Regulatory and economic capital: theory and practice, evidence from the field

Elisabeth Van Laere, Bart Baesens

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Elisabeth Van Laere, PhD student at K.U.Leuven, senior researcher Vlerick Leuven Gent Management School Research Centre Credit Risk Management (in collaboration with ING), Belgium[1]

Bart Baesens, Assistant professor School of Management, University of Southampton; Assistant Professor Department of Applied Economic Sciences at K.U.Leuven and Visiting Professor Vlerick Leuven Gent Management School, Research Centre Credit Risk Management

Abstract

In order to promote financial stability, regulatory authorities pay a lot of attention to capital regulation. In addition to these requirements, financial institutions calculate their own economic capital reflecting the unexpected losses and true risk according to the specific characteristics of their portfolio. The recently implemented Basel II framework should result in a further convergence between regulatory and economic capital. However, recent papers (Elizalde et al. (2006); Jackson et al., (2002) and Jacobson et al. (2006)) argue that also under Basel II, regulatory and economic capital will have different determinants. In order to understand the true impact of Basel II on financial stability, one should first develop an understanding of the determinants of and the relationship between regulatory and economic capital. This paper starts with an overview of capital adequacy and a description of the differences and similarities between economic and regulatory capital based on a literature review. In a next step the theoretical expectations are contested with some empirical findings. Up until now and due to a lack of data the empirical match between economic and regulatory capital requirements and the strength of the match remains practically unexplored (Jacobson et al. (2006)).

Keywords: Basel II, capital requirements, credit risk, economic capital, regulatory capital, regulatory capital arbitrage

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[1] Email: Elisabeth.vanlaere@vlerick.be or phone: +32 9 210 97 85

I. Introduction

Financial institutions play a crucial role in today's globalized economy. Because of their expertise and by monitoring and screening potential borrowers, these financial intermediaries have a comparative advantage in overcoming asymmetric information (Diamond, 1984). As such, one of the fundamental roles of these financial intermediaries is capital allocation by lending funds that have been deposited on their accounts. These deposits are subject to a "first-come-first-serve" rule. In a negative environment with rumours about the bank holding low quality assets, this could eventually lead to bank customers withdrawing their deposits because they fear bank insolvency (Diamond et al., 1983). Much of the Great Depression's economic damage was caused by bank runs and also the current financial crisis shows the negative impact on financial stability of these events (e.g. Northern Rock (UK, Sept 2007), Washington Mutual (US, Sept 2008), Landsbanki (Iceland, Oct 2008)).

To a broad extent financial institutions are typically confronted with credit, market and operational risk. The default history of financial institutions shows that credit risk[2] is the most important threat to bank solvency. Recent evolutions, such as disintermediation by highest quality and largest borrowers, a declining value of real assets (and thus collateral) in many markets (e.g. Altman et al., 2000), dramatic growth of off-balance sheet instruments with inherent default risk and a structural increase in the number of bankruptcies (e.g. Wheelock et al., 2000), make this risk factor more complex than ever before. This is reinforced by the fact that in the past years we have experienced an unusual mix of conditions[3] resulting in a deterioration of lending standards and increased leverage (e.g. Zingales (2008)). Dell'Ariccia et al. (2008) show that the decrease in lending conditions seems unrelated to improvements in underlying economic fundamentals. They find that lending standards decline in areas that experience high real estate price increases and that the ability to securitize mortgages has further relaxed lending standards. Keys et al. (2008) show that loans that are more eligible for securitisation, experience a 20% higher probability of default.

As a result of these evolutions, the risk profile of financial institutions has evolved dramatically over the past years and the financial system has become much more vulnerable to macro-economical shocks.

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[2] Credit risk can be defined as the risk of a decrease in value or a loss due to an unexpected deterioration in the credit quality of a counterparty

[3] Some examples of these conditions are s low volatility in debt and equity markets, low interest rates, high house prices, rapid innovation in financial instruments such as innovative mortgage options etc.

To protect banks against failure and to prevent an economic crisis due to contagion and systematic risk, different stakeholders want banks to maintain a certain level of capital. Rating agencies, supervisors and debt holders want higher capital to support solvency, shareholders want lower capital to boost profitability and even the behaviour of other banks might impact the target capital ratio. As a result of these conflicting interests, bank capital needs to be optimized. Given the continuous evolution in the risk profile of banks, the presumed importance of capital adequacy for financial stability and the agency costs high capital levels might bring along, regulatory authorities are in an ongoing search for optimal capital regulation. For now this search has resulted in the new Basel II framework.

In this paper we will investigate to what extent one of the major objectives of Basel II, further alignment between regulatory and economic capital[4] is currently being achieved. More specifically we will investigate the determinants of economic and regulatory capital, theoretically and empirically, to understand the extent to which both capital numbers converge. Up until now this research questions has, due to a lack of data, not been empirically investigated yet.

