Estimating the impact of the new capital requirements on the cost of bank capital: an empirical study on European banks.

Oana Toader[1]

Laboratoire d'Economie d'Orléans, LEO

ABSTRACT

Although core capital is more expensive than other liabilities, it strengthens banks' stability and improves its loss-absorbing capacity. We examine the link between high-quality capital structure, systematic risk and expected return on equity. We model how shifts in funding structure and information asymmetries (especially implicit guarantees) impact the average funding cost. Our results demonstrate that equity core capital is desirable for increasing banks stability and reducing on longer-term the average funding cost. We also find that higher amount of equity reduces the banks' dependence on public bail-outs. Our empirical analyze provides support to the new Basel III capital framework implementation.

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[1] oana.toader@etu.univ-orleans.fr

1. Introduction and summary

This paper analyzes the implications in terms of risk and cost caused by changes in the funding capital structure. The interest of this study derives from recent issues about the future structure of the banking system as the result of new prudential rules that Basel Committee imposed recently. The fundamental question behind the debate is about the effects of funding the bank assets with loss-absorbing capital (equity) rather than debt.

The crisis provided a ‘great’ experiment to test both the resistance of banks and the regulatory framework. It was proved that the system underestimated the risks associated to the banking and financial activities and that the minimal ratios were too high. It was certainly a risk coverage issue, but it also referred to the evolution of banks increasingly interconnected with the capital markets and to 'hidden' incentives to take multiple and wide range risks. The way the regulation of bank capital was designed holds an important responsibility in correcting these anomalies and restoring the proper functioning of the banking system.

Banks capital has been the heart of the discussions about financial regulation since its creation. Recently it has become even more controversial especially because of the October 2008 financial shock. Regulators, academics and bankers debate on the possible impact of these new regulatory measures. The Basel Committee representing the regulator reviewed the capital framework and introduced liquidity standards. It imposed an increase in both the quality and quantity of core capital in order to reinforce their loss-absorption capacity and to strengthen stability.

Once a shock hit the stock markets a lack of confidence was settled between banks and financial institutions and higher financing rates and weaker profits were unavoidable. Major losses were associated to banks, the whole economic system was affected and public bailouts couldn’t be avoided in order to insure the continuity of economic activity. This represents one of the most debated issue during the lasts years. Another important issue rises up from the regulator’s reaction to banks risk-taking behavior and public interventions and it embodies the main motivation of our study. Bankers complain that these new regulatory requirements will enrich the funding cost (IIF 2011, De Angelo and Stulz 2013). Moreover, they warn about the disastrous effects on credit distribution and economic activity. Finally, academics bring consistent theoretical arguments about an effective implementation of Basel III rules claiming a relatively low cost during the period of implementation and net profits on the longer term (Kashyap et al. 2010, King 2010, ECB 2011, Miles and al.2012, BIS 2010a, BIS 2010b, BIS 2012, EBA 2012). They demonstrate that banking lobby arguments are not economically funded. This debate become even more sharply with the crisis. With the publication of Basel III, the debate experienced even larger dimensions. Increasing not only the quantity but also the quality of banking capital is essential for the regulator and the supervisory authorities in order to reestablish the stability of the financial system. They also discuss about the reduction of public interventions and better resolution systems. However, banks seem to be worried about markets (short term) opinion and own profitability.

The purpose of this paper is to analyze for a sample of European banks to which extent higher capital requirements will affect banks' funding cost and how information asymmetries act on the capital structure and on the funding cost. We use a dataset on banks' balance-sheet over the period of 1997-2012 to investigate whether and to which extent average funding cost depends on capital structure. We also use public data on traded prices on banks shares and market indexes. A new dataset of banks ratings over the period of 1997-2012 is used to investigate information asymmetries effect on funding cost. We employ simple theoretical concepts in order to analyze the impact of capital structure on the average funding cost. Capital Asset Pricing Model and Modigliani-Miller theories represent finance cornerstone concepts that have already been proved. The first one is used to determine a theoretically appropriate required rate of return on banks' equity and the second one allows us to test the neutrality effect of capital structure on funding cost. We empirically test the consequences of changes in capital structure on average cost of capital and to which extent the release of Modigliani-Miller ideal assumptions impacts the banks' funding cost. The results show that for the European banks, an increase in the amount of equity will ultimately have a positive effect on the weighted average cost of banks. Strengthening the stability of banking institutions will lead to lower risk premiums and offsets the higher cost of increasing amount of equity imposed by the new regulation. Our methodology follows that of Kashyap and Miles and our empirical findings are in line with their results for samples of US and UK banks respectively. We also analyze the role of implicit guarantees provided by the government on the funding cost. We conclude that this reduces significantly the cost of banking capital and facilitate banks' access to financing. Our results provide support for the new prudential and resolution framework.

Our paper is organized as follows: Section 2 provides some background theoretical concepts about funding structure and its determinants. Section 3 describes our dataset. Section 4 reports the empirical methodology and our main results. Section 5 describes an extended analyze on information asymmetries characterizing banking system. Section 6 concludes.

2. Modigliani-Miller theorem applied to banking sector

The publication of the new capital requirements texts gave birth to real debates between regulators and supervisory authorities, on one side, and bankers on the other side. Academics and researchers bring solid arguments theoretically based to defend the benefit of the new regulatory framework. The famous theorem of Modigliani-Miller (MM) represents a theoretical benchmark and the main argument against bankers' opinion. It sustains that the value of the firm is insensible of changes in the funding structure[2] under a set of assumptions. It stays for the idea that a higher amount of loss-absorbing capital enhances bank's stability and improves its financial capacity. Thus, investors expect lower return on equity as the amount of risk engaged will be lower. A higher cost of an increased amount of equity will be offset by a reduction in the return on bank capital. Bankers answer back that an increase in the proportion of equity, the most expensive form of capital, will affect funding costs. Moreover, they 'threaten' that this supplementary cost will be transferred on lending activity and concretized in higher lending rates. This 'perverse effect' invoked by bankers thus involves an adjustment by restricting lending rather than raising capital levels as regulators considered. Both ideas have the same final argument: the economic activity growth.

In this section we focus only on the funding cost and banks business model. We firstly present the theoretical framework being at the base of our study and secondly we analyze the limits of the application of financial theories to the banking sector.

2.1. Modigliani-Miller theorem

The theory developed by Franco Modigliani and Merton Miller (Modigliani and Miller (1958)) states that, under certain hypothetical conditions, the value of the firm is independent of the balance-sheet structure. The impact of this theorem left its imprint in the literature and all future releases represent studies of the consequences of a release of the initial assumptions. In our study, we will analyze the set of Modigliani-Miller initial assumptions and their importance for MM theorem application to the banking system in a new regulation context. The argument brought by the authors is economically funded and it sustains that the value of the company is independent of the capital structure[3]: naturally, the reduction of the proportion

[2] Modigliani and Miller (1958).

[3] However, this is a different way of interpreting the theorem. Merton Miller himself acknowledges in his article published in 1988 that the way they have increased the definition of their theorem does not exactly express what

of debt in the firm's balance-sheet allows concentrating the total risk of the firm on a higher number of shares. This involves a lower required return on equity as the risk borne by each unit of equity will be lower. So, according to this theory the value of the firm will not be affected given that the cost of keeping a higher amount of 'expensive' liabilities in the balance-sheet will be compensated by a reduction in rate of return required by investors. This reasoning is valid only if several conditions are filled: i) no taxes, ii) no bankruptcy costs and no reputation effect if failure of the company, iii) perfect markets, competitive and there are no information asymmetries. However, these conditions do not characterize the financial reality this is why we propose to quantify the impact of the deviation from the Modigliani-Miller benchmark in terms of average cost of funding.

