Value creation drivers in European banks: does the capital structure matter?

Josanco Floreani, Maurizio Polato, Andrea Paltrinieri and Flavio Pichler

The aim of the paper is to investigate the main value creation drivers in European Banks. We start by identifying three business models using balance sheet characteristics of a large sample of European banks. Moreover we try to analyse the most important accounting profit and capital absorption drivers. In particular for *retail funded* bank we try to assess the impact of the loan loss provisioning (LLP) together with a wide array of credit-risk exposure on value creation measured by EVA and P/BV ratio. We develop a model for assessing whether accounting policies, such as those related to LLP, and the quality of loan portfolio play a significant role in explaining banks economic performance. Our model investigates, in particular, the effect of crisis.
Our results suggest that during crisis LLP is positively and significantly related with EVA and P/BV ratio and this holds especially for *retail funded* bank. Our study has several implications, in particular at light of changing European regulation on non-performing exposures reporting and forbearance practices alongside with regulators forcing banks to strengthen their capital base.

Keywords: Banks, Loan Loss Provisions, capital structure, performance, cost of capital

1. Introduction

The financial crisis while once more pointing out to the central role of banking institutions in the economic process, drove a renewed interest on the corporate finance for banking firms. Regulatory reforms and supervisory pressures contribute to this renewed interest by requiring actions that would affect almost all the dimensions of banking activity and the key decision variables.
Urged to rise more capital and deleverage, banks face several challenges as regards capital structure, risk exposure, the cost of capital and overall bank value. So far, corporate decisions as regards investments, financing, capital structure and their relations with bank value have not been paid wide attention in banking literature.
The aim of our paper is to develop a comprehensive model for bank value where we explicitly take into account asset composition, capital invested and capital structure. We employ standard corporate finance metrics for measuring risk exposure, the cost of capital and corporate value. The major contribution of our work is that we provide an in-depth investigation on the drivers of different components of value. Specifically, we identify exposure to systematic risk which affects the cost of capital, operational performance which are affected by asset composition and capital invested which depends on types and quality of investments.
We build on a concept of capital invested, which comprises equity capital and long term debt. On the one hand this allows us to capture the specificities of banks, where short term debt (and, in particular, deposits) are part of the production process and contribute

to create value. On the other, it allows us to frame the role of capital structure in driving expansion paths of banks. In our model, banks build up their capital structure in light of future growth. Through a real options approach, we are able to disentangle the impact of assets-in-place and growth opportunities on the value, which is another contribution we make to the literature.
Central in our analysis is asset composition and the quality of loan portfolio along with bank's provisioning policies. At this regard, we build on a significant body of literature addressing issues pertaining the cost of equity capital and the way in which capital may affect the value of banks.
The paper is organised as follows. Section 2 lays down the theoretical framework. Section 3 presents the model. Section 4 describes the sample and the methodology. Section 5 presents the results. Section 6 discusses the results and concludes.