Under Basel I, there was a big gap between economic risk of an exposure and the risk measure incorporated in regulatory capital. As such, a lot of banks removed low-risk assets from their balance sheets and only retain relatively high risk assets on balance, with a negative impact on financial stability (Avery et al. (1991); Jones (2000)). Most of the off-balance sheet vehicles are motivated primarily by regulatory arbitrage, that is, by the desire to avoid the regulatory requirements imposed on banks. The off-balance sheet vehicles tend to have little or no capital and little or no transparency. When an opaque bank invests in opaque financial instruments systematic risk is increased. The major downside of this so called regulatory capital arbitrage (RCA)[5] is that reported ratios could mask deterioration in the true financial conditions of a bank (e.g. Keys et al. (2008)). Furthermore as accessibility to RCA depends on economies of scale and scope and on international differences with respect to legislation, supervision etc. it might increase competitive inequalities and as such reduce the level playing field, (Jones, (2000)). The recently introduced Basel II framework should result in a further convergence between regulatory and economic capital and as such lower the room and incentives for regulatory capital arbitrage (Gordy and Howells (2004)).

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[4] Besides these regulatory requirements, financial institutions calculate their own economic capital reflecting the unexpected losses and true risk according to the specific characteristics of their portfolio (Jackson et al., 2002).
[5] Regulatory arbitrage refers to the fact that a bank takes advantage from the difference between regulatory and economic capital. If the true risk of a bank asset is higher than the regulatory weight, the bank will have an incentive to keep these assets on balance. However if the true risk is lower, the bank will remove the asset by means of securitisation. As such, the presence of regulatory arbitrage will increase the overall risk of financial institutions.

We will empirically investigate the above using the insights gained during interviews with several chief risk officers. Three areas are being discussed, whith the first two being inputs for the latter: general credit risk management, internal ratings and regulatory and economic capital. By commenting on the differences and similarities across the financial institutions we have questioned we will set the current scene with respect to Basel II implementation and regulatory and economic capital calculations. In doing so, we will also address another objective of Basel II, the creation of a level playing field, albeit in an indirect way.

This paper addresses a number of important gaps in academic literature. Even though there is an extended literature about capital regulation and Basel II, there is no paper that gives an overall picture about the determinants and challenges of both economic and regulatory capital. Furthermore the existing literature on economic capital is small and the comparison to regulatory capital is practically unexplored[6]. So far, the impact of Basel II on financial stability has been estimated by different techniques. However, as only from 2007 banks have started implementing it and only recently real data has become available, the true impact of Basel II has not been investigated yet. The qualitative insights gained in this paper are key inputs for further optimisation of bank regulation.

The paper continues with a comprehensive literature review discussing the interpretation and role of capital adequacy and the differences and similarities between economic and regulatory capital. In a next step theoretical expectations are contested with empirical findings.

II. Regulatory and economic capital: literature

2.1 Capital adequacy – Regulatory capital

Financial institutions are able to forecast the average risk and associated credit loss of their assets; these expected losses (EL) are part of doing business and should be covered by the pricing of assets. The unexpected losses (UL), losses that exceed expectations, should to a certain extent be covered by bank capital. An important concern of the authorities who set capital requirements is safe deposits and the protection of the economy against systematic risk (Sharpe, 1978). By imposing high capital levels, small investors are protected and potential systematic effects of bank failure are countered. However extremely high capital

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[6] To the best of our knowledge, only Elizalde et al. (2006) theoretically compare economic to regulatory capital and Liebig et al. (2007) empirically compare economic and regulatory capital, however they uses estimations rather than real capital numbers in their analysis.

requirements might create efficiency costs (Jackson et al. (2002)) such as the diversion of financial resources from their most productive use, artificial incentives to take off-balance sheet risk etc. To prevent negative consequences of setting inaccurate capital requirements, regulatory authorities should take into account this trade-off.

In 1988, the Bank for International Settlements (BIS), introduced the Basel I Accord that set the minimum capital requirement at 8% of risk weighted assets. However, under this framework the RWA failed to capture the true economic risk, resulting in regulatory capital arbitrage activities[7] (Jones (2000)). Concerns about the possible extent of these arbitrage actions, encouraged the Committee on Banking Supervision to revise the existing framework and in 1999 the first consultative paper on Basel II was published. The major objective of Basel II is to further align regulatory capital with economic capital demanded by its different counterparties (Gordy and Howells (2004)). Furthermore, Basel II should "develop a framework that would further strengthen the soundness and stability of the international banking system while maintaining sufficient consistency that capital adequacy regulation will not be a significant source of competitive inequality among internationally active banks", a level playing field" (BCBS, June 2006). Under Basel II the numerator remains unchanged at 8% of RWA, consisting at least for 50% out of common stocks and retained earnings (tier 1 capital). These funding sources are available to absorb potential losses and are considered the most reliable and liquid. Tier 2 capital, which mainly consists of subordinated debt and general provisions, but also includes undisclosed reserves, revaluation reserves and hybrid instruments, is far less reliable (see Berger et al. (1995))[8].