In a first step, the widely used Capital Asset Pricing Model (CAPM) allows us to analyze the total risk of the bank (ie.the risk of its assets β_{assets}[4]) as the sum of the risk on equity (β_{equity}[5]) and the risk on debt (β_{debt}). This assumption can be written as follows:

$$\beta_{assets,it} = \beta_{equity,it} \frac{E_{it}}{D_{it}+E_{it}} + \beta_{debt,it} \frac{D_{it}}{D_{it}+E_{it}} \tag{1}$$

Where *D* is the book value of bank's debt for *t* period and *E* is the book value of bank's equity. Representing the beta of the economic assets as a weighted average of the betas of stockholders' equity and debt is only for reasons of calculation. In order to determine the relationship between the risk associated with bank's own resources[6] and the level of debt, we will write the above equation as follows:

$$\beta_{equity,it} = \left(\beta_{assets,it} - \beta_{debt} \frac{D_{it}}{D_{it}+E_{it}}\right) \frac{D_{it}+E_{it}}{E_{it}} \tag{2}$$

Let us suppose now that $\beta_{debt,it}$=0[7], in other words that the debt is riskless. In this context the equity beta becomes:

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they wanted to convey. The use of the term of 'independence of the company's value at the financing structure of the firm' is rather strong, however it sets a benchmark. ("The view that capital structure is literally irrelevant or that 'nothing matters' in corporate finance, though still sometimes attributed to us (and tracing perhaps to the very provocative way we made our point), is far from what we ever actually said about the real world applications of our theoretical propositions. Looking back now, perhaps we should have put more emphasis on the other, more upbeat side of the 'nothing matters' coin: showing what doesn't matter can also show, by implication, what does" (Miller, 1988))

[4] Beta assets cannot be measured by using published data that is why we try to find a proxy of the risk level of bank assets by decomposing the total risk in risk issued by shareholders and risk issued by debt holders.

[5] Beta represents the systematic risk described as the sensitivity of the stock *i* at the market. (Fama and French 2004). More details in section 3.1.

[6]Among the determinants of beta we remind the costs structure: variables or fixed costs (if the company has mostly fixed costs, then it is more sensitive to the environment and thus its beta will be higher), the business sector, the growth rate of income and the funding structure.

[7] With this assumption, a part of the volatility of the economic activity, more exactly the part of risk supported by creditors will be neglected. This can be justified by the existence of deposit insurance applied to deposits. For

$$\beta_{equity,it} = \beta_{assets,it} \frac{D_{it}+E_{it}}{E_{it}} \quad (3a)$$

Knowing that financial leverage is defined as the ratio between the booking value of assets and the booking value of equity, $\frac{D_{it}+E_{it}}{E_{it}}$, then the systematic risk of equity, ie. equity beta, can be wrote as :

$$\beta_{equity,it} = \beta_{assets,it} \; L_{it} \quad (3b)$$

This last equation highlights the link between the CAPM and MM theorem: under the assumption of riskless debt, the risk of equity and the risk premium decrease linearly with leverage[8]. Therefore, if we half leverage (or double the capital ratio), the risk of equity will be halved as well. Hence, if leverage is halved (or capital ratio is doubled) this will lead to distribute the total risk of the bank on a twice as high number of shares. Consequently, each unit of equity capital will bear half of the risk he endured before and β_{equity} will be reduced to half under this theoretical framework. The main consequence is an enhanced stability of the institution. However, this reasoning supposes that there are no immediate interactions between capital structure (described by the leverage or capital ratio) and beta assets (Hamada 1971).

In a second step, according to the theoretical framework, the capital structure determines the rate of return that investors are ready to accept in order to finance an institution. We employ a linear relationship between the expected yield on stockholders' equity and the associated level of risk. This relationship spells:

$$k_{it} = E(R_{it}) = R_f + \beta_{it} \, P_r \quad (4)$$

where the expected return on the capital asset $E(R_i)$ represents the cost of equity capital for the bank *I*, R_f is the risk-free rate, β the systematic risk and P_r the market premium[9]. From

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the other liabilities, this hypothesis is also appropriate: the risk under the CAPM is not the default risk but the market risk or the risk of fluctuations in the liabilities' value correlated with the market.

[8] In theory, this relationship has been verified. However, the assumption of the independence of beta assets with respect to the leverage and across time seems to us very strong and this even more in the current context of crisis. This was not the case if it was assumed that the banks 'portfolios contain the majority of medium-and long-term claims, but descriptive statistics show that this represents only half of the banks' balance sheets. The other assets that generate profits (eg. titles and securities) represent about one third of the bank's balance sheet. This is why the issue of fluctuations in the total risk of bank assets from one year to another could depend on the economic environment and market liquidity. The assumption is also questioned from the point of view of the business model of the bank: banks can adopt their investment behavior based on the liability structure while respecting regulatory ratios (VanHoose 2007, Mc Kinsey 2011).

[9] The market premium P_r is calculated as the difference between the expected market rate of return and the risk-free rate of return $(E(R_m) - R_f)$. In our model the expected market rate of return is given by the historical returns on a market portfolio (for example CAC40 returns for French banks, FTSE 100 for English banks etc).

(3b) and (4), we can highlight the direct relationship between the capital structure described here by the financial leverage L_{it} and the expected cost of equity.

$$k_{it} = R_f + \beta_{assets,it} \; L_{it} \; [E(R_m) - R_f] \tag{5}$$

In agreement with this specification, increasing the amount of equity (ie. reducing leverage) reduces beta assets (equation 3b) and inherently the expected return on equity, k_{it}. Thus the MM principle is revealed: increase in the cost of capital caused by a higher proportion of stable resources will be offset by a reduction in the expected rate of return as investors anticipate an adjustment of k_{it} relative to a lower risk incurred.

In a third step, the compensation effect mentioned in the MM theorem will be even better highlighted in the calculation of the weighted average cost of capital (WACC):

$$WACC_{it} = k_{it} \frac{E_{it}}{D_{it}+E_{it}} + R_f \frac{D_{it}}{D_{it}+E_{it}} \tag{6}$$

With k_{it} the cost of equity, R_f the risk-free debt rate[10], D_{it} the amount of debt and E_{it} the amount of equity. The WACC is calculated as the average cost of equity and debt, weighted by their book value. The approach just outlined indicates that an increase in the proportion of equity, the resource the most expensive, makes the bank balance-sheet more stable reducing in the same time the expected rate of return on equity. A secondary effect appears with respect to the cost of debt which will decrease relatively to the risk level of the balance-sheet (Admati and al. 2010). This is due to a higher capacity of the firm to serve its debt, reducing in the same time the credit risk and the risk of default.

Going even further in this theoretical analysis, under the assumption of riskless debt, from (5) and (6) we can imagine the expression of the weighted average cost of capital as:

$$WACC_{it} = R_f + \beta_{assets,it} \; [E(R_m) - R_f] \tag{7}$$

We thus deduct that the weighted average funding cost is insensitive to the capital structure. In accordance to the theoretical framework of MM, the cost of an increase in the proportion of equity should be assumed to be equal or close to zero. Consequently, a change in the financing structure will not impact on the weighted average cost of capital.

Therefore, in the present context of new Basel III capital requirements, a banking recapitalization should have no (or weak) impact on the average cost of funding.

The risk free rate of return used for determining the risk premium is given by the interest rate of government bonds.

[10] With the assumption of risk-free debt (equation 3a), the debt rate R_d is equal to the risk-free rate R_f.

2.2. Can MM theorem apply to banks?

In a context with perfect financial markets, the corporate finance theory stipulates that the weighted average cost of capital is indifferent to the funding structure (the proportion of equity and debt, ie. the leverage). This is the essence of the Modigliani-Miller theorem that remains a cornerstone in corporate finance.