2. Theory

Because of banks exist for resolving informational asymmetries and other frictions in the allocative process, they are regarded as special firms subject to tighter regulation and supervision. Those peculiarities casted a debate in academic literature over the application of some major corporate finance theoretical frameworks to banking institutions, such as the Modigliani-Miller leverage indifference theorem.
Indeed, capital plays a pivotal role in banks. Nothing to say, literature has much contributed to the knowledge on such a role and spurred a few fruitful fields of research focusing on the central function of capital in regulation (Battacharya, Boot and Thakor, 1998; Hellman, Murdoch and Stiglitz, 2001; Barth, Caprio and Levine, 2004) and its impact on bank competition and intermediation services (Berger, Herring and Szego, 1995; Thakor, 1996; Boot and Marine, 2007).
However, whether capital affects bank value is a question which has not been exhaustively settled so far, although a few contributions shed light on the ways in which capital might affect the components of bank value. It is properly in the capital-value theoretical framework that we intend to ground our paper.
Maybe it is because there is no unanimous consensus on the application of well-known corporate finance paradigms to banks that the abovementioned question has not directly been addressed in the banking industry. What concerns at most theoreticians is the application of the M-M theorem to banks. Here two opposite views are confronting.
The first argues in favour of the application of M-M to banks. Essentially, this view (Miller, 1995) discards a common presumption that banks can leverage on deposits subsidies given that insured deposits is lower and, therefore, substituting deposits with capital may hurt value.
By contrast, an opposite view claims for a negative impact of capital o bank's value on grounds of an inverse relation between capital and liquidity creation (Diamond and Rajan, 2001). In its essential terms, the argument against the capital structure irrelevance points to the alleged perverse incentives that higher capitalization might have for banks. The role of delegated monitoring coming from deposits would induce banks to an effective use of its collection technology to assure repayments on loans. Capital do not share this feature and, therefore, substituting capital for debt would turn in reduced liquidity.
Indeed, the impact of capitalisation has received wide attention in standard corporate finance both under the perspective of signalling theory (Ross, 1977; Myers and Majluf,

1984) and of agency models (Stulz, 1990; Hart and Moore, 1985). All of these model point to a negative relation between capitalisation and corporate value.
In a similar way, liquidity synergies between deposits and loans can be advocated for ruling out the indifference of the capital structure on the value of banks (Kashyap, Rajan and Stein, 2002). The implication is that replacing deposits with equity capital would dry up such synergies and, therefore, adversely affect value.
There is limited theoretical recognition that equity capital might have a positive effect on the value of banks. The basic argument here lays on a tight relation between bank capital ant the incentive to monitor borrowers which grants banks an easier access to the capital market (Holmstrom and Tirole, 1997).
More recently, the issue has been addressed by Mehran and Thakor (2011) accounting for a positive relation between capital and the various components of bank value. To our knowledge, this paper is the first attempt to provide a thorough empirical investigation of whether M-M holds for banks and of the presumed negative relation between capital and value. The authors identify different components of value (the purchase price and goodwill in acquisitions, the NPV to shareholders) and show both theoretically and empirically that there should be an optimal capital structure for each bank. It is such that marginal costs and benefits of equity are balanced. The latter, in particular, are both direct and indirect. Direct benefits of holding more capital are identified in greater survival probabilities, leading in turn to better monitoring. Indirect benefits, in turn, arise when greater monitoring allows for an enhanced value of the relationship loan portfolio.
The monitoring paradigm is of particular interest since enhanced efforts in monitoring borrowers should have an impact on the overall quality of the loan portfolio. Indeed, Mehran and Thakor (2011) provide a comprehensive empirical investigation of the effects on value of a bulk of variables such as return on assets volatility, stock returns.
On a wider perspective, there is acknowledgement that banks' value, measured with indicators such as EVA or discounted cash flows, is also affected by several variables. Among others, we could consider overall riskiness, quality of bank assets, managerial policies, volatility of returns and capital, and loan loss provisioning as well. The last one in particular is a key variable in a variety of models trying to describe dynamics in income and in bank's capital base. Moreover, asset quality and provisions can be advocated as relevant determinants of the bank's exposure to systematic risk and, therefore, the cost of capital.
Several market based and corporate risk based variables might be assumed as determinants of betas and, in particular, to explain heterogeneity among banks. Dependent on the business model there are, then, a group of variables capturing the exposure on credit risk. Good indicators of risk could be found in the balance sheet, income statement and other disclosures (that is, disclosure on asset quality), such as ratios in different asset categories and margins. Relevant categories could be net loans, gross loans, impaired loans, reserves for impaired loans, loan impairment charges, risk weighted assets, operating margins, interest on loans. Such categories have been, in particular, identified as determinants of betas by a pioneering work of Rosenberg and Perry (1978). In particular, the authors identified a wide array of possible explanatory variables grouped in categories capturing the asset mix, the liability mix, operating characteristics (income, cash flows), size, growth and variability in stock prices. A more recent study on the Italian banking system (Di Biase and D'Apolito, 2012) use as explanatory variables the size (total assets) a leverage ratio (debt/book value of equity) a

loan to asset ratio, a liquidity ratio (cash/total assets) an intangibles ratio, a loan loss ratio and earning per shares. They find in particular a negative relation of EPS and loan loss ratio with betas.