The new Basel II framework is based on three reinforcing pillars. Pillar 1 defines new risk-based requirements for credit risk and a new charge for operational risk, Pillar 2 sets requirements for supervisory review, and Pillar 3 is related to market discipline and the associated disclosure standards. In this article the focus is on pillar 1 and pillar 2 and more specifically on the regulatory and economic capital requirements for credit risk.

Within the new framework, there are two approaches to calculate the regulatory capital requirements. Under the standardised approach, the risk weights depend on an external rating provided by external credit rating agency. The standardised approach is conceptually quite similar to Basel I, it is more risk-sensitive but there is still insufficient differentiation among creditors. As the capital requirements for the investment grade facilities remain to be too high

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[7] By reallocating their asset portfolio, differences between economic and regulatory capital are being arbitraged.
[8] For purpose of completeness we should mention the Basel Committee on Bank Supervision also distinguishes tier 3 capital. As tier 3 capital, mainly constituted from short term subordinated debt, only serves to cover market risk, and as such can not be used as a cushion against credit risk, we will not go into further detail.

and those for the noninvestment grade facilities too low, the incentive for regulatory arbitrage will remain to exist. Under the internal rating based (IRB) approach there is much more differentiation in credit risk and as such should significantly reduce the incentives to engage in regulatory capital arbitrage. Under this approach banks are allowed to determine the values for certain risk parameters based on internal models. An important issue for the strength of the IRB approach is the reliability of the parameters banks provide. By using the internal risk assessments of banks for setting capital requirements, the IRB approach promotes the adoption of stronger risk management practices by the banking industry. The internal systems used for regulatory capital should meet certain criteria and supervisory approval. In this view, the IRB approach can be regarded as a compromise between a purely regulatory measure of credit risk and a fully internal model based approach[9]. Before moving to the underpinnings of economic capital calculations, it is useful to develop an understanding about the usefulness of capital regulation. These insights underscore the relevance of investigating the impact of Basel II on regulatory capital arbitrage.

2.2 Capital regulation – usefulness

The ultimate goal of financial institutions is to maximize shareholder value taking into account the different restrictions and obligations they are being confronted with, and thus not blind compliance with regulatory measures. As such it is highly contested whether a risk based capital ratio is the ideal tool to mitigate bank risk (e.g. Berger et al., (1995)). The capital in the numerator is difficult to measure and may not always control moral hazard incentives and also the denominator appears difficult to measure and even under Basel II can be considered to be only a weak reflection of risk[10]. The lack of consensus is mainly induced by differences in opinion with respect to the objectives and implications of capital regulation, but also by the unique characteristics of banks. "Banks can create liquidity precisely because deposits are fragile and prone to runs. Increased uncertainty makes deposits excessively fragile, creating a role for outside bank capital. Greater bank capital reduces the probability of financial distress but also reduces liquidity creation" (Diamond et al, 2000, pp 2431).

Benston and Kaufman (1996) and Dowd (1999, 2000) argue that capital regulation is both unnecessary and incapable of improving banks' capital position more than banks could do on

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[9] For an overview of the input parameters of the Basel II IRB capital formula we refer to appendix 1 and 2.

[10] This is also confirmed by the current crisis where for example in the States, banks are allowed to allocate zero capital to loans that are hedged with credit default swaps. However this ignores the counterparty risk and the fact that these instruments often have no collateral.

their own. In Dowd's view, shareholders can enforce proper risk behavior. Flannery and Ranjan (2002) show that the observed increase in capital in US banks especially in the second half of 1990s can to a large extent be explained by market discipline. Over the past decades bank's counterparties have become more aware of their exposure to a bank's default risk. Also Marini (2003) argues that market-determined levels of bank capital can substitute for regulatory oversight. Previous empirical studies investigating the impact of regulations on equity in the 60s and 70s (Peltzman (1970), Mingo (1975), Dietrich et al. (1983)), also found regulations did not have an impact on capital levels. Mingo (1975) is an exception. Yet, Dietrich et al. (1983) show that Mingo's findings of significant regulatory influence is a proxy for binding deposit rate ceilings, which led banks to increase capital to lure depositors.

But even when regulations has an impact on the capital levels banks maintain, it is unclear whether increased ex-ante capital requirements do indeed reduce systematic risk. This is especially relevant taking into account that current regulations pay a lot of attention to the narrow objective of reducing individual bank failure rather than to credit crunch externalities (Kashyap et al., 2004). Blum (1999) argues that capital adequacy requirements might not reduce risk. Kahane (1977), Koehn et al. (1980) and Kim et al. (1988) show that the effect of bank capital on the overall safety depends on the risk aversion across banks. More stringent capital requirements could make the banking system as a whole more or less risky.