Nevertheless, when talking about MM theorem applied to banking sector several comments should be made. First, the riskless debt hypothesis is considered as overestimated. Although, with respect to the CAPM, this assumption is not entirely wrong: deposits can be considered a riskless resource thanks to deposit insurance and with regard to the other bank resources, this assumption is not wrong either. The concept of zero risk doesn't refer to the probability of default, but to the debt value fluctuation risk relatively to the market. Second, fiscal deductions on debt are considered as an advantage relative to equity. In reality, the interests paid on the debt are tax-deductible this tax benefit not being valid for dividends paid to the investors. It could thus represent an incentive to borrow for financing its activity towards a capital increase by shares emission. Hence, reducing the proportion of debt could lead to an increase in the average cost of capital. Theoretical counter-arguments were brought to this criticism (Miller 1976, Miller 1988, Stephen 1988) as well as empirical arguments. For a 33% tax rate, a 1% increase in the ratio of capital seem to impact the average cost of capital of 2 basis points and this effect being considered as weak. Third and foremost, the nature of banks by itself imposes a violation of initial assumptions of MM. By nature, banks are firms that are leveraged: their main activity is to collect deposits and to transform them into loans. In fact, due to the importance of deposits and debt in general in balance sheets, banks' leverage is much higher than the one any other industry. More than that, the key role of these institutions in the economic activity provides advantages comparing to firms from other sectors. Indeed, advantages offered as guarantees, more or less explicit and more or less high that banks receive, introduce serious distortions in the theoretical framework presented previously.

Implicit government subsidy is one of the most troublesome information asymmetry characterizing banking institutions. Receiving public implicit support, a part of the default risk of the bank will be transferred to the public authority. Hence, the risk premium that the bank is supposed to pay to investors is lower than the one corresponding to the real level of risk. The bank capacity to assure the debt repayment could turn out excellent without having the same quality of the financial strength. However, 'adverse reactions' of the government support were obvious, the most evident are relative to moral hazard and size (Schich and

Lindh 2012). The first one, already discussed in the literature by Oxera (2011), Hau and al. (2012), BIS (2012), refers to banks' risk-taking behavior as a consequence of the public support offered in case of bankruptcy. The second one refers to the size of the bank as the implicit 'advantage' eases access to funding and favors the increase in bank's capacity to invest and make the balance-sheet grow. A cyclical effect may appear as the size of the bank and the interconnection of financial institutions play a key role in the allocation of government support (BIS 2012).

The relation between the debt level, the systematic risk *beta* and the cost of capital sees itself changed if we take into account all these asymmetries. The neutrality of the average cost of capital regarding to the funding structure is questioned, the deviation from the theoretical benchmark will be just an empirical question (Admati et al. 2011).

3. Sample characteristics and data description

Our study is applied to a sample of European commercial, universal and investment banks. For this purpose, a panel of publicly listed banks was constructed. The dataset includes Bankscope balance-sheet annual data on a consolidated basis, spanning the period from 1997 to 2011. After checking the quality of variables included in the database, we eliminated a number of banks because of data availability necessary for the analysis for the period 1997-2011. We use accounting data on bank balance sheets as well as income statements data on an annual base. We also use public data on stock-exchange prices of bank stocks and stock indices.

Our dataset is an unbalanced panel composed of 85 banks from 18 countries. Several banks don't have historical data for 16 years[11] (appendix A).

We use as well Datastream data. Historical series on rates of return on bank debt by rating classes are used in order to compute the weighted-average cost of capital.

3.1. Equity beta

Equity beta is a main variable in our empirical analysis and it measures the sensitivity of the bank's stock *i* to market fluctuations. It describes the level of risk of a security and it is defined as the covariance between the market expected return and the expected return for

[11] Several banks went public after 1997. However we keep it in our database as they represent important entities for the banking system and for the economy.

bank stock i, divided by the market volatility $\beta_i = \frac{covariance\ (R_i, R_m)}{\sigma_m^2}$. It is called also systematic risk or non-diversifiable risk (Fama and French, 2004). Equity beta is estimated using traded daily stock market returns of European banks, together with the returns for the national market indexes specifics to each bank. Therefore, it is calculated using daily stock returns over discrete periods of one year. The stock-market return is given by the national market index corresponding to each national banking system[12].

3.2. Independent variables

Our main independent variables describe banks' capital structure: *financial leverage* and *Tier1 capital ratio.* The first one is calculated as the amount of assets divided by the amount of equity. It stands for the banks' indebtedness percentage, and so a highly leveraged firm is supposed to have a highly percentage of debt than equity. The second variable, the Tier1 capital ratio is the opposite of the leverage being calculated as the ratio of equity capital to total assets. While several measures of bank equity are available, the chosen variable is the ratio of Tier1 capital to risk weighted assets as this one is in line with the regulatory framework[13].

3.3. Control variables

We control for a series of characteristics of the bank and country levels. For the most part, we follow Miles and al. (2012). The bank specific control variables includes *liquid asset ratio* - standing for banks' capacity to sell assets without incurring sharp drops in their values, *ROA* for the overall profitability of bank's assets, *loan loss reserve ratio* for the probability of incurring future losses on its assets and balance-sheet size as given by the logarithm of total assets (ECB, 2011).

We account also for other factors that can impact the average riskiness of the bank from year to year using time dummies. We notice a common trend for banks within the same country. That is why we include in alternative scenarios country effects (country dummies) in order to control the specificity of each national banking system. The advantage of these two last variables is particularly high in the current time of economic crisis and strong stock-markets fluctuations with heterogeneous evolution within counties.

[12] We use CAC40 index for French banks, FTSE100 index for English banks, DAX index for German banks etc.

[13] Basel III is focusing on common equity as the capital component with the highest loss-absorbing capacity and on risk weighted assets as the most appropriate measure of balance sheet risk.

Descriptive statistics reflect a stronger variation in the capital ratio as well as in equity beta during 2007-2010 periods. It actually represents the most unstable years of our study. The evolution of the capital ratio proves how equity increased more slowly in relation to assets before 2007. Therefore, we deduct that banks have used other funding resources than equity, which are inevitably riskier than equity capital. Thus, banking and financial system level of risk increased as riskier liabilities were used to finance assets. Further to the consultation of these statistics, our intuition is that the equity beta risk is likely to influence the weighted average cost of capital, however these two variables do not have exactly the same evolution. Our intuition is that other factors may act on the variation of the average cost of banking capital.

4. Empirical analysis and main results

In this section of our paper we present and discuss the empirical analysis associated with our theoretical study. The analysis follows the simple approach proposed in the literature by Miles and al. (2012) and ECB (2011). The main objective is to test whether a change in the funding structure of banks, as imposed by the new so-called Basel III standards, will affect the systematic risk (equity beta), the return on equity and finally the average funding cost of capital. In a first stage we are going to analyze the relationship between beta and capital structure as described by the Tier1 capital ratio. This last variable is defined as the Tier1 capital to risk weighted assets ratio[14] and it represents the main variable for the bank funding structure. In a second stage, we quantify the impact of a capital ratio increase on the cost of equity, both under a theoretical and an alternative approach (by integrating the economic cycle as BIS 2012). We finally analyze to which extent deviations from MM benchmark, considering explicit and implicit advantages provided by the government, impact the weighted average cost of banking capital.

4.1. Baseline regressions

4.1.1. Bank equity beta and capital ratio

We are going to test in a first stage the relation between equity beta and bank's Tier1 capital ratio. From a Modigliani-Miller point of view, a higher capital ratio (ie. lower leverage) will

[14] The Basel III capital requirements impose a capital ratio based on core capital, Common Equity Tier1 (CET1). Due to a very short historical data for this variable, we will use the Tier 1 capital in the calculation of leverage. This idea was also used in the literature (Miles and al. (2012)) being justified by the strong correlation between the CET1 capital and Tier 1 capital.

strengthen bank's stability. A higher amount of equity in bank's balance-sheet allows to spread risk over a higher number of shares, therefore the risk per unit of equity capital will be lower (equation 3b). This reasoning is based on the hypothesis that investors assess the risk of the bank according to the proportion of risky resources held by banks in their balance sheet[15]. Thus, the baseline estimated relationship is given by:

$$\beta_{it} = \alpha_i + \delta X_{it} CR_{it} + u_{it} \qquad (8)$$

where CR_{it} is the Tier1 capital ratio, X_{it} is a matrix of repressors which include control variables for the assets risk (the beta assets)[16], α_i is a bank specific effect and u_{it} is the random standard error. The equity risk, β_{it}, counts for the bank *i* for the period *t.* From equation 3a and 8 we understand that the coefficient on capital ratio represents an estimate of the assets beta. This will be quantified later in our analysis in a log specification.

