Financial Institution Leverage: Some Notes

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Background and Summary

Bankers (both in Australia and overseas) generally claim that higher capital requirements will significantly increase the cost of bank funding with adverse effects for the economy. This view arises because bankers: (a) assume that debt is cheaper than equity – although note that there is no readily observable cost of equity (which is the required return of shareholders); and (b) ignore the possibility that lower leverage will reduce the cost of (both existing and new) equity (because of lower risk to equity), which could mean no, or only a small, increase in the overall cost of bank funding.

A well known theorem in finance (the Modigliani-Miller capital structure irrelevance theorem) presents conditions under which overall cost of funding will be unaffected by leverage. (MM claims that the reduction in the cost of equity due to lower risk from reduced leverage exactly offsets the greater use of that form of financing, because choice of capital structure merely involves a reallocation of asset risk between different stakeholders. Lower achieved roe will be exactly matched by a lower required return on equity of shareholders, such that there will be no change in the valuation of the organization). While those conditions don't hold generally, (a) there are good reasons to believe that there is a substantial "MM" offset effect – such that the overall effect of higher capital requirements is much less than claimed, and (b) understanding why MM may not work helps identify whether higher capital requirements actually involve a social cost (rather than a private cost to bank shareholders).

Taking the latter point first, one reason why MM may not work is that depositors/ debt holders do not demand appropriately higher rates of return from higher leveraged banks, because of perceptions of government implicit or explicit guarantees. Higher leverage then provides private gains to bank shareholders at the expense of taxpayers (or depositors – if they are misguided about government support). A second is that deposit/debt finance may be tax-advantaged (under "classical" tax systems) relative to equity. There are then private benefits to bank shareholders from higher leverage – but no social benefits. There may be some other market imperfections giving a bias towards deposit/debt finance (more managerial discipline from having "runnable" deposits/debt), but it is arguable that extremely high leverage levels are needed to achieve this. (A separate, personal, view is that

high leverage, such as banks operate with, is not consistent with the risk exposure created for stakeholders other than equityholders who benefit from risk taking but gain protection of their other wealth from limited liability structures).

Does an "MM" effect operate? Answering this question is complicated by the fact that the cost of equity capital is unobservable (and refers to the rate of return required by shareholders on the market value of equity holdings, whereas bankers operate to targets for a return on equity based on the book value of equity). But there have been some studies, including one from the Bank of England (summarized in the box below, which imply that only relatively small increases in bank funding costs would follow from large increases in capital requirements – and that the social benefits of reduced risk of financial crises outweigh those costs.

"… even proportionally large increases in bank capital are likely to result in a small long-run impact on the borrowing costs faced by bank customers. Even if the amount of bank capital doubles our estimates suggest that the average cost of bank funding will increase by only around 10–40 basis points (bps) (a doubling in capital from current levels would still mean that most banks were financing more than 90% of their assets with debt.) But substantially higher capital requirements could create very large benefits by reducing the probability of systemic banking crises." Miles et al (2013)

It is also interesting to note the comment of the UBS Chairman (The Australian Feb 22, 2014) in the box below (third column) implying that shareholders rewarded banks for having higher capital ratios – even if actual roe is reduced from less leverage, required returns of shareholders have fallen by even more!

WORLD ECONOMY

ANDREW WHITE

UBS chairman Axel Weber has offered support for reforming entitlements to suit an ageing population and highlighted the role of increased labour market flexibility in improving national competitiveness.

Mr Weber, a former president of the German central bank, the Bundesbank, also endorsed Joe Hockey's push for G20 finance ministers and central bank governors to agree on completing existing bank reforms before adding further international regulations to the to-do list.

The growing enthusiasm for making a blunt measure such as leverage ratio — the proportion of a bank's capital to its total assets — a principal tool for regulators rather than a backstop, risked derailing years of efforts by banks to "derisk" their loan books, Mr Weber said.