It is generally accepted that tighter capital regulation will in the short run result in credit rationing, whereas in the long term it might increase total lending due to the increased capital cushion. However, there is a clear lack of consensus in literature, about the effects of capital requirements on bank behaviour (Van Hoose, 2007). Van Hoose (2007) gives an overview of theoretical models predicting the effect of capital regulations and shows that the overall effect on bank safety and soundness stays ambiguous. Koehn et al. (1980), Keeton (1988) and Kim et al. (1988) show that a relative increase in equity can have both a positive (increase) and negative (decrease) effect on the bank portfolio risk. However Furlong et al. (1989, 1990) only found a negative effect on portfolio risk for value maximizing banks with publicly traded stocks. This was again contested by Gennotte and Pyle (1991) under the assumption of decreased return on investment. Lane et al (1986), Avery and Berger (1991b), Cole et al. (1995) empirically show a negative relation between the level of equity and the risk profile of a bank. However Thomson (1991) argues that the level of equity has no direct effect on bank performance.

John et al. (2000) argue that capital regulation might not be the ideal tool to control risk. They show that the effectiveness of capital regulation depends on the available investment

opportunities. More recently Jeitschko and Jeung (2005) investigated the link between agency theory and the risk-bank capital relationship. As can be expected they find that the incentive effects of bank capital depend on the agent that dominates portfolio decision making.

Looking at the impact of the adverse selection problem on the importance of bank capital, Morrison and White (2005) find that unregulated banking system can only be efficient when the monitoring cost is small. However, it is clear that if banks respond to capital regulation by making riskier asset choices, the capital cushion will disappear.

However the role of pillar 1 under Basel II can not be restricted to a safety buffer against unexpected shocks. It is expected that it will create a change in risk culture in financial institutions all around the world by encouraging improvements in the quality of risk management practices; by the increased disclosure requirements and because of the fact capital reserves will better reflect potential deterioration in expected losses.

Now we have developed an understanding of the calculation, objectives and usefulness of regulatory capital, the next paragraphs will go more into detail on economic capital.

2.2. Economic capital

Next to the regulatory requirements, financial institutions calculate their own economic capital reflecting the unexpected losses and true risk according to the specific characteristics of their portfolio (Jackson et al., 2002). Over the past years, the notion of economic capital has broadened from risk and performance measurement to the determination of bank capital adequacy. Economic capital can be defined as the amount of capital necessary to support the real economic risk a financial institution faces. This evolution is partly induced by pillar 2 of Basel II, where supervisors want banks to rely on internal models to assess capital adequacy, but also by rapid changes in risk quantification and greater complexity of portfolios. As with regulatory capital it is the capital a bank needs to absorb unexpected losses over a certain time horizon at a given confidence level[11]. Economic capital is a risk measure that does not say anything about the amount of capital held, it coexists with accounting and regulatory capital. Further, economic capital allows an adequacy assessment of the bank's overall capital.

Economic capital is mainly used for internal risk management purposes, but has different applications. Depending on the objectives of the tool and availability of data, a different

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[11] The confidence level will depend on the bank's tolerance for credit risk, which is reflected in its desired external rating.

methodology is required. The relevance and usefulness of economic capital depends on the extent to which senior management realises the importance of the economic capital measures (BCBS, 2008). One of the major challenges in economic capital calculation is risk aggregation. Economic capital typically covers credit risk, market risk (including interest rate risk), operational risk, concentration risk and is sometimes extended to business/strategic risk, counterparty risk, insurance risk, model risk etc. The individual risk components are often estimated while ignoring potential interaction effects between them[12]. Besides the interaction effect, also differences in horizons, confidence levels etc. might bias the calculations. As was mentioned before, in this paper we will mainly focus on credit risk. Portfolio credit risk models are a fundamental input in economical capital models and the main challenge in this area is the accuracy and stability of correlation estimates, especially in stress times (BCBS, 2008).

Although regulatory capital and economic capital are different, they are both a reflection of the risks embedded in transactions. However, it is important to keep in mind that also under Basel II regulatory capital is not a substitute of economic capital (Araten, 2006 and Burns, 2005). Recent papers (Jackson et al., 2002; Elizalde et al., 2006 and Jacobson et al. 2006) argue that also under Basel II, regulatory and economic capital have different determinants. Regulatory capital is estimated at a transaction level based on risk weighted assets with PD, LGD, EAD and remaining maturity as inputs. It is designed to guarantee the stability of the entire system and is thus more conservative in certain aspects. The credit risk economic capital framework can recognise concentration risks and diversification benefits that arise from regional and industrial diversification. Furthermore the credit risk EC framework can be value based, where it does not only take into account default, but also up and downgrades. In economic capital the additional risk drivers can be taken into account and for EC calculations no cap and floors are required to risk drivers. As a result EC should be a better reflection of the actual risks embedded in the transaction than regulatory capital.