The first table (appendix C1) shows results from pooled OLS estimates: (1) is a simple estimate of equity beta on capital ratio (equity to assets ratio), (2) introduces control variables for risk of assets. We notice that taking into account assets characteristics allows us to better explain equity beta variation. We include time dummies in both specifications in order to control for variation across time. At this standard level, capital ratio has a negative and significant effect on shares' risk: the higher the capital ratio is the lower the risk of the bank. These results show a compensation effect between our two main variables (estimate coefficient -0.004 to -0.006), however it is weak.

We employ three alternative estimates of the initial specification using as main independent variable the risk-weighted Tier1 capital ratio instead of a simple equity to total assets ratio. Three estimates are made: a pooled OLS and another two models allowing for bank specific effects, one for fixed effects and another counting for random effects. Choosing between the two models is a question of correlation between individual effects α_i and the other repressors. Table C2 in appendix shows regression results using level data on equity beta and risk weighted Tier1 capital ratio[17]. There are three main comments on the results. First and foremost, the negative association between risk of bank equity and Tier1 capital ratio is

[15] A reduction in the proportion of debt reduces the covariance between the bank and the stock-market (through investors anticipations considered as reasonable).

[16] It is difficult to assess the risk of bank assets. We first introduced assets characteristics as ROA, the liquidity ratio, the provisions for potential losses ratio, however these variables are not statistically significant. An alternative method is the integration of a volatility index of European equities VSTOXX. This asset risk index appears significant for our sample of European banks even when controlling for factors from year to year (appendix….).

[17] We use the nomination 'Tier1 capital ratio' in order to simplify the text. However, we refer to the main independent variable, the Tier1 capital to risk-weighted assets ratio.

stronger and more significant than in the first case when using a pooled OLS specification. Our results are therefore robust to the two alternative models, fixed and random effects. Risk-weighted Tier1 capital ratio is a better explanatory variable for equity beta than ordinary equity to total assets ratio. RWA and core capital Tier1 are more relevant in explaining banks' share correlation to the market and equity beta systematic risk. Estimated coefficients are strongly statistically significant and higher than previously. Second, in the fixed effects regression, capital structure has a greater impact on equity beta with an estimated coefficient of -0.0257. The FE estimator is consistent under both null and alternative hypothesis, we consider this one as the most appropriate as the difference in coefficients is not important (Hausman test conclusion as Chi-square(3)=1.02 and p-value=0.7958). Third, assets characteristics did not appear significant in this level specification.

As we previously said, estimated coefficient of capital ratio could describe the assets beta. Table C3 in appendix shows results of the specification of equity beta and log capital ratio[18]. With a full Modigliani-Miller we would expect an estimated coefficient of capital ratio of -1: doubling capital ratio should half equity beta. Yet, estimated coefficients are strongly statistically significant but lower than 1. This describes a partial Modigliani-Miller compensation effect of about 42%.

Determining the level of capital ratio could actually be made in accordance with a risk target often imposed by the risk manager. Indeed, there can be the possibility of a causality link between the two variables. In order to avoid this potential endogeneity between our two main variables, the beta will be considered in relation to the lag level of Tier1 capital ratio. Appendix C4 shows results of these regressions. Estimates coefficients are still negatives and highly significant with similar values than before confirming our previous findings.

While the amount of pure capital is increasing relative to the amount of debt (ie. capital ratio increase or leverage decrease), equity beta is decreasing. The explanation relies on the fact that banks' balance-sheet is steadier, beta systematic risk is lower as the bank is less vulnerable to market fluctuations. This intermediate result rejoins regulators proposals for banks' recapitalization.

Notice that we assumed that rate of return on liabilities doesn't change when the amount of debt varies. However, this might be a strong hypothesis. We will consider for frictions and consequences of capital structure changes further in our study.

[18] We don't consider for log beta as this variable has negative values for certain banks and certain periods.

4.1.2. Expected return on bank equity and capital ratio

We pursuit the analysis and the second step consists in estimating to what extent changes in the financing structure determine the required rate of return on equity. According to Modigliani-Miller theorem described previously, a higher equity share in banks' balance-sheet and implicitly a reduction in leverage will lead to a reduction in the expected return on equity as risk associated to each unit of equity is lower. Expected data for each bank of the sample is not available. In order to obtain a most appropriate measure, we are going to use an 'expected' ROE. Instead, we compute this variable as net income to market capitalization. The denominator allows us to account for investors' anticipations as they are already included in shares' price. Thus, we estimate the following model:

$$ROE_t = \delta_1 CR_{it} + \delta_2 X_{it} + \varepsilon_{it} \quad (9)$$

where ROE the dependent variable representing the expected yield offered to bank's lenders in order to pay for a new capital issue. X_{it} is a matrix of bank level and country level control variables, ε_{it} is the error term and δ_1, δ_2 are slope coefficients or vectors of coefficients. The matrix X_{it} includes both macroeconomic variables and bank specific variables[19]. In all cases, standard errors are adjusted for clustering on countries. Including individual and time effects allow us to control for factors that impact each bank's average rate of return and respectively for changes in variables from year to year.

Estimates' results presented in Appendix C5 highlight some interesting conclusions. First, capital structure described here by the Tier1 ratio represents a significant explanatory factor for the expected return on equity's variation: the higher the core equity ratio, the lower the required return on equity will be. For a one unit increase in risk-weighted capital ratio, the required return on equity is estimated to decrease by about 18 to 25 points of percentage. However, investors also seem to take into account in their anticipations of the expected rate of return the overall profitability of bank's assets (ROA), the probability of incurring future losses on its assets (loan loss reserve ratio) and also balance-sheet size advantages (estimated coefficients are statistically significant). They might ask higher returns from big risky banks (high loss reserve ratio and big balance-sheet size and also with high assets probability – meaning risky assets). The Modigliani-Miller compensation effect is significant at this level, but the theoretical benchmark is not achieved as the estimated coefficient is different and higher than -1.

[19] As regards to macroeconomic control variables we use the economic cycle and the stock-markets return. Concerning banks' specific characteristics, we use lending activity and market activity proportions in the balance-sheet, as well as the liquid assets ratio. These variables allow us to control for assets structure.

We test whether banks specific effect could better explain the variation of our dependent variable. We employ other three alternative models using only the economic cycle and bank assets characteristics as control variables: a pooled OLS model and two bank specific effects, fixed and random effects. The estimated coefficient is even stronger than before suggesting that the main explanatory factors for the rate of return on equity are those describing the capital structure and the risk asset structure. When we account for bank specific effects, national economy is also influencing the rate of return fluctuations (appendix C6). Therefore, we can conclude that there are significant bank specific effects concerning the relation between the expected rate of return on equity and the Tier1 ratio.

The evidence presented in these two subsections supports the existence of a sizeable Modigliani-Miller compensation effect for our sample of European banks during the period from 1997 to 2012. An increase in the Tier1 ratio (so a decrease in leverage) involve a decline in both the riskiness of the bank (the equity beta) and the required return on its equity (net income to market capitalization ratio). Although this neutrality is not complete, bankers claims on higher funding cost repercussion on credit distribution and economic activity might be nothing else than a management decision not a regulatory implementation unavoidable consequence (Hyun and Rhee 2011).

5. MM application to banking system. Implicit subsidy consequences on funding cost – empirical approach.

Hence the initial idealized conditions are no longer valid in reality, the theoretical MM benchmark can be seen as an extreme vision of the compensation effect. Effectively, the main interest in studying these interactions both between capital ratio and equity beta and between capital ratio and the expected return on equity is reflected in the weighted average cost of capital (WACC) estimation. The higher cost of an increase in the equity proportion (the most expensive form of capital) in the balance sheet will be offset by a reduction of the rate of return paid to investors. Theoretically, the WACC should stay unchanged. But in reality, we are facing information asymmetries, several fiscal and cost advantages so the calculated WACC will deviate from the benchmark. We are further going to estimate information asymmetries' impact on the weighted cost of capital, and more precisely implicit guarantees as they represents the main limit of MM theorem application to banks.

