large change in the firm's P/E multiple as it is used to discount all future earnings. This, in turn, leads to a dramatic difference in relative business unit valuation.

□ **Impact of the differentiated cost of capital effect.** Table D gives an indication of how large an impact the differentiated cost of capital effect can have in practice. It lists the levered beta, cost of capital and theoretical P/E multiple for representative AA rated firms and their stand-alone businesses (without recognising the diversification effect). For example, a double-A, US regional bank with a 60/40% split between retail and commercial banking would have a beta of 1.26, a cost of capital of 10.4% and an implied P/E multiple of about 19%. Note that this average cost of capital hides the fact that shareholders expect a much lower cost of capital for the retail versus the commercial bank (for example, 9.3% versus 12.2%), and therefore a much higher implied P/E multiple. This 3% difference in the cost of capital for the retail versus commercial bank implies a 10-point difference in implied P/E multiples (for example, 24.6 versus 14.6). Clearly, if managers are attempting to optimise shareholder value, this 'small' difference in the cost of capital can have a substantial impact on the firm's strategy.

□ **Impact of leverage or default effect.** Table E indicates how large an impact the leverage and the country-of-domicile effects can have in practice. In terms of the leverage effect, the difference in P/E multiples between AAA– and A– European commercial banking operations is 6.7 points (for example, 25.1/18.4). In terms of the country-of-domicile effect, the difference between a European and US/UK AA– rated commercial bank is 4.8 points (for example, 18.7/13.9). These differences are substantial and can have significant implications on a firm's corporate strategy, with the biggest differences being for very high and very low beta businesses in the US.

E. Default/leverage effects (risk-free = 3.5%, risk premium = 5.5%, growth = 4%)

	European						US/UK					
	Beta			P/E multiple			Beta			P/E multiple		
Business	AAA	AA–	A	AAA	AA–	A	AAA	AA–	A	AAA	AA–	A
Retail	1.03	1.11	1.31	25.1	22.7	18.4	1.01	1.09	1.29	25.8	23.3	18.8
Commercial	1.20	1.30	1.52	20.5	18.7	15.2	1.53	1.64	1.94	15.2	13.9	11.5
Asset management	1.19	1.29	1.51	20.7	18.8	15.4	1.49	1.61	1.90	15.6	14.3	11.8
Life insurance	0.98	1.05	1.24	27.2	24.5	19.8	0.87	0.94	1.10	32.1	28.8	23.1
P&C insurance	1.01	1.09	1.29	25.8	23.3	18.9	0.96	1.04	1.22	27.7	25.0	20.2
Equity inv. banking	1.68	1.81	2.13	13.6	12.4	10.3	3.77	4.07	4.78	5.5	5.0	4.2
Fixed-income inv. banking	1.26	1.35	1.59	19.4	17.7	14.5	1.71	1.85	2.17	13.2	12.1	10.0

F. Impact of idiosyncratic risk (risk-free = 3.5%, risk premium = 5.5%, growth = 5%)

	Avg. idiosyncratic risk			Avg. R-squared – 1.65 sd			
	Levered beta	Cost of capital	P/E multiple	Levered beta	Cost of capital	P/E multiple	P/E difference
Regional bank	1.26	10.4%	19.32	1.24	10.3%	19.73	2.1%
Multiline insurance	1.07	9.4%	24.06	1.05	9.3%	24.51	1.9%
Investment bank	2.58	17.7%	8.27	2.49	17.2%	8.59	3.8%
Universal bank	1.51	11.8%	15.44	1.48	11.6%	15.81	2.4%
Diversified financial services firm	1.56	12.1%	14.81	1.53	11.9%	15.17	2.5%

REFERENCES

AM Best, 2000
About our ratings
Overview document

Copeland T, T Koller and J Murrin, 1994
Valuation – measuring and managing the value of companies
John Wiley & Sons, second edition

Crouhy M, S Turnbull and L Wakeman, 1999
Measuring risk-adjusted performance
Journal of Risk 2(1), fall, pages 5–35