The prevalent differences are partially induced by the different objectives regulatory and economic capital target, e.g. financial soundness and optimization of business strategies, respectively. Carey (2000) indicates that the success of Basel II in matching economic and regulatory capital will depend on the degree to which the IRB approaches will take into account portfolio differences related to maturity, granularity and risk characteristics. The interviews we have conducted (infra) show that there are big differences in the way banks are addressing economic capital. In some banks it has gained quite some acceptance over the past

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[12] Only few financial institutions are using more advanced techniques (e.g. copulas) to address this.

years, in others it is still in its infancy or still not part of their strategy. But also those banks that are already more advanced, use different techniques, include different kinds of risks etc. So the inputs that feed economic capital models differ a lot.

The table in appendix 2 gives an example of potential differences between regulatory capital and economic capital. As the calculation of economic capital within a financial institution and the observed differences with regulatory capital depend on the model and parameterization of model inputs, we have added a more detailed overview between both capital numbers in appendix 3. For a detailed comparative analysis of the existing credit risk models we refer to Crouhy et al. (2000) and Allen (2004). The table includes some of the main features of KMV, Credit Metrics and Credit Risk+, which are assumed to be reasonable models to quantify economic capital (Crouhy et al. (2000)). This table is not intended to give an exhaustive overview of all the features of the different credit risk models that exist, but rather to give an idea of some important differences between them.

III. Regulatory and economic capital: practice

The theoretical overview in the previous paragraphs shows that even though the recently introduced Basel II framework should result in a further convergence between regulatory and economic capital, also under Basel II regulatory and economic capital have different determinants. Both capital numbers move in the same direction, but not with the same slope and speed. Notwithstanding the fact that Basel II will not be able to fully align regulatory capital to the risk profile of the bank, it is expected to make the two capital numbers converge and as such will impact the lending behavior. Where Basel I offered a leeway for capital arbitrage by choosing higher-risk assets within each risk category, Basel II is ought to offer fewer possibilities for regulatory arbitrage and as such should increase financial stability. However these are theoretical expectation and up until now, due to a lack of data, the empirical match between economic and regulatory capital requirements and the strength of the match remains practically unexplored (Jacobson et al. 2006).

In the next part of this paper we will look at how economic and regulatory capital calculations are done in practice. Based on the interviews, we will develop an understanding about current practices with respect to general credit risk management, internal rating models and regulatory and economic capital. This will allow us to set the current scene and to draw conclusions with respect to regulatory capital arbitrage and the creation of a level playing field. As only from 2007 banks have started implementing Basel II and as a consequence only

recently real data has become available, all the previous empirical papers that look at the expected effect of Basel II on financial stability and/or lending behaviour (e.g. Reisen (2001), Griffith-Jones (2003), Liebig et al. (2007)) use approximated capital numbers and not real capital numbers. To the best of our knowledge, this is the first paper to address this issue in a qualitative way after Basel II implementation.

3.1 Empirics: setting the scene[13]

Based on a detailed literature review and the comments of academics and practitioners we developed a survey[14] that was used as a guideline during interviews with several banks around the world. The following banks were involved in this research: U.S. Bank, Barclays, HBOS, HSBC, ING Belgium, KBC, Dexia, Fortis, SEB, Landbouwkrediet, Axa, Metrobank, Jyskebank and KHB bank[15]. After the interviews with the banks we have interviewed some supervisors to check their opinion. Given the confidentiality we are not allowed to reveal which supervisors participated, however when relevant we will mention their viewpoint. All interviews were conducted in the course of 2008, after Basel II implementation. As such this is the first paper that sets the Basel II scene based on reality rather than on expectations.

For the purpose of our research, it was especially important to involve banks from different size, geographic location etc. As we do not have the intention to give an exhaustive overview about differences and similarities across regions and sizes we are convinced that potential selection/response bias are not an issue here.

3.1.1 Credit Risk Management

Taking into account the recent macro-economic evolutions, the new regulatory framework and the relaxing of lending standards (e.g. Zingales (2008)) it is interesting to see how credit risk management has evolved over the past years. This section describes how banks perceive the credit risk management currently in place. More specifically we look at whether banks have experienced an evolution in credit risk management over the past years and if so, which part they attribute to Basel II.

With respect to the quality of credit risk management currently in place, ten banks feel it is good and four feel it needs to be further improved[16]. The latter are the four smallest banks in our sample. This finding is in line with literature that states that larger banks are often less

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[13] All the info that is listed below is based on the interviews except when we explicitly mention a reference.
[14] The questionnaire is added in appendix 4.
[15] Given confidentiality of the answers we are not allowed to distribute them individually per bank.
[16] No one was convinced of the fact that current credit risk management practices were very good.

risky, due to diversification and economies of scale and scope in screening and monitoring (Jokipii et al., 2008 etc.). If you have lower risk ceteris paribus your risk management will be perceived to be better.