Provisioning policies might be used for income smoothing or capital management purposes. The rationale for the income smoothing hypothesis lies in the fact that LLPs can be used to reduce the volatility of earnings. The early studies in the income smoothing literature date back to the end of the 1980s and the first contributions were those by Greenawalt and Sinkey (1988) and Ma (1988), who find evidence of earnings management in the U.S. banking industry. Greenawalt and Sinkey (1988) use a sample of 106 large bank holding companies for the period 1976-84 and find that banks' managers effectively tend to use LLPs to reduce reported earnings through an increase in LLPs when income is high, while they tend to reduce LLPs when earnings are low. Moreover, they show that regional banking companies smooth their income more than money-centre banks. Ma (1988) uses data on the 45 largest U.S. banks in the period 1980-84 and finds a strong evidence of banks' managers using LLPs to reduce (raise) their earnings when the operating income is high (low). Wahlen (1994) tests the income smoothing hypothesis on a group of 106 commercial banks for the period 1977-88 and finds that when future cash flows are expected to be positive, banks' managers increase LLPs. On the contrary, Wetmore and Brick (1994) find no evidence of income smoothing practices in the analysed sample of 82 US banks for the 1986-90 period. Bhat (1996) tests the income smoothing hypothesis for 148 U.S. large banks in the period 1981-91 and finds that banks which manage their earnings through LLPs have low growth, low book-to-asset and market-to-book ratios, high loan-to-deposit and debt-to-asset ratios, low ROA and total assets. In other words, income smoothing is typical of small, badly capitalized and with poor financial conditions banks. More recently, Kanagaretnam *et al.* (2003) use a sample of 91 public listed US banks for the period 1987-2000 and find that banks' managers reduce current income through LLPs to "save" income for the future when earnings are high and vice versa when current income is low. Liu and Ryan (2006) investigate whether banks' income was lower during the 1991-2000 period, which covers also the so called 1990s boom. The results show that profitable banks tended to decrease their income in the sample period using LLPs, in particular on homogenous loans.

In the most recent years, studies have been conducted also for non-US banks. Ismail *et al.* (2005) base their analysis on a sample of Malaysian banks, including bank specific as well as macroeconomic factors peculiar to the Malaysian economy. They find that Malaysian bans do not smooth their income through LLPs. Norden and Stoian (2013) investigate a group of 85 Dutch banks in the period 1998-2012. They find that banks tend to increase (decrease) their LLPs when their income is high (low), thus giving strong supporting evidence to the income smoothing hypothesis.

The second hypothesis used to explain the use of LLPs is the need to manage the regulatory capital. The changes in the regulation at the end of the 1980s may have indeed modified the incentives for banks' managers to use LLPs for capital adequacy reasons. This stream of literature can be dichotomized into two categories, pre and post1989 capital adequacy regulation. In 1989 the US regulatory agencies changed the capital ratio computation to adhere to the then newly adopted Basel I framework excluding loan loss reserves from the numerator of the capital ratio. Two main contributions (Moyer, 1990 and Kim and Kross, 1998) focus solely on the capital management hypothesis.

Moyer (1990) finds evidence that prior to 1989 US banks' managers tended to increase LLPs to raise the capital ratio and to prevent it falling under the minimum level of 5.5 per cent, while after Basel I entered into force LLPs were no longer used to manage regulatory capital ratios. Kim and Kross (1998) use a sample of 193 US bank holding companies for the period 1985-92, which is then divided into two sub-periods according to the entrance into force of the Basel I regulatory framework, namely 1985-88 and 1990-92. The results show that banks with low capital ratios used LLPs in the 1985-88 period more than in the 1990-92 one, since incentives to use them in the latter period were non existent. However, regulation after 1989 seemed to have no effect on banks which in the 1985-88 period had higher capital ratios.