In an interview with *The Weekend Australian* Mr Weber said those banks that had adopted the Basel III capital rules ahead of schedule — such as Australian and Swiss banks — were being rewarded by the market with higher valuations.

Tensions emerged between banks and regulators ahead of the G20 meeting in Sydney this weekend over moves for further banking reforms, with warnings that it was restricting the ability of banks to lend to business and stimulate economic growth at a time when

The attached notes (somewhat "textbook" in nature) attempt to spell out how the MM proposition can be interpreted in the context of bank lending and loan pricing, and identify implications for policy of the reasons for failure of MM to fully apply. They do not examine potential biases implied by the risk-weighting approach of the Basel capital requirements, which is a separable issue to the overall level of capital required. They also do not examine

the question of the relationship between bank roe (profitability) and availability of internally generated funds to provide equity capital required for growth. That is also a separable matter – arguably, to offset hubris and ensure that market discipline occurs, bank managers can, and should, distribute 100 per cent of earnings and raise required equity capital for expansion by rights issues or other external equity raisings. (Transactions costs of external equity raising are, of course, an impediment to this state of nirvana!)

These notes also do not consider whether Australian bankers are assuming and applying cost of equity capital estimates (eg 15+per cent roe on book value) which are too high relative to the risk premium required by shareholders. Market to book ratios for the major banks well in excess of unity (over 2 for CBA at the moment, I think) can be interpreted as implying that actual roes are well above the required return of shareholders. This is an important question, not just in terms of the issue of competition in banking. Given the dominant role of banks in financing Australia, use of an excessively high cost of equity in pricing loans means that there would be borrowers with worthwhile projects who will not be able to obtain finance at a price consistent with economic efficiency.

Conclusion: There is no logical argument or evidence supporting the view that bank capital ratios as low as currently exist (even after recent regulatory increases) are socially optimal, nor arguments to show that any social costs (of possibly marginally higher bank funding costs) from higher capital ratios would not be outweighed by social gains from greater financial stability. It is not even clear that higher capital ratios would involve a private cost to bank shareholders whose required returns would fall because of lower risk of bank equity, such that they would be content with lower bank roe's. Bank management prefer lower capital ratios perhaps, partly, because they are exposed to less market discipline in raising deposit and debt funds compared to equity raisings.

Introduction

A major component of recent regulatory changes has been to increase capital requirements for banks and other financial institutions. These notes aim to explain, from the perspective of finance theory, the role of equity capital in financial institutions, private incentives for high leverage, and consequences of higher capital requirements. Ultimately the purpose is to answer the question: do higher capital requirements have adverse consequences (socially and/or for banks) and if so why?

A Framework for analysis

It is useful to start with the Modigliani-Miller (MM) irrelevance theorem (that, under certain conditions, leverage is irrelevant for the cost of capital and value of a firm) as it applies to banks – not because the world meets those conditions, but because it makes clear the incentives for leverage and their consequences.[1]

Essentially the MM theorem is based on recognising that the risk associated with particular assets must be borne in aggregate by the providers of finance for those assets, and they will expect returns on their financial contributions commensurate with the share of risk borne. Increased leverage (more debt, less equity) will increase the risk borne by each dollar of equity finance and thus increase the cost (expected/required return)[2] of equity finance to a degree which just offsets the apparently lower cost of each dollar of debt finance. (The usual analogy is that cutting a pie into more or different sized pieces does not alter the amount of pie! Here, the pie is the future risky cash flows of assets, and debt/equity decisions simply determine how the amount and risk is divided among providers of finance.)