Notwithstanding the fact that credit risk has become more complex (see Altman et al. (2000), Keys et al. (2008) etc.) all investigated persons are convinced that the credit risk management in their bank has improved[17] over the past years either to a big or a lesser extent[18]. This perception is interesting when combined with the findings of Zingales (2008) and Dell'Ariccia et al. (2008) that show deterioration in lending standards. So in a time where credit risk has increased and credit risk management has improved we witness a relaxing of lending standards. One explanation for this finding is the ongoing search of banks to boost shareholder value resulting in excessive risk taking. This risk-taking behavior is stimulated when the true economic risk is not reflected in capital regulation[19] resulting in adverse selection and regulatory capital arbitrage. (Re)Securitization is a way to address high risk exposures while keeping profit at a high level. These practices are confirmed by Keys et al. (2008) who show that loans that are more eligible for securitisation experience a 20% higher probability of default. As a response to the current crisis where collateralized debt obligations comprised of asset-backed securities the so-called resecuritisations showed to be highly correlated with systematic risk, Basel II requires a higher capital charge. Furthermore, under Basel II liquidity lines extended to support asset-backed commercial paper (ABCP) conduits will require higher capital requirements by eliminating the distinction between short-term and long-term liquidity facilities. On top of that the committee has also proposed for banks to obtain comprehensive information about the underlying exposure characteristics of their externally-rated securitization positions. Failure to obtain such information would result in higher capital requirements. However as the Basel II framework fails to clearly define how supervisory authorities should evaluate risk transfer, it is highly possible that a significant level of regulatory capital arbitrage will remain to exist especially among different countries, which ultimately may hurt the level playing field.

Van Hoose et al. (2007) investigated the role bank capital plays in the safety and soundness of the banking system and conclude that because the intellectual underpinnings of Basel II are not really strong; the impact of pillar 1 on financial stability is ambiguous. However it could

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[17] The interviews revealed that the changes have taken place in several domains ranging from portfolio management, risk rating systems, quantitative models, capital adequacy calculations, more proactive credit risk management, credit culture, organisational structure, centralised risk information system to more model-based decisions in credit approval process.
[18] Linked to size, it seems smaller banks tend to perceive the evolution in credit risk management more as "big improvement", where larger banks mainly indicate "slight improvement".
[19] But also deposit insurance guarantees resulting in moral hazard.

be argued that the recent positive evolutions in credit risk management are consequence of Basel II and therefore the new framework has an unambiguous positive impact on financial stability. As such, it is relevant to understand what is triggering the positive evolution and more specifically whether Basel II plays a role in this.

A first important trigger seems to be data quality. As was already predicted by Altman et al. (1998), significant improvements in data on historical defaults and loan returns allow banks to improve risk management. On top of this, nine banks are convinced Basel II was a direct trigger; where five banks claim Basel II had nothing to do with it. Mainly the larger banks are convinced that the positive evolutions were not induced by the regulatory framework and would have taken place anyhow. However at the same time these banks are convinced Basel II has structured and speed up things. More specifically Basel II seems to have contributed in several ways.[20] At first by encouraging data quality and data availability, two things that are key in risk management. Furthermore by making risk management more structured and harmonised and by changing risk culture. Quite some banks stated that Basel II seems to guide business sense as it forces top management to become more aware of the importance of risk management. Even banks that have always been highly risk oriented are forced by Basel II to measure things in a more exact and consistent way. The above shows Basel II has played a role in the evolution of credit risk management for all banks albeit in an indirect way. This finding is also in line with the initial perception banks had with respect to Basel II. Besides the potential capital relief, most banks were convinced of the impact Basel II could have on risk management. Also the supervisors stressed that the idea of Basel II is not to lower capital requirements, but to make them more risk sensitive.

The current crisis has underscored the importance of effective credit risk management as a key component to financial stability. As such Basel II is really important if not for the capital cushion as such be it for the impact on risk measurement and awareness in banks. Of course better risk management and measurement does not necessarily result in a reduction of regulatory capital arbitrage and as such we agree with Van Hoose (2007) that the net effect of Basel II on financial stability is double (infra).

With respect to the credit risk measurement, we notice quite some consistency mainly enforced by Basel II. For instance all banks apply a one year credit horizon and recognise the Basel II default definition as a default event. However when we further look into the

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[20] All identified triggers except one have a direct or indirect link with Basel II.

pragmatism beyond Basel II, we notice considerable differences. Indifferent of size, only 50% of the banks have defined a materiality threshold for the default event and only 64% of the investigated banks use other triggers than Basel II in their default definition.

3.1.2 Internal rating model

Mainly over the past decade ratings have gained importance due to Basel II, the further development of credit risk models, their use in structured finance etc. (Carey et al. (2001), Altman et al. (2002), Saunders (2002), Van Gestel et al. (2009)). The next part gives an overview of rating model practices in the interviewed banks.

