

Modigliani–Miller, Basel 3 and CRD 4

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Abstract: Since 2007, bank capital regulation has been strengthened in Europe and globally. Bank organizations have expressed serious concerns about the impact of higher capital requirements on bank funding costs and on the lending capacity of banks. The message of a 1958-Article by Modigliani and Miller is that bankers should not worry. Changes in the debt-equity ratio do not affect the firm's average cost of capital. With reference to a sample of recent empirical studies, this SUERF Policy Note concludes that the tougher and more complex capital regulation requires modification but not rejection of the M&M analysis.

JEL-codes: E44, F36, G21, G28, G32

Keywords: Basel 3, bank capital regulation, capital adequacy, capital requirements directive, capital structure irrelevance, cost of capital.

M&M's irrelevance proposition

Capital structure – the ratio between debt and equity on a firm's liability side – is irrelevant. Changes in the debt-equity ratio do not affect the firm's average cost of capital. This proposition is one of the strong messages in a path-breaking 1958-article in the American Economic Review by Franco Modigliani and Merton H. Miller (M&M). In a 1995-article, Merton H. Miller argued that in principle, the M&M propositions apply also to banks (Miller, 1995).

Basel 3 strengthens banks' capital base

Basel 3 is a comprehensive set of reform measures addressing the lessons from the financial crisis, which began in 2007. It was endorsed by the G20 in November 2010. In 2011, the Basel Committee on Banking Supervision published a document

(BCBS, 2011), in which it presented the agreed series of reform measures to strengthen the regulation, supervision and risk management of the banking sector. In more recent documents, the BCBS has included further measures. The aims of the proposed measures are to improve the banking sector's resilience, to improve risk management and governance and to strengthen banks' transparency and disclosures. Basel 3 builds on the three pillars of the Basel 2 framework concerning capital elements and risk coverage, risk management and supervision and market discipline. Basel 3 strengthens the regulatory capital framework by raising both the quality and quantity of the regulatory capital base and enhancing the risk coverage of the capital framework. Basel 3 introduces also a leverage ratio that serves as a backstop to the risk-based capital

measures as well as a number of macroprudential elements to help contain systemic risks (BCBS, 2013, p.4). Thus, global systemically important financial institutions (SIFIs) must have higher loss absorbency capacity to reflect the greater risk that they pose to the financial system. The BCBS has agreed on Basel 3 phase-in arrangements. By the end of 2016, the minimum common equity capital ratio of 4.5% and the minimum Tier 1 capital requirement of 6.0% should be implemented. By 2019, the capital conservation buffer (2.5%) and the minimum total capital plus conservation buffer (10.5%) should be in place. The gradual implementation of the Basel 3 framework in the legislation of individual countries is followed by the BCBS and published in current progress reports.

CRD 4 implements Basel 3 in the EU

CRD 4 is an EU legislative package covering prudential rules for banks and other financial institutions. The text of the fourth Capital Requirements Directive was published in the Official Journal of the EU on 27 June 2013 (European Commission, 2013, p. 338 ff.). CRD 4 consists of the Capital Requirements Directive (2013/36/EU), which must be implemented through national legislation, and the Capital Requirements Regulation (575/2013), which is directly applicable to firms across the EU.

The purpose of CRD 4 is to implement Basel 3 in the EU. Basel 3 is not law. It is the most recent configuration of a set of globally agreed and recommended prudential standards. CRD 4 transposes Basel 3 into EU and national law. The two legal texts in CRD 4 are very comprehensive and complex. In several hundred pages, there are detailed rules on approaches for calculating own funds requirements, provisions concerning risk weights, measuring of credit and counterparty risk, market risk, operational risk, liquidity risk, countercyclical capital buffers, special provisions for global and systemically important institutions etc. There are also provisions mandating the European Banking Authority (EBA) to develop regulatory technical standards to further definition of risks and own funds requirements.

Bankers fear that CRD 4 increases banks' funding costs

BCBS and EBA have over the years as part of the development of Basel 3 and CRD 4 carried out consultations directed at interested parties including banking organizations. In several of the responses from organizations like European Banking Federation (EBF), American Bankers' Association (ABA) and Institute of International Finance (IIF), the respondents have expressed concerns for an increase in banks' funding costs as consequence of higher minimum capital requirements. The organizations have also argued that higher bank funding costs will imply higher costs of borrowing for households and businesses, lower bank credit growth and lower GDP growth.