Fundamental to the argument is the realization that (in perfect markets) shareholders can, at no cost, undo the effects of corporate leverage changes on their investment returns by personal leverage changes. For example, consider shareholdings in a company with assets of $100 financed by $50 equity and $50 debt. The shareholders get the returns on the assets after repayments on $50 of debt (made by the company). If the company were financed by 100% equity, shareholders can achieve the same returns by owning all the (now $100) equity and part financing it with $50 of personal borrowings (secured, if need be, against the equity). They get the returns on the assets, and then make repayments on $50 of debt on personal account, rather than that repayment occurring at the bank level. (Clearly there's some daylight between the perfect market assumption made here and the real world, the implications of which need to be addressed later!)

[1] Admati and Hellwig (2012) provide a robust attack on bankers' views about costs of being required to use more equity financing because of higher capital ratios. They also stress the point (appropriately) that common use of the term "hold more capital" induces misperceptions of what is involved – which is solely a change in the mix of funding of assets.

[2] The terms required return and expected return are often used interchangeably – the assumption being that asset prices will adjust such that investors are willing holders at the current price and therefore must expect a return equal to their required return.

In the context of banks, the appropriate interpretation of MM relates to the question of what interest rate will need to be charged for a particular loan to meet the required expected returns of shareholders and depositors/ debt-holders. A simple example can illustrate – it ignores operating costs etc which can be incorporated, but which just make the description more messy. It also helps to see the underlying mechanics by initially assuming that there is just one person (you) providing the entire finance to the entity providing loans – which we'll call (and gradually morph into) a bank (and an important subsequent consideration is what difference it may make if there are different groups of finance providers).

A Simple Model

Suppose you establish a lending company/bank which wishes to finance a $100 portfolio of loans, and you personally are providing all of the finance to that bank, initially in the form of equity only. The risk free rate is 4% and the risk of those loans is such that you require an expected return of 8% to make it worthwhile to bear that risk. The loans are such that there is a 0.9 probability that full repayment ($100(1+r)) will be received (where r is the interest rate charged) and 0.1 probability that only $90 will be recovered. To get an expected return of 8% the expected loan repayment needs to be $108. Since the expected repayment is 0.9(100(1+r)) + 0.1(90), the loan interest rate which needs to be charged can be found from solving:

$$0.9(100(1+r)) + 0.1(90) = 108$$

giving $r = 0.10 = 10\%$.

Now, suppose that you decide to designate $50 of your contribution as a deposit/debt[3] which has priority of repayment over the other $50 of equity. Since the worst outcome for the bank is that it recovers $90 from the loans, there is no risk of default on the deposits, hence they should pay 4% which is the risk free rate. What expected return should you now require on your equity contribution, and what loan interest rate should be charged?

Since you still receive all the returns on the loans, nothing has effectively changed and the required loan rate is still 10%. It is just that $52 gets designated as a return of deposit plus interest, and the remainder of either $58 (110 – 52) with probability of 0.9 or $38 (90-52) with probability of 0.1 is the equity return. What has happened to the expected rate of return on equity? For the $50 equity investment, the expected return is 0.9(58)+0.1(38) = 56, giving an expected rate of return of 12%.

[3] Deposits differ from debt in a number of ways including seniority and issuance/redemption arrangements. They also generally pay lower interest rates, but create operational costs for the bank due to services provided. Flannery (2012) notes that empirical evidence supports the intuition that banks will use debt as a marginal source of finance – once the full marginal cost (interest plus operating costs) of deposits equals the marginal cost of debt. Hence, no distinction is made in this discussion.

Why has the expected return on equity increased from 8%? The reason is that previously each dollar of equity would return either 1.10 or 0.9. Now the return will be either 1.16 or 0.76 – the equity risk has increased due to leverage and the resulting commitment to make a fixed prior payment from loan receipts to deposits.