A growing body of literature has focused on both hypotheses, thus investigating whether banks' managers use LLPs to smooth income and/or manage the regulatory capital ratios. These contributions can be divided into those studying US banks and those focusing on non-US banks, the latter being the most recent literature on LLPs. As regards the former, Collins *et al.* (1995) use data from 160 US banks in the 1971-91 period and find supporting evidence of the income smoothing hypothesis, while no relationship exists between LLPs and capital ratios, meaning that banks' managers do not use loan loss reserves to manage their regulatory capital. Beatty *et al.* (1995) and Ahmed *et al.* (1999) find contrasting evidence to that of Collins *et al.* (1995). Beatty *et al.* (1995) use a slightly different sample from that of Collins *et al.* (1995). Their sample is made up of a smaller number of banks (148) and covers a shorter period (1985-89). The results show no use of LLPs by banks' managers to smooth income, while LLPs are used in the management of capital ratios. Ahmed *et al.* (1999) also use a smaller sample that Collins *et al.* (1995), made up of 113 banks, but test a shorter, even though more recent time period (1986-95). They find no supporting evidence for the income smoothing hypothesis, but find that banks' managers use LLPs for capital management purposes, since in the pre1989 analysis banks showed higher level of LLPs than in the post 1989 period.

In recent years studies have focused on non-US banks, in particular from Australia (Anandarajan *et al.*, 2006), Europe (Curcio and Hasan, 2008 and Curcio *et al.*, 2012), Spain (Pérez *et al.* (2008)), Taiwan (Chang *et al.* (2008)) and the Middle East region (Othman and Mersni, 2014).

Anandarajan *et al.* (2006) focus their attention on a sample of 50 Australian commercial banks, ten of which are listed, for the period 1991 to 2001. The results show that banks' managers use LLPs to manage their regulatory capital, but only in the pre1996 period. The year 1996 is considered the cut-off date for the implementation of the Basel I framework in Australia, even though some banks may have adopted it earlier: still the Authors say that in 1996 all Australian banks had adopted the Basel I rules. Moreover, results indicate that Australian banks and, in particular listed ones, use LLPs to smooth their income. European banks' attitude towards using LLPs has been investigated both in 2008 and in 2012.

Curcio and Hasan (2008) compare the earnings- and capital-management incentives of 907 banks belonging to different countries, all geographically part of the European continent, and in particular: i) the 15 EU/pre-2004 countries; ii) the 10 EU/2004 countries; and iii) 23 non-EU/2006 countries. The time period is 1996-2006. The results show that both EU and non-EU banks use LLPs for income smoothing purposes. Moreover, EU banks, both pre- and post-2004, use LLPs to manage regulatory capital, while non-EU banks do not.

Curcio *et al.* (2012) use a sample of commercial, cooperative and savings banks belonging to 19 out of the 21 European countries of origin of the credit institutions subject to the 2010 and 2011 EBA's stress tests, for the period 2006-2010. The results support the hypothesis of income smoothing through LLPs for the sample banks, in particular for listed banks, but rejects the hypothesis of capital management, only for non tested banks. Indeed, the Authors find that banks that were tested under the EBA's 2010 and 2011 stress tests use LLPs more to manage their regulatory capital than to reduce the volatility of their earnings. Pérez *et al.* (2008) focus their attention on Spanish banks. The importance of this banking system relates to the strict rules the Banco de España had on loan loss provisions, that were expected to prevent banks' managers from using LLPs for either income smoothing or capital management purposes. The results show that in the period from 1986 to 2002 Spanish banks effectively use LLPs to reduce the volatility of their income, but they do not manage their regulatory capital ratio through loan loss provisions.