Froot K and J Stein, 1998a
Risk management, capital budgeting, and capital structure policy for financial institutions: an integrated approach
Journal of Financial Economics 47, pages 55–82

Froot K and J Stein, 1998b
A new approach to capital budgeting for financial institutions
Journal of Applied Corporate Finance 11(2), summer, pages 59–69

Hall C, 2002
Economic capital: towards an integrated risk framework
Risk October, pages 33–38

Jorion P, 1997
Value at risk – the benchmark for controlling market risk
Irwin

Matten C, 1996
Managing bank capital – capital allocation and performance measurement
John Wiley & Sons

Merton R, 1974
On the pricing of corporate debt: the risk structure of interest rates
Journal of Finance 27(3), pages 449–470

Merton R and A Perold, 1993
Theory of risk capital in financial firms
Journal of Applied Corporate Finance 6(3), fall, pages 16–32

OWC, 2002
The evolving role of the CFO and CRO: an international survey

Standard & Poor's, 1999
Bank ratings criteria
February

Wilson T, 1992
Raroc remodelled
Risk September, pages 112–119

Wilson T, 2002
Cost of capital for financial institutions
Working paper, Mercer Oliver Wyman

Wilson T, 2003a
Valuation, earnings volatility and cost of capital
Working paper, Mercer Oliver Wyman

Wilson T, 2003b
Valuing financial institutions: integrating internal and external metrics
Working paper, Mercer Oliver Wyman

Zaik E, J Walter, G Kelling and C James, 1996
Raroc at the Bank of America: from theory to practice
Journal of Applied Corporate Finance 9(2), pages 83–92

☐ **Impact of idiosyncratic risk.** As can be seen from table C, the cost of idiosyncratic risk is statistically significant based on the estimate of k_2. The question is, how significant is it in terms of expected shareholder returns and the cost of capital? To provide some guidance, we will use equation (6) to specify the relationship between idiosyncratic risk, total risk and R-squared, for example, $\sigma_I^2 = \beta^2\sigma_M^2(1/R^2 - 1)$, evaluated at the average R-squared for the beta regressions for all the firms in the sample (41%) and at a 1.65 standard deviation confidence interval (5%), the latter signifying a firm dominated by idiosyncratic risk. In table F, we illustrate the impact of idiosyncratic risk on the cost of capital and the P/E multiple for a US/UK AA rated financial institution under both scenarios. The last column of the table essentially says that the benefit in terms of the cost of capital from reducing idiosyncratic risk from the average level to 1.65 standard deviations below the average brings roughly a 2–4% increase in the P/E multiple, with higher systematic risk firms benefiting more. Clearly, this is not meaningful from a corporate strategy perspective.

Conclusion

In this article, we have claimed that many institutions are significantly overvalue high-risk businesses and undervalue low-risk businesses because they use a common cost of capital. Developing an estimable equation based on a theoretical model, we have demonstrated that this effect can be very significant, leading to very different costs of capital, implied P/E multiples and therefore valuations. In the process, we have also helped to rationalise the shareholder and debt-holder perspectives. The most important implications of this research are, first, that financial institutions should use different hurdle rates when evaluating different businesses (even if they are individually capitalised to a common probability of default). Second, the hurdle rates should be uniformly higher if the company is more leveraged for the same business mix. ■

Thomas Wilson is a managing director and global head of the finance and risk practice at Mercer Oliver Wyman in New York. **This article summarises results in Wilson (2002) and is the first of a three-part series focused on valuing financial institutions (Wilson, 2002, 2003a, 2003b). The author would like to thank Mercer Oliver Wyman's finance and risk practice, Charles Monet of Morgan Stanley, Till Guldimann of Credit Suisse Group, George Pastrana of UBS Warburg, Dan Marinangeli of Toronto Dominion, Sanjiv Talwar and Michel Crouhy of CIBC, PRMIA workshop participants in Toronto, New York and London for challenging discussions, and two anonymous referees for their helpful and insightful comments.** **E-mail: twilson@owc.com**