A recent example is the response by EBF to the EBA consultation paper on criteria for determining the minimum requirements for own funds and eligible liabilities under Directive 2014/59/EU (EBF, 2015, p.3). EBF supplements its warnings against excessively high EU minimum capital requirements and the associated increased funding costs for the European banking industry with a reference to the disadvantage for all European institutions particularly in comparison to the US and Japanese competitors (EBF, 2015, p.14).

So, Basel 3 and CRD 4 deal with minimum capital requirements. A long list of recent BIS publications and EU documents explain the need for stronger rules on capital adequacy, and the CRD 4 legislative package is – as mentioned - very comprehensive.

A striking contrast

It is difficult to think of a more striking contrast in views on the relevance of the capital structure of banks. In Europe, thousands of bankers, regulators, lawyers and financial supervisors have in recent years used much of their time on developing capital regulation and on ensuring or monitoring compliance with strengthened minimum capital requirements. For many of them, M&M's irrelevance proposition belongs presumably to an unrealistic academic world. Even if regulators agree with bankers'

concerns, they might still raise equity requirements in the interest of systemic stability.

The theoretical M&M assumptions

M&M assume that financial markets are efficient and perfect. In the basic version of their model, taxes are absent. Trading in stock markets and bond markets take place under atomistic competition. Shareholders receive an uncertain stream of income, which is regarded as extending indefinitely into the future (M&M, p. 265). All bonds are assumed to yield a constant income per unit of time, and this income is regarded as certain by all traders regardless of the issuer. Bankruptcy costs are absent. Shareholders are able to invest and borrow under the same conditions as the companies in which they own shares, so that they can adjust their balance sheets without costs. Investors are assumed to exploit any arbitrage opportunities and thereby ensure that the M&M propositions are fulfilled in financial markets. Accordingly, in equilibrium, nobody has an incentive to pay a higher share price for companies with a specific capital structure. Why pay anyone for establishing a certain desirable debt-equity balance, when you can do it yourself without costs? If a company in the M&M world tries to increase its profitability through greater leverage, it will be offset by an increase in the cost of the remaining equity capital due to greater risk.

The M&M model is based on drastic Simplifications

In the real world, financial markets are not perfect. Competition is not atomistic. There is information asymmetry between company managers and shareholders. Banks and investors pay taxes on profits, dividends and capital gains. Interest expenses are tax deductible. Dividend payments are not. There are costs associated with rebalancing of portfolios. Banks and their shareholders do not have the same conditions, when they trade on bond markets and stock markets. All these characteristics of the financial environment in which we live remind us that economic models can never be more than rough approximations of the world that we try to understand. That does not mean that models are

useless. They can often help us understand the functioning of financial systems, but we need to keep the restrictive model assumptions in mind and to formulate our conclusions with caution. In spite of all their simplifications, models may still capture essential characteristics of the interplay between banks, shareholders, depositors and other decision makers, whose aggregate behavior create the market forces. It is the task of empirical analysis to try to evaluate to what extent the model characteristics are discoverable in the data. As is the case for economic models, statistical methods have also serious limitations. Data is always incomplete and the assumptions concerning stochastic elements and density functions etc. are never completely fulfilled. Still, we need empirical studies in order to move from abstract theory towards the real world.

But the M&M model is taken seriously...

M&M's propositions are included in almost all finance textbooks. The basic model is presented, and in most cases followed by qualifications motivated by the effects of tax systems, market frictions, agency problems and asymmetric information. As explained below, the propositions are also taken seriously by central bankers and academics, who carry out empirical studies of the likely effect of higher minimum capital requirements for banks.

...by the Basel Committee (2010)

In 2010, the Basel Committee's Long-term Economic Impact (LEI) working group, chaired by Claudio Borio and Thomas Huertas, published a report "An assessment of the long-term economic impact of the new regulatory framework". It assesses the economic benefits and costs of stronger capital and liquidity regulation in terms of their impact on output. The main benefits of a stronger financial system reflect a lower probability of banking crises and their associated output losses. Costs are mainly related to the possibility that higher lending rates lead to a downward adjustment in the level of output. In their baseline scenario, the working group assumes that the whole adjustment to higher capital requirements is absorbed by lending rates, i.e. any increase in bank funding costs or reductions in returns on investments

are fully passed through to the banks' borrowers. Later in the report, the working group writes that there are good reasons to believe that the cost of capital would decline in response to a reduction in bank leverage. As capital levels increase and the bank becomes safer, both of these costs should decline, further reducing the impact on lending spreads. And, in the limit, the change in the cost of capital could reduce to tax effects (M&M, 1958). Such a decline has, however, not been considered by the working group in the estimates included in the report.