Chang *et al.* (2008) study the income smoothing and capital management hypotheses for a group of banks listed in the Taiwan Stock Exchange for the period 1999-2004. Their results indicate that the former is supported, since banks' managers effectively use LLPs to manage their earnings, while there is no evidence supporting the latter. Othman and Mersni (2014) conduct a comparative study between banks belonging to the Middle East region. These banks differentiate because 21 are Islamic banks, 18 are conventional banks but with Islamic windows and 33 are conventional banks. The results show no important differences in banks' managers use of LLPs: indeed, Islamic banks use LLPs to smooth their income and to manage their regulatory capital in the same ways as conventional banks, both with and without Islamic windows.

Another reason for using LLPs is the signalling hypothesis, under which banks' managers are supposed to increase LLPs as to indicate the financial strength or the market value of banks. In other words, LLPs contain both bad and good news: the former relates to the fact that increasing LLPs signals a higher default risk. The latter indicates the willingness of the banks' managers to deal with problematic loans as well as with performing ones.

This stream of literature yields conflicting results as in the cases of income smoothing and capital management; indeed some Authors point to the existence of the signalling effect, whilst others support the opposite. Again, the literature is mainly US-based and is particularly focused on market reactions to the Citicorp announcement of LLPs increases in 1987. Beaver *et al.* (1989) use a sample of 91 US banks for the period 1979-83 and show that banks which report higher loan loss provisions have higher market-to-book values and thus support the idea that banks' managers use LLPs to signal the financial strength of their bank. Wahlen (1994) reaches the same conclusion, though using abnormal returns. Elliot *et al.* (1991) and Griffin and Wallach (1991) conduct an unusual analysis to test the signalling hypothesis. Elliot *et al.* (1991) use the announcements of increased loan loss reserves by Citicorp and other US banks as well as the write-off announcement of the Bank of Boston in 1987 related to problematic loans in lesser developed countries, Brazil in particular, and look at the market reactions in the two days before and after the announcements date. Their analysis show that the Citicorp as well as other than Bank of Boston banks notice was assessed positively by investors: they thought Citicorp had to increase its LLPs to better deal with the problematic loans. The write-off announcement made by the Bank of Boston was interpreted negatively due to the fact that it would decrease the capital adequacy ratio.

Griffin and Wallach (1991) also focus on Brazil. They analyse the stockholders' returns of 13 large US banks to test whether they were affected by the increase in LLPs due to the bad credit situation in Brazil. The results show that the stock markets effectively appreciated the decision of banks' managers to rise the amount of loan loss reserves, for it meant they wanted to resolve Brazil's debt situation.

Liu and Ryan (1995) and Liu *et al.* (1997) investigate a sample of 104 US banks for the period 1983-91. Liu and Ryan (1995) distinguish loans for which banks make the provisioning on a timely basis (small and infrequently renegotiated loans) and those for which provisioning is made on a less timely basis, thus loans that may show default problems (large and frequently renegotiated loans). Their results point to the fact that increases in LLPs are positively assessed for the latter loans, while the financial markets give a negative interpretation to increases in the LLPs of loans that are usually provisioned on a timely basis.

Liu *et al.* (1997) deepen their previous analysis by investigating whether there is difference in the signalling role of banks' LLPs between bad and good capitalized banks and across fiscal quarters. They find that stock markets value in a positive manner the LLPs only for banks with low regulatory capital levels and in the fourth quarter. Beaver and Engel (1996) distinguish between the two components of LLPs, the non-discretionary or specific and the discretionary or general ones. The former are strictly related to the assessment of the expected losses of a bank's loan portfolio. The latter are set aside against not yet identified losses, for prudential purposes. Their analysis shows that financial markets give different values to these two components; in particular, increases in the discretionary component are viewed positively, while increases in non-discretionary LLPs are seen as negative signals.

Ahmed *et al.* (1999) are the first to extend the period of analysis of the role of LLPs to after the Citicorp announcement in 1987. They investigate not only the income smoothing and capital management hypotheses, but also the signalling one. They find conflicting evidence to that of previous studies. Indeed, for their sample of 113 US bank holding companies over the 1986-1995 period LLPs do not entail any signalling effect.

