IV SPECIAL FEATURES

A COMMON EQUITY CAPITAL, BANKS' RISKINESS AND REQUIRED RETURN ON EQUITY

In the ongoing reform of the financial system, a key regulatory objective is to increase the soundness and resilience of banks. In line with this objective, regulators have placed emphasis on higher common equity capital requirements. The industry has been critical of a higher reliance on equity. Since equity is the most expensive source of capital, it is often asserted that higher equity ratios may materially increase banks' funding costs, with adverse consequences for credit availability.

Based on a sample of large international banks, this special feature provides an assessment of the relationship between banks' equity capital, riskiness and required return on equity. Following a methodology employed in recent papers, an attempt is made to measure these relationships in the light of the hypothesis of Modigliani and Miller[1] on the irrelevance of the capital structure for the value of the firm.

The empirical evidence discussed in this special feature supports the notion that higher capital requirements tend to be associated with a decrease in the riskiness of equity returns and thus of the required risk premium, in line with the theoretical argument. This conclusion counters the industry's concern about a material increase in funding costs and further supports the regulators' focus on higher equity requirements.

INTRODUCTION

The new Basel III standards for internationally active banks represent the cornerstone of the revised global regulatory reform. The overarching objective of Basel III is to strengthen the quantity, quality and consistency of the regulatory capital base. To achieve this aim, regulators have chosen to place particular emphasis on the component of capital which has the highest loss-absorbing capacity in a going concern, namely common equity. Under the previous regime, banks could hold as little as 2% of common equity as a share of risk-weighted assets. The new rules demand a higher common equity ratio equal to 7% of risk-weighted assets, i.e. the new minimum (4.5%) plus the capital conservation buffer (2.5%).[2]

In addition to Basel III, a parallel strand of work has addressed systemically important financial institutions (SIFIs). Joint efforts by the Basel Committee and the Financial Stability Board have resulted in the publication of a consultative document proposing a set of measures to *initially* be applied to global systemically important banks (G-SIBs).[3] These measures are specifically designed to address the negative externalities and moral hazard posed by these firms.

According to the consultative document, G-SIBs will need to satisfy additional loss-absorbency requirements beyond Basel III. In quantitative terms, the framework proposes a progressive capital surcharge, ranging from 1% to 2.5% of common equity, depending on a bank's systemic importance.[4] Crucially, regulators have chosen to focus exclusively on common equity as the eligible tool for meeting the surcharge.

Overall, the regulatory focus on higher common equity requirements has evident benefits: (i) it makes an institution more resilient to adverse shocks; and (ii) it reduces the probability and the impact of default, and thus the severity of the externality imposed on the broad financial system.

1 F. Modigliani and M. Miller, "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, No 48, 1958.

2 This increase is further bolstered by the stricter definition of eligible capital components, which aims to eliminate elements that are not truly loss-absorbing in stress periods.

3 The focus on global banks is only an initial step. It is foreseen that the framework will be extended to all SIBs and to non-bank SIFIs. See Basel Committee on Banking Supervision, "Global systemically important banks: Assessment methodology and the additional loss absorbency requirement", 2011.

4 Systemic importance is measured according to an indicator-based methodology developed by the Basel Committee. While an examination of this methodology is beyond the scope of this special feature, it is key for the overall framework.

The decisions leading to both the Basel III requirements and the surcharge on G-SIBs benefited from impact and calibration studies that have shown that the overall long-term effect of the new standards on banks' lending capacity and, ultimately, on the real economy will be moderate, especially if phased in gradually. Based on the results of these studies, the international regulatory community agreed to introduce the capital conservation and counter-cyclical capital buffers (envisaged under Basel III) as well as the higher loss-absorbency requirements for G-SIBs between January 2016 and the end of 2018. This delayed timeline has been devised to give banks time to adjust to the new rules, while minimising short-term disturbances to banks' strategies, business models and capital planning.