Now, suppose that you decide to designate only $10 of your contribution as equity and $90 as deposits. It is now possible that there will be default on the deposit obligations. If the loans return $90, that will only return the deposit principal and none of any promised interest amount. If the deposit interest rate remains at 4 per cent, the expected return on deposits will be less than the risk free rate of 4 per cent. Being rational you decide that you require a deposit interest rate r_d such that the expected return per dollar of deposit of $0.9(1+r_d) + 0.1\ (1) = 1.04$. This gives a required deposit interest rate of 4.44%.[4]

Again, nothing of substance has changed, you still receive all of the loan repayments – but the deposits are "risky" and the risk of the equity component has increased further as has its required return. In this world, leverage doesn't matter. Equity finance appears more expensive, but using less of it increases its required rate of return and once there is a non-zero risk of default on deposits, the required promised rate of return on deposits also increases. (The expected return on the $100 of funds invested is still 8 per cent (and the risk is still that the repayment will be $110 or $90) – but the allocation of returns and risk differs between the bits invested as equity and as deposit.

Putting all of that in terms of return on equity (roe):

Leverage	Poor loan outcome (0.1 probability)	Good loan outcome (0.9 probability)	Expected
Zero (all equity)	ROE = -10%	ROE = +10%	ROE = +8%
50% (half equity)	ROE = -24%	ROE = 16%	ROE = +12%
90% (10% equity)	ROE = -100%	ROE = 60%%	ROE = +44%

Note that while increasing leverage has dramatic effects (in this numerical example) in terms of increasing the expected return on equity, this is just equal to the increase in required rate of return – putting on your hat as the shareholder of this bank, you are no better off. The increased variability of equity returns as leverage increases means that because your (smaller) equity contribution is bearing (almost) all of the risk, you want a higher rate of return on it.

[4] In the good state of the world which has a probability of 0.9, the loans repay $110, the deposits receive $93.996 (=90(1.0444)) and the equity return is $16.004 (= 110-93.996). When some of the loans default (probability 0.1) and on $90 is recouped, the deposits receive $90 and equity $0. The expected rate of return on the equity is now 44.036% (=0.9(60.004%) + 0.1(-100%)).

Real World Complications – Different Depositors and Shareholders

What, of substance, is different in the real world that gives banks incentive to high leverage?

One important consideration is that in practice depositors are a different group of individuals to equity providers. One consequence may be that depositors do not understand that the high leverage creates a risk of the bank defaulting on its obligations to them. If they do not demand a higher interest rate (such as the 4.44% in the example above), then while higher leverage increases risk per dollar of equity finance, the expected rate of return to the shareholders increases by more than is necessary to compensate for the increased risk.[5]

Note that this is completely independent of whether there is a government safety net or not, and is applicable to financial institutions outside of the prudentially regulated space such as finance companies. Is it appropriate that owners of a bank/financial institution increase leverage to benefit from misconceptions of depositors about riskiness of their funds? This seems to be a moral rather than economics question – except to the extent that disappointed expectations of depositors have consequences for the efficient working of the economic/financial system.

But one reason why depositors may not respond to the increased risk arising from leverage, by demanding higher promised interest rates, is that they believe that governments protect them, either implicitly or explicitly, from having to bear losses on their funds. Then, unless there is an explicit, leverage related, fee levied upon banks which reflects the risk now borne by the government, bank equity holders still have an incentive (by way of higher risk adjusted expected returns) for higher bank leverage. This private benefit is, of course, not a social benefit, but rather a wealth transfer by creation of a contingent liability for taxpayers. If bank failures also create economic disruption there is more than just a wealth transfer, but also a net social loss.

Do minimum risk-related capital requirements remove this problem and the need for risk-related fees. Only if they are sufficiently stringent such that there is zero risk of default by the bank will that be so. Otherwise, the bank is able to raise deposit funds at the risk-free interest rate rather than at a higher promised rate which reflects the default risk. The expected return on equity will exceed the required return by virtue of the free subsidy provided by the government explicit or implicit insurance.