We consider that this competitive advantage 'offered' by the public authority is translated into lower funding rate than the one corresponding to the real risk level of the bank

(Oxera (2011), Ueda and di Mauro (2012), Noss and al. (2012)). In order to calculate this spread between the two funding rates we'll employ a rating based approach. Thereby we use different ratings that credit rating agencies issue for the same bank: a traditional credit rating (*'support' rating*) and a 'stand-alone' rating[20] ('*Bank Financial Strength rating'*) both issued by Moody's. One and the other reflect an external estimation of the probability of default on banks' debt, but only the second one eliminates the influence of the "safety net" inherent in the industry. Our purpose is to compare the actual bank's cost of funding (corresponding to the 'support' rating) with an estimate of a higher funding cost the bank would pay in absence of public guarantee (corresponding to 'stand-alone' rating). The rating based approach used in our estimations, comparing to a contingent claim approach, relies on rating agency judgment on the failure probability of the bank and the probability of a government bailout. This allows us to take into account the relative risk associated with banks' business models. However, rating agencies judge the banks' probability of default considering its individual circumstances without taking into account the shock that the failure of one bank could have on the entire banking system. This can underestimate the value of implicit subsidy as it was calculated previously.

The spread between the two ratings calculated first in number of notches and secondly in terms of funding cost was called in the recent literature 'credit/rating uplift' (ICB 2011). The average 'rating uplift' defined as the difference of notches between the 'stand-alone' rating and the 'support' rating is estimated for the banks in our sample of 2 notches and it is illustrated in the graph in appendix D.

So, we can divide our period in two sub-periods: time of relative stability ("before the storm") up to 2008 and crisis time – starting in 2008. The spread is significantly more important during after 2008. Implicit subsidy small values for the period up to 2007 are explained by the absence (or weaker) government intervention as banks could handle themselves to finance their activity. Staring from 2008 until 2010, a more important variation is highlighted on the graph – it could be due to an overall deterioration of financial markets, including banks. As a consequence, public bailouts reached historical values for these last years (appendix D). This significant variation is due foremost to a highly probability of government intervention.

[20] The banks in our sample are large banks (holdings). We thus assume that any support is issued by the government and there will not be a holding support. Moody's issue a 'support' rating corresponding to the traditional rating and a 'stand-alone' rating excluding the government support. The Bank Financial Strength rating reflects how Moody's appreciates the probability of an external intervention in cases of default. This last ration mentioned varies from A to E (A for a stable bank and E for a bank with high probability of future bailout). Starting from 2008 Moody's issues also a 'stand-alone' rating similar to the 'support' rating (ratings from AAA to D). We are taking into account this last rating allows us to make a more meaningful comparison between the two cases.

Indeed, excessive bailouts were accorded to banks during this period in order to ensure the continuity of the funding activity; however governments were increasingly weak staring from 2008.

It is important to be specified that the implicit guarantee is associated to the cost of debt and it will be further highlight by the funding rate associated to banking debt.

Conducive to the analysis, we are using in our WACC calculations debt funding rates R_d corresponding to different rating classes issued for Moody's between 1997 and 2012 as it follows:

$$WACC_{it}^{support} = k_{it} \frac{E_{it}}{D_{it}+E_{it}} + R_d^{support} \frac{D_{it}}{D_{it}+E_{it}} (1-t_s) \qquad (10)$$

This equation estimated the WACC in the case when the bank benefits from a government guarantee and its debt funding rate $R_d^{support}$ will correspond to the rate associated to the 'support' rating. Assuming now that this advantage is lost and the bank should assure by itself the entire default risk associated with its balance-sheet. In this case the debt funding rate will be higher than the previously case as the banks' debt is no more 'protected' by the government. The WACC is calculated as:

$$WACC_{it}^{stand-alone} = k_{it} \frac{E_{it}}{D_{it}+E_{it}} + R_d^{stand-alone} \frac{D_{it}}{D_{it}+E_{it}} (1-t_s) \qquad (11)$$

We are going to take into account in our estimations the implicit guarantees, the most important asymmetry, but also the fiscal advantage associated to banks' debt and described here by *(1-t_s)*.

Knowing that $R_d^{stand-alone} > R_d^{support}$, therefore the weighted average cost of capital in the first case (with the public guarantee) will be lower than in the case without the public support.

The average spread of funding cost (WACC) captures the implicit advantage in terms of funding rate that some banks (especially systemic banks) receive from public authorities:

$$\Delta WACC_{it} = k_{it} \frac{E_{it}}{D_{it}+E_{it}} + \Delta R_d \frac{D_{it}}{D_{it}+E_{it}} (1-t_s) \qquad (12)$$

With the variation in the average cost of banking capital wrote as $\Delta WACC_{it} = WACC_{it}^{stand-alone} - WACC_{it}^{support}$ and $\Delta R_d = R_d^{stand-alone} - R_d^{support}$ the spread in debt cost of funding without and with the public protection.

For each bank in the sample, we estimate the average cost of funding either with or without the respective credit rating uplift. Using our database of European banks for the period of

1997-2007, we map yield spreads to different categories of ratings (as illustrated in appendix D).

The funding cost spread due to implicit guarantees is higher the poorer the banks stand-alone credit rating (ie. higher numerical value as described in appendix D). Relatively higher implicit guarantee values were recorded during the 2007-2009 periods, highlighting a deterioration of banks balance sheets but also a stronger dependence on public rescue funds. Consequently, banks reported strong implicit benefits during the crisis period relatively to the previous period. Situation changed after 2009 when government safety net was increasingly weakened. The reduction of these implicit guarantees was reflected in funding cost rises for about 80 basis points between 2007 and 2012.

We further ask for the future evolution of these information asymmetries as new regulation is to be implemented. The new prudential rules of Basel Committee impose strengthen capital requirements[21]. We expect that an increase in banks capital ratio (ie. a decrease of leverage as debt proportion in the balance-sheet is decreasing) as proposed within the Basel III framework will strengthen banks stability and ease financing process (Demirguc-Kunt et al 2010). Opinions are displayed: on one side regulators and supervisory authority argue that increasing capital ratios will strengthen banks and the whole banking system stability (BIS 2010a, BIS 2010b, Kashyap et al. 2010, King 2010, ECB 2011, Miles and al. 2012, BIS 2012). But on the other side, bankers, with a more short-term vision, sustain that increasing the amount of the most expensive liability (equity as core capital) will increase the funding cost (IIF 2010, Stulz and al. 2013). In our opinion, the debate has more sense from a timeline perspective. In our analysis, we consider a long-time horizon as the Basel III framework implementation should be made until 2019.

Starting from this debate, we are interested in analyzing funding cost sensitivity to capital structure. We compute weighted-average cost of capital for each bank of our sample in two cases described previously: the first one when the bank benefit from implicit guarantees and the second one eliminating this public support and counting only for bank strengthen. The calculated 'uplift' between the two measures represents the value of the implicit subsidy for each questioned bank.

[21] In this paper we consider only for capital requirements of the new Basel III framework. Our choice could be restrictive for our analysis; however Modigliani-Miller, the main theoretical model used here refers only to capital amount of the balance sheet. In its initial form, it doesn't take into account liquidity. It allows us to compute for the weighted average cost of capital only from a capital point of view. Our analysis is opposed to De Angelo and Stulz (2013) affirming that high leverage is optimal for banks as they are discussing on the WACC evolution from a liquidity point of view. As a consequence, Modigliani-Miller theory could not be use in their context.

We analyze elasticity of funding cost with respect to capitalization level. We first impute logarithm of our two main variables, WACC and Tier1 ratio and then we apply a simple OLS regression. The estimated coefficient of Tier1 ratio represents nothing but the elasticity coefficient and it describes the sensitiveness of the dependent variable, the WACC, relative to the capital structure described by the Tier1 ratio. The first important result illustrate negative elasticity coefficient between log-Tier1 ratio and both log-WACC and log-implicit guarantee (appendix E1). The second evidence is that banks are less sensitive to changes in capital structure when public support is excluded: the elasticity coefficient is weaker in the case when we exclude implicit guarantees and we count only for bank's financial strength. The third important result highlights a stronger elasticity coefficient during the crisis period than in normal times. This result is also confirmed by an implicit guarantee - Tier1 ratio elasticity analysis (appendix E2): elasticity coefficient is 3 percentage points higher during the crisis (2007-2012) than in normal times (1997-2007[22]).