...by Admati & al. (2013)

In October 2013, Anat R. Admati, Peter M. DeMarzo, Martin E. Hellwig and Paul Pfleiderer published a revised version of their 2010 paper "Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Socially Expensive". (Admati et al., 2013). A more comprehensive version of the analysis was published in a book (Admati and Hellwig, 2013). The authors criticize in strong words the view that bank equity is expensive. They argue also that the Basel 3 minimum capital requirements are too lax and allow banks to remain very highly leveraged. They refer to M&M (1958) according to which increases in the amount of financing done through equity simply changes how risk is allocated among various investors in the bank, i.e. the holders of debt and equity and any other securities that the bank may issue. The total risk itself does not change and is given by the risks that are inherent in the bank's asset returns (Admati et al., 2013, p. 16). There is in their view no reason to dismiss the M&M analysis on the ground that the assumptions are highly restrictive. The essential assumption is, according to the authors, that investors are able to price securities in accordance with their contribution to portfolio risk, understanding that equity is less risky when a firm has less leverage. The reason why bank shareholders resist attempts to increase capital requirements is that they include the loss of the tax and bailout subsidies associated with debt. Bank owners do not like the implied redistribution, which makes debt safer at the shareholders' expense. The authors argue that in assessing social costs of higher capital requirements,

it is necessary to consider the benefits to taxpayers and creditors that are the counterpart to the private costs to shareholders (Admati et al., p.19).

...by Miles & al. (2013)

In 2013, David Miles, Jing Yang and Gilberto Marcheggiano published an article "Optimal Bank Capital" in *The Economic Journal* (MYM, 2013).

The authors estimate the long-run costs and benefits of having banks fund more of their assets with loss-absorbing capital – by which they mean equity – rather than debt. They quote the M&M proposition and add that there are certainly reasons why the M&M result is unlikely to hold exactly (MYM, 2013, p.5). On the other hand, it would in their view be a bad mistake to simply assume that the reduced volatility of the returns on bank equity deriving from lower bank leverage has no effect on its cost at all. The key empirical question they want to answer is to what extent there is an offset to the impact upon a bank's overall cost of funds of using more equity because the risk of that equity is reduced and so the return it needs to offer is lowered (MYM, 2013, p.6).

The authors use data on UK banks to assess to what degree the M&M proposition holds. With reference to the Capital Asset Pricing Model (CAPM), they estimate equity betas using stock market returns of UK banks together with returns for the FTSE 100 index from 1992 to 2010, which represents the market portfolio. They regress the equity betas on banks' leverage ratios. Leverage is defined as a bank's total assets over its Tier 1 capital. The results suggest that the asset beta of banks is low. An asset beta of only around 0.03 generates an equity beta that is close to 1, given that for much of the sample the leverage of banks is around 30 (MYM, 2013, p.11). When they apply regression on changes in beta on changes in leverage, the coefficients are larger, but in all cases the impact of leverage upon beta are highly significant. In the analysis, they assume that debt has a zero beta. If leverage is reduced from 30 to 15, their regression results suggest a fall in the required return on equity from 14.85% to 12.6% (MYM, 2013, p.13). If the M&M proposition did not hold at all, the changes in leverage would have no impact on the required return on equity. By comparing changes in

the weighted average cost of capital (WACC) based on the regression results to those based on the assumption that there is no M&M-effect, they obtain a measure of the extent to which the M&M proposition holds. By applying alternative versions of regressions, they estimate what they call the “M&M offset” expressed as a percentage of what the effect would have been, if the M&M proposition held exactly. The M&M offset varies from 45% to 90%. They assume that the required return on debt does not change as leverage changes. This is a conservative assumption and might understate the M&M effects. In all calculations mentioned above taxes are ignored.

The message of the M&M proposition is that the cost of higher capital requirements should be close to zero. The empirical work of MYM based on data from UK banks suggests that there are some M&M effects. The costs of stricter capital requirements are, however, fairly small even if there are deviations from the proposition. In their concluding remarks, the authors write that to have banks finance a much higher proportion of their lending with equity than in recent decades would in fact be a return to a situation, which historically served the economic development in the UK rather well.

...and by Cline (2015)

In 2015, William R. Cline published the paper “Testing the Modigliani-Miller Theorem of Capital Structure Irrelevance for Banks” in the Peterson Institute for International Economics Working Papers Series (Cline, 2015). In the motivation for his research, he refers to the Basel 3 proposals, which approximately will double minimum capital requirements for most banks and triple them (or more) for systemically important financial institutions (SIFIs). The author wants to answer the question whether more highly capitalized banks do indeed enjoy lower costs of equity capital.