All banks, except one[21], are using an internal model that calculates PD and LGD[22]. When building a credit risk model, a bank has to decide on the rating philosophy. The time horizon of assessing the creditworthiness of borrowers in assigning ratings which is part of the rating philosophy is on a spectrum between point-in-time (PIT) and through-the-cycle (TTC)[23]. Even though this is an arbitrary distinction, the chosen rating philosophy influences many aspects ranging from pricing, credit and portfolio monitoring to level and volatility of capital requirements and as such has an important impact on both financial stability and the level playing field. If the PD assigned to a rating grade is fixed, a TTC rating system will result in relatively stable regulatory capital requirements, whereas a PIT system will produce more counter-cyclical capital requirements. As such, in order to reduce the incentive for regulatory capital arbitrage it is important that the rating philosophy is consistently applied in both regulatory and economic capital.

Banks seem to apply very different rating philosophies; however the chosen philosophy is applied consistently across asset classes. This is in line with Treacy et al. (2001) who conducted a survey of rating practices at the 50 largest US banks. An important reason why banks opt for a certain rating philosophy seems to be pragmatism and data availability, but also credit culture[24] and competition. Furthermore some banks also admitted that the rating

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[21] That bank is already making its first steps to building a credit rating model

[22] Most banks have a rating model for all asset classes and three only have a rating model for certain asset classes (mainly corporate internal rating model).

[23] Point-in-time (PIT): the rating gives an indication of the borrower's current condition and/or most likely condition over a short chosen time horizon, typically one year.
Through-the-cycle (TTC): the ratings give an indication on the borrower's creditworthiness, based on a full business or economic cycle.
Hybrid: the rating is in the area between PIT and TTC.

[24] Credit culture refers to an implicit understanding that certain underwriting standards must be maintained even in the face of constant revenue pressure.

philosophy was coincidence rather than a well balanced choice and that it was partly inspired by rating agencies and supervisors. Furthermore, everyone agreed there is no model that is completely PIT or TTC and as such they are convinced that some surfing through the cycle is unavoidable.

Besides the difference in rating philosophy, also the number of rating classes differs significantly across banks. Eight financial institutions have the same number of rating grades across asset classes ranging from 7 to 23. This difference in granularity across banks is mainly induced by the differences in portfolio and models in use. Internal ratings systems with many grades are more expensive but especially for profitability analysis fine grained distinctions are necessary to support risk-return trade-offs. Even though there is a large difference in granularity, all banks are convinced that there is a large homogeneity in each rating class of the bank's internal rating system.

It is important to note that some banks use different rating philosophies depending on the purpose of the rating. For instance one bank uses PIT for pricing and impairment and TTC for capital calculations. This practice could be an additional stimulus for capital arbitrage.

3.1.3 Regulatory and economic capital

We will now look at the way regulatory and economic capital are calculated and how this differs across banks.

Even though it is often argued that mainly large banks will apply the IRB approach and that smaller banks will opt for the standardised approach, we find no link between the size of the bank and the approach a bank is adopting. This could imply that the level playing field is stimulated by Basel II. Furthermore, all banks seem to have the intention to move to the IRB approach and most of them even plan to implement the advanced IRB approach. An important reason for this finding is the better competitive position that is induced by the IRB approach. Depending on portfolio risk, advanced IRB could result in the highest capital relief, freeing up resources that can be used for other purposes. However, most banks indicated that the main advantage of IRB is the fact that it enables banks to have a better understanding of the relationship between risk and return. As a second and third advantage banks indicated a better understanding of risk concentration and more completely and timely risk data. This again confirms that the main issue in capital regulation is not necessarily the ultimate capital level but rather the impact it has on credit risk management practices. These findings should also positively contribute to regulatory capital arbitrage as the IRB approach can be regarded as a

compromise between a purely regulatory measure of credit risk and a fully internal model based approach and as such might result in a high convergence between regulatory and economic capital.

In reality, only a small fraction of the banking system is constrained by regulatory capital requirements. In practice many financial institutions hold capital in excess of the required amount[25]. Also during the latest financial crisis, banks encountered the financial shocks with capital cushions significantly above regulatory thresholds. However and partly due to procyclical behaviour, the overall cushion seemed too thin. A big challenge for banks is the way they deal with uncertainty about the scale of losses they can face in a less benign economic and financial environment, and the size of the cushion they have to build against that uncertainty. Risk management tools rely on history and experience which makes it very difficult to assess potential future losses for innovative financial instruments or unseen financial shocks. The latest Qualitative Impact Study (QIS 5) that measures the expected impact of Basel II on the industry even shows that on average and especially under the advanced IRB approach, the minimum required capital is expected to drop relative to the current accord. In response to this expected drop in regulatory capital, banks in the US will have to maintain a 3% tier 1 leverage ratio[26] as an additional safety measure. Also in Europe there are advocates of this "US leverage ratio" to prevent capital of falling below a level that comprises financial stability.