A THEORETICAL PERSPECTIVE ON THE COST OF EQUITY

While generally supporting the underlying objectives of the regulatory reform, the industry has criticised the introduction of higher common equity requirements as a decision fraught with potentially adverse consequences. T he industry's core argument is based upon the premise that equity is more expensive than debt because it is riskier. This implies that increasing the equity share in the capital structure (i.e. decreasing banks' leverage) would adversely affect banks' realised return on equity. The industry claims that the return on equity required by investors to hold banks' equity would be broadly insensitive to the decrease in leverage, thus leading to a material increase in funding costs. In turn, this substantially higher cost of funding for banks would translate into a higher cost of credit for clients and counterparties and possibly in lower credit availability.

In spite of the industry criticism, financial theory provides the intellectual basis to defend the insistence on higher common equity, including from a cost of funding perspective.[5] The theoretical benchmark is the well-known Modigliani and Miller (M-M) theorem[6] on the irrelevance of the capital structure for the value of the firm, under a certain set of conditions. Starting with Miller[7], several scholars[8] have argued that there are no strong logical arguments against the theoretical validity of the M-M proposition for banks.[9] Indeed, the M-M theorem shows that the industry's view of the cost of equity as *invariant to the degree of leverage* is logically flawed. The fallacy lies in the fact that, as leverage declines, the riskiness of banks' equity declines as well, and so does the rate of return investors require to hold equity. This effect offsets the increased weight of the more expensive equity in the capital structure, so that – absent taxes and other frictions – the overall cost of capital stays unchanged as bank leverage varies.[10] This is the essence of the M-M result.

The crucial issue is that higher equity reduces leverage. Hence, as claimed by the industry, reduced leverage decreases the return on equity in good times[11] (when a bank earns more than its cost of capital, i.e. when it makes a profit). At the same time, however, it increases the return on equity in bad times, i.e. when a bank experiences a loss. In other words, higher equity capital lowers the return on equity in good times, but raises it in bad times: the volatility of equity returns decreases. As a result, the risk borne by shareholders also falls. Since rational pricing implies that a less risky financial claim commands a lower risk premium, it follows that the required return on equity for a better capitalised bank will also fall.

5 Beyond a purely prudential perspective.
6 Modigliani and Miller, op. cit.
7 M. Miller, "Do the M&M propositions apply to banks?", *Journal of Banking and Finance*, No 19, 1995.
8 For a thorough exposition, see A. Admati, P. DeMarzo, M. Hellwig and P. Pfleiderer, "Fallacies, irrelevant facts and myths in the discussion of capital regulation: why bank equity is not expensive", *Stanford Graduate School of Business Research Paper Series*, No 2063, 2011.
9 The findings in Gropp and Heider suggest that there are considerable similarities between the capital structures of banks and non-financial firms (see R. Gropp and F. Heider, "The determinants of bank capital structure", *Review of Finance*, No 14, 2010).
10 The argument assumes that the riskiness and the profitability of the firm do not change in response to changes in the capital structure. It cannot be excluded, however, that higher capital requirements could induce changes in banks' strategies and risk profiles.
11 Basically, the same level of profit is distributed over a larger equity stake.

The validity of the M-M result hinges on a set of assumptions, namely: complete and frictionless markets, symmetric information, lack of agency problems and no taxes. In practice, the existence of deviations from these idealised conditions suggests that one cannot expect a full M-M effect. Moreover, there are reasons that may further undermine the logic of the M-M theorem in the case of banks, and especially large banks. First, banks are highly leveraged institutions for which the value of the tax shield of debt (i.e. the fiscal advantage delivered by the deductibility of interest expenses) tends to be fairly sizeable. Second, in the case of large banks deemed "too big to fail", the implicit government guarantee to rescue a bank nearing insolvency translates into a lower risk premium charged by shareholders and creditors: correctly anticipating a bail-out, investors rationally underprice the cost of bankruptcy. Third, banks are unique with respect to other economic agents in that they are able to issue money-like liabilities, which command a liquidity premium and a convenience yield that decrease their interest rate. The argument is usually applied to deposits, but a strand of banking theory suggests that it can be extended to most banks' short-term liabilities, such as repos and other forms of short-term wholesale funding.[12]

Ultimately, the extent of the validity of the M-M proposition for banks is an empirical question that deserves appropriate analysis. As discussed, while it may be excessive to expect a full M-M effect, there are solid reasons why a negative relationship between banks' risk and capital is to be expected. The issue is of evident importance, since a validation of the M-M implication would sharply undermine the industry's key concern about a sizably higher cost of funding.