Three main results resort from our analysis. First, our results sustain Basel III capital framework implementation as we provide evidence on the beneficial consequences of a better capitalization: higher amount of stable capital reduces banks' balance-sheet vulnerability to market fluctuations and improves stability, thus investors should require lower rates of return on capital and banks funding cost will be lower than previously. Second, as implicit guarantee is relied to debt, the value of this public support will decrease with balance-sheet capitalization. We thus induce the importance of strengthen capital requirements in order to reduce asymmetries and comparative advantages for too-big-to-fail banks.

As a result of our empirical analysis, we have three comments. First and foremost, implicit subsidy provided to banking institutions makes liabilities price more insensitive to the capital structure (ie. to the amounts of equity and debt). Second, the fact that the public support conducts to liabilities "mispricing" may increase incentives to both risk-taking and activity growth (Diamond and Rajan 2009, Diamond and Rajan 2011, Farhi and Tirole 2012, Hau, Langfield and Marquez-Ibanez 2012, IMF 2011). Third, banks that receive public support have no interest in internalizing bankruptcy costs as these will increase their funding costs. As we could see from our results, the higher the implicit guarantee the lower the cost of liabilities will be[23]. In the same time, as banks are bailed-out by governments, in the end there will be

[22] 2002-2004 periods are not included in ours ample of crisis periods as shock didn't had a major influence on banking system neither on our sample of European banks.

[23] This can be the result of the fact that depositors and creditors anticipate that they will be bailed out ex-post, so their ex-ante assessment of risk takes into account the existence of this government protection. Moreover, they have few incentives to monitor and supervise the risks banks can take. We could think that junior creditors

the taxpayers' funds that will support losses of banks' excessive risk-taking and thus the higher the value of the implicit subsidy the greater the impact on taxpayers will be.
In conclusion, imposing higher core capital ratios will enhance stability and will make bankers and shareholders aware of their responsibilities. Moral hazard will be so reduced as well as public interventions to rescue banking institutions from bankruptcy (Kwast and Passmore 2000,). We thus provide support to Basel III capital framework as it could reduce the overall risk in financial and banking system.

6. Conclusions

The financial crisis has been a 'great' test for banks and regulatory reform. Banks' innovations and the excessive risk-taking proved to be important vectors in attending financials' and bankers' main objective – the one of maximizing the return relative to risk. They are constrained by regulatory claims wishing to control risk default. But the way capital requirements were designed, next to assets and liabilities structure, lead to collective risk-taking and procyclical leverage. These features induced the outbreak of the financial crisis and the main issue for next regulatory reform.
New regulatory framework imposed a higher core capital level. Higher proportion of equity in the capital structure is associated with a reduction in the risk level and in risk premium, but also in the expected rate of return. Economically funded arguments disclaim industries' concerns about a higher funding cost. Well capitalized banks are essential to better cover the risks and surpass stress periods without requesting for public bailouts. We bear empirical proves that higher amount of Tier1 equity improves banks' stability and reduces the expected cost of capital. Our results support the concept of a Modigliani-Miller compensation effect for a sample of 85 European banks during the period from 1997 to 2012. We provide evidence of a positive relationship between capital structure and the systematic risk of banks on one side and their funding cost on the other side. Better capitalized banks are less dependent on public funds; this also reduces explicit and implicit advantages. This last section of our study is also our main contribution to the literature. We estimate implicit subsidy effect on banks' average cost of capital: stronger balance-sheet capitalization reduces both the probability of default

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would have more incentive in monitoring banks activity. But many holders of subordinated debt and even of hybrid products have been bailed out during the subprime crisis which clearly questioned their incentives to monitor.

and the need of public bail-outs. To a longer-term horizon, this reduces the banks' funding cost as they are steadier.

Capital requirements could have important effects on banks' business models, although it is absolutely unavoidable for a strengthen stability of the banking system. Imposing higher capital requirements without controlling for banks performance and risk-taking incentives might prove useless.

Appendix

Appendix A: Dataset.

Variable	Nb.	Nb. Obs. (total)
Periods (years)	16	1188
Banks	85	1188
Countries	18	1188

Appendix B: Descriptive statistics main variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Equity beta	880	.6203	.5923	-.0041	2.5874
Leverage	1118	19.3667	11.0699	-46.6166	128.9872
T1 ratio	835	9.0883	2.7704	-6.7	20.3
Leverage RWA/T1	835	11.6471	3.7141	-27.0270	49.5049
ROA	1118	.6501	1.4183	-16.787	21.445

1997-2007					
Variable	Obs	Mean	Std. Dev.	Min	Max
Equity beta	510	.4865	.4816	-.0041	1.8854
Leverage	530	19.6529	7.5454	1.035149	47.6741
T1 ratio	423	8.2436	2.1864	4.42	20
Leverage RWA/T1	423	12.7866	2.6698	5	22.6244
ROA	530	.9033	1.1011	-.171	21.445

2007-2012					
Variable	Obs	Mean	Std. Dev.	Min	Max
Equity beta	370	.8048	.6759	-.0037	2.5874
Leverage	588	19.0559	13.9239	-46.6166	128.9872
T1 ratio	412	9.9556	3.0294	-6.7	20.3
Leverage RWA/T1	412	10.4772	4.2385	-27.0270	49.5049
ROA	588	.37527	1.6549	-16.787	9.783

Appendix C

Appendix C1: Equity beta and capital ratio. Pooled OLS regression.

VARIABLES	(1)	(2)
Capital ratio	-0.00446**	-0.00633***
	(-2.334)	(-3.051)
Size		0.0471***
		(3.210)
ROA		0.0122
		(0.812)
Liquid asset ratio		0.0212
		(0.110)
Loan loss reserves ratio		0.0140
		(1.042)
Constant	0.768***	0.438**
	(16.78)	(2.548)
Observations	721	721
R-squared	0.008	0.099
r2_a	0.00614	0.0761
F	5.449	4.295

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
All specifications include time dummies. Equity beta as dependent variable. Capital ratio is calculated as equity capital to total assets ratio.

Appendix C2: Bank equity beta and Tier1 capital ratio, 3 models: pooled OLS, fixed effects (FE) and random effects (RE). Level specification.

	(1)	(2)	(3)
VARIABLES	OLS	FE	RE
Tier1/RWA ratio	-0.0221***	-0.0259***	-0.0257***
	(-3.533)	(-4.782)	(-7.289)
Size	0.0201	-0.00229	0.00145
	(1.283)	(-0.0668)	(0.105)
Liquid asset ratio	0.0429	-0.345	-0.345**
	(0.209)	(-1.259)	(-2.512)
ROA	0.00579		
	(0.255)		
Constant	0.657***	1.050**	1.032***
	(3.250)	(2.559)	(5.557)
Observations	721	721	721
R-squared	0.025	0.096	
r2_a	0.0182	0.0917	.
F	3.896	7.942	.
Number of id		65	65

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.
The dependent variable is equity beta. Second column illustrates results for fixed effects model where fixed effects are accounting for bank specific characteristics. The reported constant represents the average of such estimated effects. Third column reports results for random effect model. In all three regressions, standard errors are robust to clustering effects at the bank level. A Hausman test is applied in order to compare FE et RE estimators. The null hypothesis of this test is that the differences in coefficients are not systematic. Chi-square(3)= 1.02 and p-value=0.7958. We cannot reject the null hypothesis that the differences in coefficients are not significant, so FE model is better than RE model.

Appendix C3: Bank equity beta and Tier1 capital ratio, 3 models: pooled OLS, fixed effects (FE) and random effects (RE). Log specification.