Hatfield and Lancaster (2000) add to the growing literature on LLPs by analysing the effects of LLPs increases for seven different reasons (general domestic loans, adverse economy, commercial loans, lesser developed countries loans, combination of domestic and foreign loans, combination of real estate and energy loans, real estate only loans) of 33 US bank holding companies in the 1980-92 period, thus allowing for the examination of the post Citicorp announcement. They use data relating to 121 announcements of increases to LLPs. Their analysis is aimed at testing the market reaction in the -15/+15 days window from the announcement date. The results show that the markets react negatively in the days before the announcement is made, while the reaction turns positive once the announcement is made. However, the markets response is not the same for all types of loans: in particular, only for the lesser developed countries and combinations of domestic and foreign as well as real estate and energy loans categories the positive market reaction after the announcement is significant.

Recently, the signalling hypothesis has been tested also for non-US banks. Anandarajan *et al.* (2006) find that Australian banks do not seem to use LLPs to signal their intentions of higher earnings in the future to outsiders. Curcio and Hasan (2008) find conflicting results for European and non-EU banks. In particular, they show that LLPs have a signalling role for non-EU banks, while provisioning policies have no signalling purpose for EU banks. Leventis *et al.* (2012) examine a sample of 91 listed commercial

banks, both financial sound and unsound, originating from 18 EU countries for the period 1999-2008 in order to test for the use of LLPs, in particular after the implementation of the IFRS reporting standards in 2005. In their analysis they find no strong evidence of the signalling hypothesis. In particular, their results suggest that the managers of less financially sound banks engage in stronger signalling than financial healthy banks. Moreover, the implementation of the IFRS reporting standards affected the signalling behaviour of EU unsound banks managers, in that they make stronger use of LLPs after 2005 relative to the previous period in which they had to adhere to national accounting principles.

3. The model

We develop a simple model of a bank who collects deposits (D) and issues bonds (B) and equity (E). Bonds comprise a wide array of securities ranging from ordinary debt to subordinated debt. Liabilities and equity finance loans (L) and other assets (OA).

Rather than total assets, we define the capital invested (CI) as the sum of equity and bonds. Indeed, deposits are part of the production process. For simplicity, we might think at a reclassified version of the bank's balance sheet where bonds and equity finance working capital (loans net of deposits) and other assets. In this case, E+B equals net total net assets and obviously represents the capital invested. We refer to it as to the capital invested of the assets in place.

We take as reference the framework developed by Mehran and Thakor (2011) where different specifications of bank value are predicted against bank's equity and a set of other explanatory variables comprising the volatility of asset returns, the Roe and stock market returns. In that, the model incorporates both the operational risk and the financial risk of the bank. We specify the operational risk as an explicit function of the quality of the loan portfolio which can be proxied by measures such as loan loss provisions and impairments on loans.

The total equity of the bank is characterized by a volatility σ_E which is dependent on the expectations on bank profitability. Implicitly, we assume that equity vary with accrued profits; we, therefore, rule out the access to new external equity funds. Total assets are characterize by a volatility σ_A.

Equity is risk sensitive according through bank capital regulation and drives the expansion of loans: L=f(E). It allows, therefore, for growth opportunities. The hypothesis is that the bank operates with E>E(R) with the E(R) is the minimum capital requirement. The excess of capital to the minimum requirement is available to finance growth opportunities which we endogenize in the model. A growth opportunity reflects the opportunity to make an investment at some future date that may turn out to have a positive net present value.

Instead of defining value according to the standard discounted cash flow model, we model the enterprise value (EV) in terms of Economic value added (EVA). Such an asset side approach (or capital budgeting approach) allows us to define the value as the sum of the value of current business and the value recognised on future projects. Moreover, it focuses on the basic drivers of value (i.e. margins and costs).