TESTING THE M-M EFFECT ON A SAMPLE OF LARGE INTERNATIONAL BANKS

Kashyap et al.[13] and Miles et al.[14] have recently tested the M-M hypothesis on a sample of US and UK banks respectively. With regards to these two countries, the findings of the papers provide evidence of a significant negative relationship between leverage, on the one hand, and banks' riskiness and return on equity, on the other hand.

This special feature investigates whether these findings also apply at a global level, by taking into account a broader sample of large, internationally active banks. This empirical investigation is further justified by the regulatory decision to require that a set of designated G-SIBs fully meet the capital surcharge, beyond the Basel III standards, through common equity.

In the following, the methodology proposed by Kashyap et al. and Miles et al. is applied to a sample of large, international commercial, universal and investment banks. For this purpose, a panel of publicly listed international banks was constructed.[15] The dataset, gathered via Bloomberg on a consolidated basis, includes semi-annual balance sheet data for banks headquartered in 18 countries, spanning the period from the first half of 1995 to the second half of 2011.

The starting point for the sample was the 70 largest global commercial and investment banks in terms of total assets as of year-end 2010. Data quality checks led to a final sample of 54 banks.[16] In particular, the data were cleaned to exclude: (i) banks with no observations for either the dependent or one of the explanatory variables; (ii) banks with no data available before 2004[17]; and (iii) data entry errors[18].

12 Building on this key observation, Stein argues that it is privately efficient for a bank to set a very high level of debt, beyond what is socially optimal (see J. Stein, "Monetary policy as financial-stability regulation", *Quarterly Journal of Economics*, forthcoming).
13 A. Kashyap, J. Stein and S. Hanson, "An analysis of the impact of 'substantially heightened' capital requirements on large financial institutions", University of Chicago Booth School of Business and Harvard University, 2010.
14 D. Miles, G. Marcheggiano and J. Yang, "Optimal bank capital", *CEPR Discussion Paper Series*, No 8333, 2011.
15 See Table A.4 for the list of international banks in the sample.
16 The smallest bank in the sample held total assets of above €185 billion at the end of 2010.
17 To avoid relying on a sample where the financial crisis which started in 2007 is overrepresented.
18 Such as unit errors and incorrect decimal places.

While no attempt is made to develop criteria to select a set of G-SIBs, this sample of the largest international banking groups comprises most of the G-SIBs identified by the Basel Committee on Banking Supervision and the Financial Stability Board. Thus, the findings of the analysis are also related to the decision of regulators to focus on common equity as the instrument for meeting the surcharge requirements.

Do higher levels of equity capital decrease banks' risk?

As discussed, the empirical test performed here follows the simple approach proposed by Kashyap et al. and Miles et al.

The starting point of the analysis is to choose a suitable measure of banks' equity risk. A natural and easily computable measure is the beta (β) of the bank's share price, as defined within the capital asset pricing model (CAPM).

For each bank, its equity beta is estimated over a six-month rolling window using traded daily stock market returns together with the returns for the reference national index, from the first half of 1995 until the second half of 2011. Then, the relationship between banks' *risk* (proxied by the banks' equity beta) and *equity capital* is tested.[19] While several measures of bank equity capital are available, the chosen variable is the ratio of common equity to total assets. This is in line with both the market and the regulatory focus on common equity as the capital component with the highest loss-absorbing capacity in a going concern.

The model estimated is a simple fixed effects regression[20]:

$$\hat{\beta}_{it} = a_i + bCapratio_{it\text{-}1} + X_{it}'c + d_t + u_{it}$$

for banks $i = 1...J$ and time periods $t = 1, 2, ...T$,

where a_i is a vector of bank-specific fixed effects, X a matrix of regressors that include control variables and d_t a vector of time fixed effects.