VARIABLES	(1) OLS	(2) FE	(3) RE
Tier1/RWA ratio	-0.251***	-0.426***	-0.418***
	(-2.751)	(-4.732)	(-7.474)
Size	0.0213	-0.00253	0.00117
	(1.357)	(-0.0756)	(0.0851)
Liquid asset ratio	0.0461	-0.390	-0.387***
	(0.224)	(-1.412)	(-2.820)
ROA	0.00989		
	(0.348)		
Constant	0.988***	1.794***	1.758***
	(3.266)	(4.108)	(7.589)
Observations	721	721	721
R-squared	0.017	0.099	
r2_a	0.0106	0.0950	.
F	2.665	7.611	.
Number of id		65	65

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Regression of equity beta on log capital ratio, measured as Tier1 capital to risk-weighted assets ratio. In this case a Hausman test is used to compare the two alternative models, fixed and random effects. Chi-square(3)= 1.70 and p-value=0. 6362. FE estimator is consistent both under null and alternative hypothesis.

Appendix C4: Bank equity beta and Tier1 capital ratio, 3 models: pooled OLS, fixed effects (FE) and random effects (RE). Level specification with lagged capital ratio.

VARIABLES	(1) OLS	(2) FE	(3) RE
Lagged Tier1/RWA ratio	-0.0210***	-0.0193***	-0.0191***
	(-6.352)	(-4.031)	(-5.831)
Size	-0.000993	0.00323	0.00535
	(-0.0806)	(0.116)	(0.436)
Liquid asset ratio	-0.430***	-0.496*	-0.503***
	(-3.183)	(-1.797)	(-3.749)
ROA	-0.0265***		
	(-3.197)		
Constant	1.054***	0.969***	0.956***
	(6.509)	(3.126)	(5.978)
Observations	655	655	655
R-squared		0.072	
Number of id	65	65	65
r2_a	.	0.0676	.
F	.	7.271	.

Notes: z-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
The dependent variable is equity beta.

Robustness check (footnote) – risk assets given by vstoxx index.

VARIABLES	(1)
Tier1/RWA ratio	-0.0119*
	(-1.690)
Vstoxx	-0.0115*
	(-1.663)
Constant	1.289***
	(4.756)
Observations	721
R-squared	0.075
r2_a	0.0523
F	3.269

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
The dependent variable is equity beta. Vstoxx is the equivalent of Vix index on US stock exchange market. It is computed for Eurostoxx market.

Appendix C5: Expected return on bank equity and Tier1 capital ratio, 3 models: pooled OLS, fixed effects (FE) and random effects (RE). Level specification.

VARIABLES	(1)	(2)	(3)	(4)
Tier1/RWA ratio	-0.185**	-0.254*	-0.672***	-0.305**
	(-1.965)	(-1.877)	(-3.178)	(-2.101)
Economic cycle		-0.219	-1.501	-0.511
		(-0.794)	(-1.357)	(-0.840)
Rm			6.689	3.698
			(1.278)	(1.236)
Size			1.473***	1.029**
			(3.368)	(2.585)
Liquid asset ratio			-2.366	-4.360
			(-0.405)	(-1.048)
Loan loss reserve ratio			1.348***	0.774**
			(3.066)	(2.353)
ROA			4.319***	2.091***
			(5.433)	(3.993)
Constant	3.724***	4.806***	-20.63**	-14.14*
	(3.141)	(2.787)	(-2.445)	(-1.884)
Observations	704	704	704	704
R-squared	0.005	0.008	0.113	0.774
r2_a	0.00405	0.00422	0.0677	0.732
F	3.862	2.088	2.506	18.42

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
The dependent variable is expected return on equity. All regressions include time dummies. We tested Fama and French factors HML (value factor) and SMB (size factors), but they are are not significant explanatory variables for the expected return on equity. The other macroeconomic factors don't appear as significant for our sample of European banks either. So in the following estimates we are not focusing on these variables.

Appendix C6: Expected return on bank equity and Tier1 capital ratio. Level specification. OLS pooled regressions.

VARIABLES	(1) OLS	(2) FE	(3) RE
Tier1/RWA ratio	-0.645***	-0.302**	-0.329***
	(-3.424)	(-2.388)	(-2.643)
Economic cycle	-0.709	-0.979**	-0.924**
	(-1.081)	(-2.211)	(-2.134)
Size	1.331***	0.826**	0.909***
	(3.424)	(2.344)	(2.671)
Liquid asset ratio	-0.203	-2.304	-2.149
	(-0.0385)	(-0.612)	(-0.580)
Loan loss reserve ratio	1.092***	0.655**	0.683**
	(2.925)	(2.395)	(2.543)
ROA	4.001***	2.032***	2.160***
	(5.606)	(4.380)	(4.730)
Constant	-12.68**	-10.24	-4.345
	(-2.060)	(-1.288)	(-0.930)
Observations	704	704	704
R-squared	0.102	0.089	0.113
r2_a	0.0620	0.0489	0.0677
F	2.550	0.623	2.506
Number of id		65	65

Notes: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
The dependent variable is expected return on equity.

Appendix D

Appendix D1: Credit ratings and the associated numerical value.

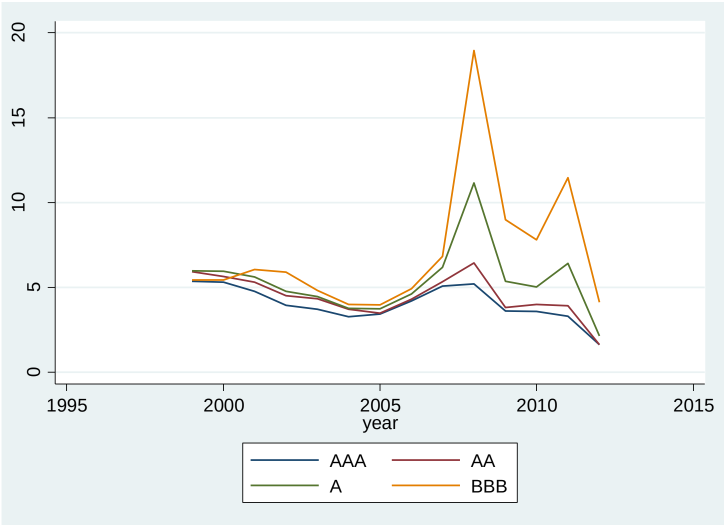
S&P	Moody's	Fitch	Numerical value
AAA	Aaa	AAA	1
AA+	Aa1	AA+	2
AA	Aa2	AA	3
AA-	Aa3	AA-	4
A+	A1	A+	5
A	A2	A	6
A-	A3	A-	7
BBB+	Baa1	BBB+	8
BBB	Baa2	BBB	9
BBB-	Baa3	BBB-	10
BB+	Ba1	BB+	11
BB	Ba2	BB	12
BB-	Ba3	BB-	13
B+	B1	B+	14
B	B2	B	15
B-	B3	B-	16
CCC+	Caa1	CCC+	17
CCC	Caa2	CCC	18
CCC-	Caa3	CCC-	19
CC+	Ca1	CC+	20
CC	Ca2	CC	21
CC-	Ca3	CC-	22
C+	C1	C+	23
C	C2	C	24
C-	C3	C-	25

Notes: In our analyze we used only Moody's ratings.

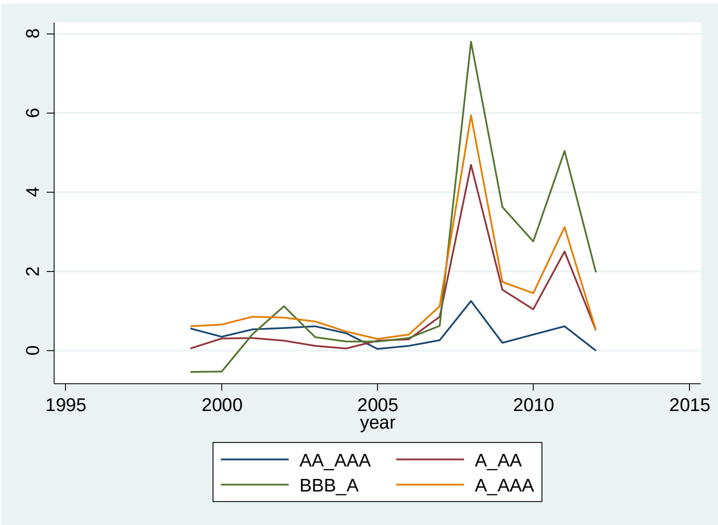
Appendix D2: Rating for banking stability (Moody's Bank Financial Strength Rating).