Another argument might be that the required returns of equity holders do not vary with leverage in the way described. If the required return on equity does not increase as much with leverage as assumed, then increasing leverage will generate a higher expected return

[5] Compared to the case where the deposit rate is 4.44%, a deposit rate of 4% means that the equity return is now either $16.4 (= 110- 93.6) or $0 with an expected return of 54.26%. The expected return has increased with no increase in the probability of, or loss involved from, the bad outcome!

on the funds invested than is required to compensate for the risk involved.[6] But to argue that requires either: (a) an assumption of irrationality or inability to assess risk on the part of equity investors; (b) some assumption about investor risk-return preferences inconsistent with conventional analyses, or (c) some real world market imperfections. Of the latter, there are many – but the relevant question is what are the implications?

Real World Complications – Imperfect Credit Markets

Conceivably, investors in bank shares may want the risk-return characteristics of highly leveraged indirect claims on returns from bank assets – such as occur if banks have high leverage. In theory, they could achieve the same outcome from using personal leverage to buy shares in less levered or unlevered banks. Using margin loans, for example, the lender providing finance for purchase of shares in an unlevered bank faces the same default risk as if she had been the direct provider of debt finance to a levered bank. (Although the margining process, equivalent in principle to withdrawing debt financing from a bank as its share price declines, protects against that default risk).

In practice, credit markets do not work this well, such that there may be cost savings from borrowings being made by the bank entity (essentially on behalf of shareholders), rather than by the shareholders themselves. Undoubtedly there are cost savings simply from the lowered transactions costs of economies of scale of the bank's borrowing relative to multiple individual borrowings. There may also be institutional constraints which prevent some share investors from taking leveraged positions. While that suggests benefits from some bank leverage – it does not explain the rationale for such high leverage as empirically observed.

Possibly more important is the fact that banks can raise "debt" funds in the form of deposits – which provide liquidity services as well as explicit interest to depositors. If, for example, depositors value those liquidity services more than the operational (and risk management) costs the banks incur in providing them, the total costs of deposits (interest and related operational costs) to the bank may be less than straight debt borrowing costs to either the bank or shareholders. In practice, however, it can be expected that banks will expand deposit funding to the point where marginal total costs of the alternative sources of funds are equal. The rationale then for further leverage via (non-deposit) debt funding requires some alternative explanation – such as the transaction cost savings or other imperfections.

Real World Complications – Taxation

Even without there being uninformed depositors or government guarantees, there do exist market imperfections which give incentives to higher leverage. One is taxation. Under a classical tax system, increasing leverage reduces the total government tax receipts from a

[6] Of course, if the bank equity is tradeable, this will cause the market value of equity to exceed the book value (the amount originally invested). That outcome applies generally when the expected rate of return on book value exceeds the required rate of return of shareholders.

given level of business activity. The reason is that interest on debt is deductible in calculating income for corporate tax purposes, and equity holders are taxed on dividends paid to them from after-corporate-tax earnings. There is thus "double taxation" of dividends on equity but single taxation of interest on debt.

The first point to note here is that while the tax savings from increased leverage are a private benefit to the owners of the business using higher leverage, they are not a social benefit (unless one takes the extreme position that all government expenditure financed by taxation is a waste). Entities enjoying higher "tax shields" from higher leverage are imposing higher tax requirements on the rest of society to achieve the level of total tax revenues seen necessary for desired provision of government services. It is possible to show that under simplifying assumptions the private value of the tax shield (the increase in firm value from leverage and lower tax payments) under a classical tax system is equal to t_cD where t_c is the corporate tax rate and D is the level of debt (and deposits in the case of banks). The leverage levels employed by banks relative to most other businesses make this tax shield quite substantial.[7]