The inclusion of time fixed effects (d_t) in the regression makes it possible to account for factors that have an impact on banks' average risks from year to year, such as a general economic boom or downturn. It should be noted that it is possible that leverage (i.e. the inverse of the capital ratio) and banks' riskiness are simultaneously determined by a bank's manager. In other words, the causal link between leverage and beta is not assured as it could also run in the opposite direction. For instance, a bank manager may first set a target risk profile and then decide on the leverage that is consistent with the target. More generally, as noted by Kashyap et al., banks with different risk profiles may choose different capital structures.

In order to account for this potential endogeneity problem, the beta is regressed on the lagged capital ratio. Furthermore, the choice of control variables attempts to capture other factors that can affect banks' risk which are specific to each bank: return on assets (to account for overall bank profitability), total assets (to account for size), and risk-weighted assets (to control for a regulatory measure of balance sheet risk).

The results of the regressions are shown in Table A.1. Column (1) shows the baseline regression where the only regressor is the lagged capital ratio.[21]

As predicted, the coefficients show that banks' risk (proxied by the beta) declines with increases in the equity-to-assets ratio. The results are highly significant, suggesting that higher bank capital reflects in lower bank market risk.[22]

19 Under the CAPM, and provided that banks' debt is uncorrelated with the market portfolio, a simple linear relationship holds between the equity beta and leverage. See Miles et al. for details.

20 Results remain qualitatively unchanged under the random effects specification, although the capital ratio coefficient declines somewhat.

21 Given the choice of a fixed effects model, the tables only report the *R-squared within*.

22 Robustness tests show that estimates remain highly significant when employing other measures of capital, such as tangible common equity over total assets or common equity over risk-weighted assets. However, the more limited coverage of these data for the sample leads to a reduced number of observations.

Table A.1 Dependent variable: banks' beta (fixed effects estimation), standard errors are robust to clustering at year and bank level

	(1)	(2)
Common equity $_{it-1}$ / assets $_{it-1}$	-0.045	-0.079
	[0.016]***	[0.021]***
Return on assets		-0.072
		[0.036]**
Log risk-weighted assets		0.294
		[0.133]**
Log total assets		-0.205
		[0.121]*
Constant	1.494	0.493
	[0.129]***	[1.242]
Observations	1,372	652
R-squared within	0.360	0.530

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.2 Gauging the Modigliani-Miller effect

	(1)	(2)
Common equity $_{it-1}$ / assets $_{it-1}$	-0.045	-0.079
	[0.016]***	[0.021]***
Average common equity / assets	5	
Average beta	1.1	
Δ in average beta given a 100% increase in capital	-0.225	-0.400
Δ in average beta given a 100% increase in capital, under full M-M validity	-0.550	-0.550
Final average beta	0.875	0.701
M-M effect	41%	73%

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%.

Column (2) of Table A.1 reports the results of the baseline regression augmented to include additional control variables. The coefficient on the capital ratio and the explanatory power both increase considerably. The coefficients on the control variables also appear significant and of the expected sign. The banks' equity beta increases in total risk-weighted assets, while it decreases in both higher profitability, as measured by return on assets, and size. Although only marginally significant at conventional levels, the negative sign on size may reflect the fact that larger banks are perceived by the market as less risky, owing to better diversification. On the other hand, it could also reflect the implicit government guarantee to bail out the firm when in distress.

These results allow a comparison of the estimated magnitudes with those predicted by the M-M proposition. A full M-M effect implies that when the capital ratio doubles, the beta should decline by half, since the same equity risk is spread over a layer of equity twice as large. The average ratio of equity to assets in the sample is 5%, while the average beta is 1.1. Thus, if the equity ratio doubles to 10%, the beta should fall by half, to 0.55. Table A.1 shows that the coefficient of the equity ratio is -0.045. This coefficient implies that if the equity ratio goes up by 5% (i.e. it doubles), the beta will fall by 0.225 to 0.875 (since 0.045*5 = 0.225). Given that with a full M-M effect, the beta would fall by 0.55, this implies a M-M effect of 41% (= 0.225/0.55).[23]

Table A.2 summarises the results for the baseline regression (column (1)) and the one including controls (column (2)). Overall, the estimates suggest a M-M effect in a range of 41% to 73%, depending on the specification, thus confirming the findings of Kashyap et al. (and Miles at al.). Indeed, these two papers estimate the M-M effect to range between 45% and 75%.