We define the value of the bank in terms of economic value added for shareholders (EVA_S) as follows:

$$EV = CI_{Aip} + \sum_{t=1}^{\infty} \frac{EVA(Aip)_t}{(1-K_c)^t} + NPV(G) \quad [1]$$

where EVA(Aip) is the economic value added due to the assets in place while NPV(G) is the net present value of growth opportunities. CI_{Aip} is the capital invested referred to the assets in place. According to our definition is the book value of equity plus the long term debt.
Therefore, crucial for assessing bank's value is the characterization of the economic value added and the growth opportunities.
For convenience, we refer to the EVA as the economic value added for shareholders:

$$EVA_S = (\frac{NI}{E} - K_e) \cdot E \text{ [2]}$$

Where NI is the net income and K_e is the cost of equity capital. Net income, in turn, can be defined as operating income net of impairments on loans. This allows us to define the economic value added for shareholders as a function of the operating income (OI), total assets (TA), the quality of the loan portfolio and the leverage:

$$EVA_S = \left[\frac{(OI-Imp)}{TA} \cdot \frac{TA}{E} - K_e\right] \cdot E \text{ [3]}$$

The value, therefore, is positive related with the return on assets (OI/TA) and negatively related with the magnitude of impairments (Imp) on the total assets (Imp/TA). The leverage (TA/E) acts as a multiplier. Increases in the leverage benefit value whenever the operating income exceeds impairments. To measure growth opportunities consider that the bank invest E(t) at time t to create an asset value of A(t) which can be interpreted as the NPV of future cash flows produced by new loans. The optimal decision is to make the investment (new loans) whenever $\alpha A(T) > E(t)$. The value of the growth opportunities is the value of a call option (Broyles and Copper, 1981)). We model therefore the value of a call option on the asset αA(t) with exercise price E(t):

$$G(t) = \alpha A(t) N(d_1) - E(t) e^{-rt} N(d_2) \text{ [4]}$$

Since the value of the firm at time t is defined as $V_t = A_t + G_t$, where A_t is the value of existing assets (or *Assets in place-Aip*), it follows that the beta of the bank can be expressed as $\beta(V)V_t = \beta(Aip)Aip_t + \beta(G)G_t$. In turn, the beta of the assets in place can be estimated as the covariance of the firm's Roe and the market Roe divided by the variance of the market Roe (De Andres et al, 2008). It can be shown (Galai and Masulis, 1976) that:

$$\beta(G) = \alpha A(t) N(d_1) \beta(Aip)$$

Crucial in the model are volatilities of equity and total assets and the betas (both betas of equity and betas of growth opportunities).
The volatility of equity can be captured by the volatility of equity returns based on market prices. Indeed, information embedded on market prices can be a useful tool for assessing bank's conditions (Flannery, 1998). By the way, such an approach allows us to estimate the unknown volatility of assets based on the observable market value of equity and the volatility of equity returns. Ronn and Verma (1986) proposed an implementation of the Merton's model for pricing the value of guarantees for the

liabilities of the bank. The basic of their approach is a model of asset volatility as function of equity and equity returns. Following Ronn and Verma, therefore, we model the volatility of assets as a function of the volatility of equity and the bank's financial leverage:

$$\sigma_V = \frac{E}{VN(x)}\sigma_E \text{ [2]}$$

where $E = VN(x) - \rho BN(x - \sigma_V\sqrt{T})$ and $x = \frac{\ln\left(\frac{V}{\rho B}\right)+\sigma^2 T/2}{\sigma_V\sqrt{T}}$.

According to the monitoring hypothesis discussed in the previous section, a greater bank capital would benefit bank's value given its incentive to strengthen monitoring efforts. In turn, this should results in a higher quality of the loan portfolio. We, therefore, state the following hypothesis:

Hypothesis 1: The greater the capital base (lower leverage), the lower the asset volatility. We expect a positive moderating effect of equity capital on impaired loans in the sense that it contributes to reduce asset volatility by lowering the magnitude of impaired loans on total assets.