The second point to note is that the tax shield argument as a motive for higher leverage has substantially reduced significance in Australia where a dividend imputation tax system applies. If all shares in a company earning income in Australia are held by Australian residents and where there is a 100 per cent dividend payout rate, corporate tax payments are completely "washed out" by lower personal tax payments due as a result of franking credits attached to dividends. In practice, banks have some overseas income, some non-resident shareholders and less than 100 per cent payout rates partially reducing the "washout" effect. Nevertheless, tax incentives for higher leverage are significantly reduced by the dividend imputation tax system. One consequence is that the "tax" cost to Australian banks of higher equity ratios is much less than for the majority of banks globally who are not subject to such integrated tax systems. (The consequences of high payout rates reducing bank retention of capital and impeding balance sheet growth, can be overcome partly via dividend reinvestment schemes – and is otherwise only an issue of significance if there is some economic rationale for owner (rather than manager) preference for financing growth by internal finance (retained earnings) rather than externally provided equity finance).[8]

Practical Limits to Leverage

If there is such a tax advantage to leverage, what inhibits firms from becoming almost entirely debt financed? While there is a lot of variability, the debt-assets ratios of non-financial businesses tend to average around the 0.3 – 0.5 mark. Banks, aggregating deposits with other debt securities on issue, have debt-assets ratios typically around the 0.95 mark or higher. Why is that so?

[7] Whether it helps explain the massive growth in banking once constraints reduced by financial deregulation were removed may warrant study.
[8] A large literature exists on this topic.

The main market imperfection generally perceived to inhibit excessive leverage is the cost of financial distress. Higher leverage and risk of failure increases the probability that available resources will need to be used to deal with such risks or that customers (particularly where long term implicit or explicit contracts are involved) may be less willing to deal with a company with higher risk of failure. That is, at some level of leverage there is some reduction in the expected future free cash flows generated by the company which are available to provide returns to providers of finance.

Where the marginal costs and benefits of increased leverage cancel out to determine the optimal leverage for a firm depends on a number of factors. Among those factors are firm characteristics such as the volatility of product demand and tangibility of assets (and thus potential recovery rates of creditors in the event of firm failure). [9]

Optimal Bank Leverage

Why should banks have such high leverage relative to other types of businesses? One possibility may be that deposits are different from debt. And indeed they are – particularly at call deposits.[10] One (academic) argument as to why banks finance themselves with deposits rather than debt is that the balance sheet fragility created by using withdrawable deposits / short term debt acts as a mechanism for ensuring bank management is incentivised in managing the asset side of the balance sheet (loans). But that is an argument related to use of deposits (and short term debt) rather than long term debt, and does not explain why leverage should be so high. Another such argument is that high leverage enables bank managers to own a larger share of the bank's equity and thus aligns their incentives with those of owners. Perhaps this is relevant for a (very) small bank, but unlikely to be relevant for large banks – which can also design managerial remuneration contracts to provide alignment. A third academic argument is that because assessing bank risk-taking is difficult for outsiders, issuing debt with fixed payoffs which are insensitive to risk (except in the low probability event of bankruptcy) is a better way to overcome this information asymmetry problem than using equity financing. (Flannery, 1994, discusses these theories, and Gropp and Heider (2010) find that a range of variables found relevant for explaining capital structure differences in non-financial firms also apply in the case of large European and US banks).

Another possible reason is that the nature of bank business is low risk. If, for example, their only activity was to take depositor funds and invest them in (particularly short-term) government securities (and cash and deposits at the Reserve Bank), there would be little

[9] There are some studies that argue that there is no optimal leverage – rather it is the product of historical factors such as availability of, and preference for, internal financing or historical managerial choices of raising equity or debt to "time the market" conditions for favourable cost conditions. Even though there is some evidence to suggest that these arguments are relevant, it remains the case that there is some "clustering" of leverage ratios for different industries and particular characteristics of firms.

[10] While deposits generally pay lower interest rates than debt, that reflects the associated operating costs from providing deposit facilities etc.

reason not to be highly levered. But, if the activities are broader than that (lending, trading etc) there is variability in the value of the bank's assets (due to default and market risk) which, at some level of leverage, creates risk of insolvency. (And leverage – use of deposit funding – also creates liquidity risk for banks arising from the mismatch of asset maturity and deposit maturity. A bank which was 100 per cent equity financed would have no liquidity risk!)