Do higher levels of equity capital decrease banks' required return on equity?

The estimates discussed so far hinge on the validity of the CAPM. A more direct way of testing the M-M effect would be to investigate the relationship between the required return on bank equity and the capital ratio. Unfortunately, data about earnings expectations are not widely available. As suggested by Miles et al., an alternative, albeit imperfect, approach

23 To gauge the implication for the return on equity, recall that, under the CAPM, the expected risk premium (i.e. return on equity net of the risk-free rate) on an individual stock is the product of the beta multiplied by the market risk premium. Assuming a risk-free rate and a market risk premium both equal to 5%, the estimates in the regression including controls suggest a decline in the equity risk premium for the average bank of 2%, from 5.2% to 3.2%, upon a doubling in the equity ratio. Such an effect is equivalent to 77% of what would be expected under a full M-M effect.

is to employ the realised returns on equity (i.e. the earnings yield on the banks' stock) as a proxy for expected returns.

Table A.3 summarises the results of a simple fixed effects[24] regression of the earnings yield on the common equity ratio.[25]

These estimates suggest that the common equity ratio is also significant in explaining the movement in the required return on bank equity as proxied by realised earnings: the higher the equity ratio, the lower the required return on equity. For a one unit increase in capital, the required return on equity is estimated to decrease by about 40 basis points.

Using these results it is possible to directly compute the decline in the required return on equity associated with a decrease in leverage. Consider the coefficient on the common equity ratio (-0.0041) in Table A.3. At the average equity ratio in the sample, the required return on equity is about 0.123 + (-0.0041*5) = 10.3%. Assuming a risk-free rate of 5%, the equity risk premium of a bank with this capital would be 5.3%. If the capital ratio doubles to 10, the required return on equity would now be 0.123 + (-0.0041*10) = 8.2%, yielding an equity risk premium of 3.2%. Under a full M-M effect, the equity risk premium should fall by half to 2.65%. Altogether, these computations imply that, upon doubling the equity ratio, the reduction in the risk premium on bank equity is around 78%[26] of the reduction expected under a full M-M effect.

Table A.3 Dependent variable: earnings over share price ratio, standard errors are robust to clustering at both year and bank level

Common equity $_{it-1}$ / assets $_{it-1}$	-0.0041
	[0.0019]**
Constant	0.123
	[0.011]***
Observations	1,277
R-squared within	0.12

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%

CONCLUDING REMARKS

The evidence presented in this special feature supports the existence of a sizeable M-M effect for a sample of 54 large international banks during the period from the first half of 1995 to the second half of 2011. An increase in the equity ratio (a decrease in leverage) is associated with a decline in both the riskiness of the bank (as proxied by the equity beta) and the required return on its equity (as proxied by the earnings yield). The estimates range between 41% and 78% of what would be predicted under a full effect. Given the caveats limiting the extent of the validity of the M-M assumption in the case of large banks, it is remarkable that these figures are both sizeable and highly significant.[27] Furthermore, they are in line with the findings of Kashyap et al. and Miles et al. for samples of US and UK banks respectively.

The observation that higher common equity ratios are associated with lower risk premia as well as a decline in banks' required return on equity largely downplays the industry's concern about a material increase in funding costs. Ultimately, this evidence provides further support[28] for the regulatory emphasis on higher minimum equity capital requirements in the overhaul of banking regulation. Overall, higher equity requirements are conducive to a less risky banking system, with only modest,

24 This specification also includes year effects. Results remain qualitatively unchanged under the random effects specification.
25 The significance of the coefficient on the capital ratio further improves when employing tangible common equity over total assets as a measure of capital, although its value declines to -0.0033.
26 78% = (5.3-3.2)/(2.65).
27 The fact that the equity beta does not fully reflect changes in leverage may also be due to changes in banks' risk profiles as well as to the inability of investors to promptly recognise the change in risk or to fully rebalance their portfolios.
28 In spite of the findings of this special feature, it cannot be ruled out that some banks may nonetheless react to higher capital requirements by increasing risk. For instance, this behaviour could be induced by flawed incentives in compensation packages, often anchored to non-risk-adjusted performance. Strong and effective supervision remains key. It is the task of supervisors to ensure that the reform will realise its beneficial effects without triggering undesirable consequences.

if any, negative effects in terms of the cost of funding. In particular, this analysis of a sample of large international banks vindicates the decision taken by international authorities that G-SIBs should fully meet the surcharge with common equity.