In turn, the operational risk (implicitly measured in our model by the operational income on total assets) together with the financial risk is expected to play an effect on the systematic risk exposure, captured by equity betas, and therefore on the cost of equity.

The pro-cyclical behaviour of banks significantly accentuates swings in earnings and is expected to have significant implications as regards the responsiveness of systematic risk exposure. In particular, it casts the question of whether betas are actually responsive to performance measures or, rather, they are reactive to risk taking behaviour, which affects future losses and performances. Under the income smoothing hypothesis provisions can be used, to some extent, for earning management purposes and, in particular, earnings smoothing (reducing volatility in earnings). On the other hand, provisioning, together with capital requirements, has to do with the coverage of credit risk. Capital requirements themselves, which are designed to cover unexpected losses, are expected to have an impact on systematic risk. On the other hand with fair risk coverage policies associated with adequate capital buffers the bank set the conditions for exploiting future growth opportunities.

We, therefore, state the following hypothesis:

Hypothesis 2a: Betas are responsive to risk exposure and risk-coverage policies. Higher provisions have a positive impact on betas (lower systematic risk).

Hypothesis 2b: The greater the capital base the higher the lower the beta of growth opportunities.

4. Sample and Methodology

We base on a sample of 148 listed European banks for the timeframe 2006-2013 without restrictions in terms of total assets. Our source is the Bankscope database for banks' financial data while we relied on Bloomberg database for market data such as stock prices, returns and volatility.

We, then, collect from the Bloomberg database the betas for each bank in our sample. We get for each year the betas over a ten year time horizon.

We test our hypothesis by employing GLS fixed effects panel data models. According to hypothesis 1 we predict loan loss provisions as follows:

$$(\sigma_A)_{i,t} = \alpha + b_1(\frac{TA}{E})_{i,t} + b_2 X_{i,t} + v_{i,t}$$

Where σ_A is the asset volatility, TA/E is the leverage while X is a vector of control, variables comprising the ratio of gross loans on total assets, loan loss provisions on gross loans, reserves for impaired loans on impaired loans, the return on equity and stock market returns. We introduce in the regression the moderating effect of the leverage on the ratio of impaired loans on gross loans.
We test hypothesis 2(a) and 2(b) by means of the following models:

$$\beta_{i,t} = \alpha + b_1 TA/E_{i,t} + b_2\sigma_A + b_2 LLP/GL_{i,t} + b_3 RIL/IMPL_{i,t} + b_4 roe_{i,t} + b_5 RWA/TA_{i,t} + b_6 X_{i,t} + v_{i,t}$$

Where LLP/GL are loan loss provisions on gross loans, RIL/IMPL are reserves for impaired loans on gross loans, RWA/TA are risk weighted assets on total assets, roe is the return on equity and X is a vector of control variables including gross loans on total assets, reserves for impaired loans on equity capital and the price-to-book value.
We test the same relation with reference to the beta of growth opportunities (hypothesis 2b) in order to assess whether the beta of asset in place and the beta of growth opportunities are responsive to different drivers.
We, therefore, test the following model:

$$\beta(G)_{i,t} = \alpha + b_1 TA/E_{i,t} + b_2\sigma_A + b_2 LLP/GL_{i,t} + b_3 RIL/IMPL_{i,t} + b_4 roe_{i,t} + b_5 RWA/TA_{i,t} + b_6 X_{i,t} + v_{i,t}$$

Finally, we conduct robustness tests for testing for heteroskedasticity and endogeneity.

5. Sample and Methodology

6. Discussion and conclusions

Appendix

Table 1 – The sample

Italy	25
United Kingdom	12
France	22
Germany	11
Netherlands	5
Spain	7
Denmark	26
Sweden	5
Belgium	4
Austria	2
Ireland	2

Greece	6
Luxembourg	3
Portugal	5
Poland	2
Hungary	1
Cyprus	3
Finland	3
Malta	2
Slovenia	2