MBFS	Numerical value
A	1
A-	2
B+	3
B	4
B-	5
C+	6
C	7
C-	8
D+	9
D	10
D-	11
E+	12
E	13
E-	14

Appendix D3: The funding rate associated to different rating classes in % (left). Rate spreads associated with rating spreads in % (right).



Source: Datastream, author's calculations



Source: Datastream, author's calculations

Appendix E

Appendix E1: Elasticity WACC and leverage.

	WACC - Leverage		
	With implicit subsidy	Without implicit subsidy	Without implicit subsidy – crisis period
Elasticity	0.449***	0.464***	0.543***
	(8.257)	(10.11)	(9.426)

Variables Funding cost as weighted average cost of banking capital (WACC)
Leverage as equity to total assets ratio.

Appendix E2: Elasticity WACC and risk-weighted Tier 1 ratio.

	WACC – risk-weighted Tier1 ratio		
	With implicit subsidy	Without implicit subsidy	Without implicit subsidy – crisis period
Elasticity	-0.705***	-0.324***	-0.519***
	(-7.119)	(-3.687)	(-5.812)

Variables: Funding cost as weighted average cost of banking capital (WACC)
Risk-weighted Tier1 ratio calculated as Tier1/RWA.

Model: The estimation method is based on a simple regression and therefore easily implemented on a spreadsheet. We first apply logarithm to our main variables and thus the coefficient of regression will describe the elasticity coefficient. It represents the ratio of logarithmic derivatives of the two variables.

Appendix E3: Elasticity implicit subsidy and risk-weighted Tier 1 ratio.

	Implicit subsidy – risk-weighted Tier1 ratio	
	All periods	Crisis period
Elasticity	-0.720**	-0.750**
	(-2.255)	(-2.176)

Notes: Implicit subsidy is computed as a funding cost spread. It represents the difference between the WACC with public guarantee and the WACC excluding this support.

REFERENCES

Admati, A, P.de Marzo, Helling, M., Pfleiderer, P. 2011. - *Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Expensive.* 2011, Stanford GSB Research Paper No. 2063.

Basel Committee on Banking Supervision (BCBS). 2010a. – *Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements,* 2010, Bank for International Settlements (BIS Interim Report).

Basel Committee on Banking Supervision (BCBS). 2010b. – *An assessement of the long-term economic impact of the transition to stronger capital and liquidity requirements,* 2010, Bank for International Settlements (BIS).

Basel Committee on Banking Supervision (BCBS). June 2011. - *Basel III: A global regulatory framework for more resilient banks and banking systems.* 2011, Bank for International Settlements.

BCE. 2011. - *Financial Stability Review.* 2011, pp. 125-157.

BIS. 2012. - *Post-crisis evolution of the banking sector.* 2012, Annual Report, pp. 64-92.

BIS. march 2012. *Bank stocks returns, leverage and the business cycle, BIS Quaterly Review.*

Demirguc-Kunt, A, Detragiache, E and Merrouche, O. 2010. - *Bank capital : lessons from the financial crisis.* 2010, Policy Research Working Paper Series 5473, The World Bank.

Diamond, D. W. et Rajan, R. 2009. - *Illiquidity and interest rate policy.* 2009, NBER Working Papers no. 15197.

Diamond, D W et Rajan, R. 2011. - *Illiquid banks, financial stability and interest rate policy.* 2011, NBER Working papers no.16994.

Eliott, D., Salloy, S. and Oliveira Santos, A. 2012 – *Assessing the cost of financial regulation,* IMF Working Paper no. 12/233.

European Banking Authority, (EBA). October 2012. - *Final report on the implementation of Capital Plans following the EBA's 2011 Recommendation on the creation of temporary capital buffers to restore merket confidence.* October 2012.

European Parliament Directorate General for Internal Policies Policy Department A: Economic and Scientific. 2011. - *CRD IV – Impact assessment of the different measures within the capital requirements directive IV.* 2011.

Farhi, E. and Tirole, J. 2012. - *Collective moral hazard, maturity mismatch and systemic bailouts.* 2012, American Economic Review vol 102, no 1.

Hamada, Robert. 1971 - *The effet of the firm's capital structure on the systematic risk of common stocks.* 1971, The Journal of Finance, pp. 435-452.

Hau, Harald, Langfield, Sam et Marquez-Ibanez, David. 2012. *Bank ratings;What determines their quality?* s.l. : European Central Bank, 2012.

Hyun, J-S and Rhee, B-K. 2011. - *Bank capital regulation and credit supply.* 2011, Journal of Bnaking and Finance vol. 35, pp. 323-330.

Institute International Finance (IIF). 2010. - *Interim report on the cumulative impact on the global economy of proposed changes in the banking regulatory framework.* 2010.

Institute International Finance (IIF). 2011. - *The cumulative impact on the global economy of changes in the financial regulatory framework,* 2011, Washington

IMF. 2011. - *Key Risks and Challenges for Sustaining Financial Stability.* 2011, Global Financial Stability Report.

Independent Commission on Banking. september 2011. - *Final Report recommendations.* september 2011.

Kashyap, A. and Stein, J. 2010. - *An Analysis of the Impact of "Substantially Heightened" Capital Requirements on Large Financial Institutions,* University of Chicago and Harvard Working paper. 2010

King, M. 2010. - *Mapping capital and liquidity requirements to bank lending spreads.* 2010, Bank for International Settlements, Working paper no. 324 .

Kwast, Myron and Passmore, S. Wayne. 2000. - *The Subsidy Provided by the Federal Safety Net: Theory and Evidence.* 2000, Journal of Financial Services Research.

Le Leslé, V. and Avramova, S. 2012 - *Revisiting risk-weighted assets: why do RWAs differ across countries and what can be done about it?,* 2012, IMF Working Paper, no. 12/90

Mc Kinsey 2011 - *Day of Reckoning: New Regulation and the Impact on Capital Market Business, septembre.*

Miller, M. 1977. - *Debt and taxes.* 1977, The Journal of Finance, pp. 261-275.

Miller, Merton. 1988. - *The Modigliani-Miller propositions after thirty years.* 1988, The Journal of Economic Perspectives, pp. 99-120.

Miller, M. 1995. - *Do the M&M propositions apply to banks?* 1995, Journal of Banking and Finance, pp. 483-489.

Miller, Merton and Modigliani, Miller. 1961. - *Divident policy, growth, and the valuation of shares.* 1961, Journal of Business, pp. 411-33.

Miles, D., Yang, J and Marcheggiano, G. 2012. - *Optimal bank capital.* 2012, The Economic Journal.

Modigliani, F. and Miller, M. 1958. - *The cost of capital, corporation finance and the theory of investment.* 1958, American Economic Review, pp. 261-97.

Noss, J. and Sowerbutts, R. 2012. - *The implicit subsidy of banks.* s.l. : Bank of England, 2012.

Oxera. 2011. - *Assessing state support to the UK banking sector.* s.l. : mimeo, 2011.

Schich, S. and Lindh, S. 2012. - *Implicit Guarantees for Bank Debt: Where do we stand?* s.l. : OECD Journal: Financial Market Trends, 2012, Vol. vol. 2012, issue 1.

Stephen, R. 1988. - *Comment on the Modigliani-Miller propositions.* 1988, Journal of Economic Perspectives, pp. 127-133.

Ueda, K. and Weder di Mauro, B. 2012. - *Quantifying structural subsidy values for systemically important financial institutions.* s.l. : IMF, 2012. WP/12/128.