However, one caveat is in order. These findings relate to a broad structural link between equity ratios and the cost of equity. They do not suggest that *raising* equity capital in private markets is without cost. Indeed, the well-known debt overhang problem[29] as well as asymmetric information[30] issues suggest that capital issuance can be costly, especially under stressed market conditions. By providing an appropriately long phasing-in period for the new requirements, these concerns have been taken into account by the regulatory community. Indeed, the higher capital ratios could be largely achieved via retained earnings.

Finally, it is worth recalling that recent studies have also suggested that a positive relationship may hold between levels of capital and firm value.[31] These findings point to potential beneficial effects of higher equity capital requirements, which go beyond the neutrality result of M-M.

Table A.4 List of the 54 international banks included in the sample, by country

Bank	Country
Erste Group Bank	Austria
Observations	Australia
Australia and New Zealand Banking Group	Australia
Commonwealth Bank of Australia	Australia
National Australian Bank	Australia
Westpac Banking	Australia
Dexia	Belgium
KBC Group	Belgium
Banco Do Brasil	Brazil
Bradesco	Brazil
Itau Unibanco	Brazil
Bank of Montreal	Canada
Bank of Nova Scotia	Canada
Canadian Imperial Bank of CA Commerce	Canada
Royal Bank of Canada	Canada
Toronto-Dominion Bank	Canada
Credit Suisse	Switzerland
UBS	Switzerland
Commerzbank	Germany
Deutsche Bank	Germany
Deutsche Postbank	Germany
Danske Bank	Denmark
Banco Santander	Spain
BBVA	Spain
BNP Paribas	France
Crédit Agricole	France
Société Générale	France
Intesa Sanpaolo	Italy
Unicredit	Italy
Mitsubishi UFJ	Japan
Mizuho	Japan
Nomura Holdings	Japan
Shinkin Central	Japan
Sumitomo Mitsui	Japan
Woori Financial Group	Korea
ING Group	Netherlands
DnB NOR	Norway
Nordea	Sweden
SEB AB	Sweden
Svenska Handelsbanken	Sweden
Swedbank AB	Sweden
Barclays	United Kingdom
HSBC	United Kingdom
Lloyds Bank	United Kingdom
Royal Bank of Scotland	United Kingdom
Standard Chartered	United Kingdom
Bank NY Mellon	United States
Bank of America	United States
Citigroup	United States
Goldman Sachs	United States
JP Morgan	United States
Morgan Stanley	United States
PNC Financial	United States
US Bancorp	United States
Wells Fargo	United States

29 The debt overhang problem, i.e. the difficulty of raising equity when doing so disproportionally benefits creditors, was first identified by Myers (see S. Myers, "Determinants of corporate borrowing", *Journal of Financial Economics*, No 5, 1977).

30 The adverse selection problem of raising equity in private markets is linked to the idea that managers have private information that investors do not have. As such, investors will tend to discount the price of equity, thus increasing the issuance costs for the firm. The main result here is the celebrated "pecking order theory", according to which a firm raises capital preferentially via retained earnings. See S. Myers and N. Majluf, "Corporate finance and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, No 13, 1984.

31 For instance, Berger and Bouwman show that capital helps medium and large banks to survive banking crises; obviously, banks which default incur massive value losses (see A. Berger and C. Bouwman, "Bank capital, survival, and performance around financial crises", *Working Paper Series*, No 09-24, Wharton Financial Institutions Center, 2009). More directly, Mehran and Thakor show that bank value and banks' equity capital are positively correlated in the cross-section (see H. Mehran and A. Thankor, "Bank capital and value in the cross-section", *Review of Financial Studies*, No 24(4), 2011).