An empirical analysis of this question can be used in a broader analysis of optimal bank capital requirements from the standpoint of society, taking account of risks of financial crisis from insufficient bank capitalization (Cline, 2015, p.3). The author is familiar with MYM (2013) but does not use the stock

price beta for banks within the CAPM framework. He finds the explanatory power of the CAPM too weak and accordingly finds it problematic to rely on use of beta as the indirect means to identify the M&M effect. Instead, Cline directly uses a specification of the M&M proposition for an empirical test. Data for the period 2001-2013 for the 54 largest US banks is drawn from databases in the Securities and Exchange Commission and Bloomberg. At the end of 2013, the total assets of the banks in his sample represented 82.7% of total assets of US depository institutions. Cost of equity is estimated as the inverse of the price/earnings ratio for the year in question. Empirical estimates require the use of actual observed earnings as a proxy for expected future earnings. In order to circumvent the problem with years of losses, the author constrains the earnings yield observations to be no lower than the real return on US Treasury inflation-protected (TIP) five-year bonds, plus a risk spread of 100 basis points as the lowest meaningful rate at which investors might be prepared to provide equity capital to banks.

The analysis shows that there has already been significant deleveraging among US banks since 2007. The ratio of debt to equity has fallen from an unweighted average of about 10.5 to about 8. The ratio of Tier 1 capital to total assets has risen from 7.2% to about 9.2% (Cline, 2015, p.10). In a table, the author considers the implications of a sharp increase in bank capital requirements on the average cost of capital for US banks.

With reference to a suggestion made in Admati and Hellwig (2013), he calculates the effects of raising bank capital requirements from a benchmark of 10% of total assets to 25%. Taking the averages over alternative model specifications and interest rate assumptions, the expected change in the average cost of capital from the higher capital requirements would amount to 62 basis points.

In the absence of any M&M offset, the average increase would be 112.5 basis points. So on average, the M&M offset amounts to 45% of the potential increase in the weighted average cost of capital (Cline, 2015, p.13). The estimates in MYM (2013) would, according to Cline imply an increase of 81 basis points for the same increase in capital requirements. Admati and other researchers have

argued that even if higher bank capital requirements cause an increase in bank lending rates, the result is likely to be welfare-enhancing from the viewpoint of society as opposed to private shareholders and borrowers. They refer to distorted incentives for bank risk taking related to deposit guarantee systems and implicit guarantees of too-big-to-fail. Cline admits that recognition of societal externalities could lead to optimal capital requirements that are significantly higher than in the past, but choice of policy should not be based on a general proposition that higher capital requirements are costless. The M&M offset is in fact far from complete.

Concluding remarks:

Increasing complexity in financial regulation requires precaution and modification but not rejection of the M&M analysis

In 1958, M&M characterized their own model assumptions as drastic simplifications (M&M, 1958, p.296). They also expressed the hope that other researchers in subsequent years would relax these assumptions in the direction of greater realism and relevance. Their hope has been fulfilled. The literature on capital structure and capital costs has been rich in the last five decades. Most contributing authors have concluded that capital structure becomes relevant when the decisions of banks, depositors and shareholders are assumed to be based not only on trade-offs between expected returns and risk but also on tax implications, default risk, transaction costs, the existence of asymmetric information, conflicts of interest between debtholders and shareholders, and different kinds of regulation.

When M&M wrote about the conceptual distance between their simplified model and the real world, they had the 1958-real world in mind. The development of financial market infrastructures, trading technology, tax systems, capital liberalization, globalization, the building up of the European Union and of the supervisory and regulatory infrastructure since 1958 can only imply that the conceptual distance between the M&M model and the 2015 real world is even greater than it was when the article was published.

The implementation of Basel 3 and CRD 4 will in the coming years create a more complex financial environment than ever. The conceptual distance can thus be expected to grow.

So, when we look at empirical studies aiming at discovering whether the M&M proposition apply to banks' cost of capital in the real world, we must be prepared to accept modest results. An interesting feature of MYM (2013, p.30) and Cline (2015, p.13) is that the authors conclude their empirical work by writing that there are *some* M&M effects.

They argue that we should not reject the M&M proposition all together with reference to the drastically simplified model assumptions. Even confronted with market frictions, incomplete competition, asymmetric information, conflicts of interest, taxation, complex regulation - including different kinds of safety nets - etc., banks, depositors and shareholders still make trade-offs between expected returns and risks. When capital requirements are strengthened, the observed effects on banks' cost of capital will in a very complex way be partly influenced by these trade-offs.

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