What level of leverage involves an acceptable risk of bank failure? Historically (ie until the early 20th century) banks (worldwide) generally operated with equity/asset ratios of 20 per cent plus – and owners were often subject to double or unlimited liability. Nowadays, economic capital modelling is used to suggest that equity/asset ratios of 4 or 5 per cent (or less) are consistent with a probability of failure of (say) 0.1% p.a (ie a failure once in 1000 years) or less. A quick glance at the historical record might call the robustness of that statistical modelling into question – and, in any event, the historical record reflects the risk management benefits provided to banks through government and central bank support mechanisms. In particular, implicit guarantees and central bank liquidity facilities provided by the State enable private banks to profit by "riding the yield curve" at much less risk of depositor runs and costly fire sales of assets than would otherwise occur.

Empirical Evidence on Bank Value and Bank Capital

Unfortunately, there are few articles which empirically test whether higher bank capital ratios add or reduce value for bank shareholders. Even if there were, the problem exists that any finding that value falls with higher capital ratios could be due simply to the existence of implied or under-priced deposit insurance or government guarantees.

One study (Mehran and Thakor, 2011) which attempts to examine this question does so by considering whether the acquisition price paid in US bank takeovers increases more than one-for-one with the capital position of the target bank. (The price and capital position are both deflated by the target bank's assets to enable comparability, and other potential determinants of the acquisition price are controlled for). The results indicate that an increase in the capital/assets ratio of 0.01 leads to approximately a 0.014 increase in the acquisition price/assets ratio. The implication is that higher capital has a more than one for one effect in increasing the market value of the bank. Interestingly, the Chairman of UBS, Axel Weber was recently quoted as saying that "banks that had adopted the Basel III capital rules ahead of schedule – such as Australian and Swiss banks – were being rewarded by the market with higher valuations" (The Australian, February 22, 2014)

A study by Miles et al (2012) from the Bank of England uses historical data on British bank equity returns and leverage to assess how higher capital ratios affect bank cost of funding and to estimate an optimal capital ratio for banks. They find that while the MM effect doesn't operate fully, there is a significant partial effect, such that a doubling of equity ratios (eg from 8 to 16 per cent of assets) would increase the overall cost of bank funding by

only around 40 basis points. (The figure derived varies somewhat when different assumptions are used, but not dramatically).

Berger (1995) finds that for US Banks in the 1980s higher capital ratios led to higher subsequent ROE (and that ROE also contributed to subsequent higher capital). Jordan et al (2011) find in a study of the effect of the TARP on US banks following the financial crisis, that bank market/book ratios were positively related to tier one equity capital ratios.

Using US data, a working paper by Baker and Wurgler (2013) "confirm that bank equity risk is sharply increasing in leverage" but note that this has not historically been translated into higher equity returns. They interpret this as implying that required equity returns have not increased substantially when higher leverage is used (basing their argument partly on the failure of the simple CAPM to explain historical equity returns). They suggest that a proposal to increase required capital ratios by 10 percentage points (eg from say 5 to 15 per cent) could lead to an increase in the weighted average cost of capital (and lending spreads over the risk free rate) of between 60 -90 basis points. They note that this is large (compared to an historical estimate of bank funding costs of around 40 basis points over the risk free rate), that it could increase the competitiveness of shadow banks, but that whether it is a socially beneficial adjustment in response to other issues is an open question.

A similar result can be obtained relatively simply by noting that if required equity returns are not affected by leverage (and ignoring taxes), a one percentage point increase in equity/assets (and consequent equivalent decrease in deposits/assets) increases funding costs per dollar of assets by $0.01(r_e - r_d)$. If, for example, the required return on equity (r_e) is 0.15 and deposit cost (r_d) is 0.05, this gives an increase of 0.001 or 10 basis points per each percentage point increase in the equity ratio.

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