Also in our sample all banks hold capital well above the required minimum. It is difficult to empirically distinguish different underlying determinants of bank capital buffers. Differences can be induced by differences in access to funding, shareholder structure, portfolio risk etc. (Jokipii, 2008). Due to the diversification effect, economies of scale in screening and 'too big to fail' principle, larger banks are expected to hold smaller average capital buffers. However, we find no evidence for this for this in our sample. Banks listed several reasons why they hold excess capital, amongst others, external rating, shareholder requirements, procyclicality etc. One bank stated they used economic capital to decide on the capital buffer.

In our sample eleven banks are currently calculating economic capital. In a number of banks it was introduced in the early nineties, in others it was introduced only very recently. In a few banks it has gained quite some acceptance over the past years, in others it is still in its infancy or still not part of their strategy. The confidence interval for economic capital ranges from 99.9 (Basel II pillar 1) to 99.98. The economic capital model itself differs a lot across banks.

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[25] The main reasons why banks hold excess capital is to avoid any supervisory intervention, to qualify for certain activities, or the fact that Basel II fails to recognize certain types of risk (e.g. business risk, duration risk[25]).
[26] The leverage ratio equals core capital as a percentage of non-risk weighted assets

Four banks use a default-model where the other seven rely on a market value model. For most banks MKMV is a fundamental input, two banks use pillar 1 capital and one bank uses Monte Carlo Simulations and moves in the direction of CreditMetrics. No bank is using a reduced form approach for its economic capital calculations. The biggest difference across banks lies in the parameters that are included in their economic capital calculations. Besides the regulatory ingredients credit, market and operational risk, only in a few banks economic capital also includes interest rate, business, reputational risk etc. One bank stated they try to capture all risks they are confronted with and those risks that are difficult to quantify are covered by an arbitrary buffer. Furthermore, only seven banks are explicitly recognizing concentration risk and one bank recognizes concentration risk implicitly through conservative credit risk calculations. On top of that only one bank is explicitly recognizing the correlation between different risk factors and only one bank uses different risk and correlation curves to tolerate greater PD volatility depending on the business cycle.

The above clearly shows that where banks tend to converge with respect to regulatory capital practices, there are still big differences across banks with respect to economic capital calculations.

Jones (2000) pointed out that the underlying factors driving regulatory capital arbitrage will remain to exist unless economic and regulatory measures of risk converge. Diversification and concentration effects create the biggest gap between economic and regulatory capital. However the above shows that current practice with respect to economic capital calculations is still not to its full potential, which could imply that in future due to better correlation and concentration measurement, the gap between regulatory and economic capital could even further increase. As is depicted in appendix 5, also differences in the PD, LGD and EAD parameters play an important role in the divergence between both capital numbers. On top of that, for most of the interviewed banks regulatory capital is higher than economic capital. Taking into account that regulatory capital arbitrage is widely perceived as a "safety valve" for reducing the adverse effects of regulatory capital requirements that exceed levels commensurate with the bank's underlying economic risk, this implies that also under Basel II incentives for RCA will remain to exist. Furthermore by stimulating economic capital calculations that better reflect the true risk, RCA could even increase in some cases.

At the same time most banks acknowledge that economic capital is currently not used to its full potential, and that it often has the same use as regulatory capital. In future, they expect to use it for identifying concentrations in the portfolio and for measuring and managing risk.

As Basel II will increase regulatory capital for higher risk exposures the flow of funds to these lower rated counterparts is expected to drop (e.g. Griffith-Jones, 2003, Reisen (2001))[27]. Credit decision will always depend on the expected yield over a minimum margin where credits priced below minimum margin are not profitable and will not be supplied. Taking into account the more conservative features of regulatory capital, you could argue that regulatory capital is too expensive and that economic capital is a more valid input for pricing. In reality most of the interviewed banks still rely on regulatory capital for loan pricing. However there is a tendency that in the near future banks will rely more on a combination of both.

The above clearly shows that current practices differ a lot across banks especially with respect to economic capital practices. The fact that banks seem to move in the same direction for regulatory capital could imply that Basel II is indeed increasing the level playing field. However for economic capital practices there is still a long way to go. Absent greater convergence, regulatory capital standards seem destined to become increasingly distorted due to further financial innovations and improved and new methods for economic capital calculations and RCA. So even though Basel II has a positive impact on risk management practices, the impact on regulatory capital arbitrage and associated financial stability is ambiguous and will highly depend on the financial institutions, which in itself will again distort the level playing field.

IV. Conclusion

In order to promote financial stability, regulatory authorities pay a lot of attention to capital regulation. This paper shows, it is not that straightforward to find an accurate, easy to calculate capital ratio and that the effect of capital regulation on both risk mitigation and level of capital is highly contested. In addition to the regulatory requirements, financial institutions calculate their own economic capital reflecting the unexpected losses and true risk according to the specific characteristics of their portfolio. The recently implemented Basel II framework should result in a further convergence between regulatory and economic capital.

In assessing the impact of Basel II on financial stability, through reduced regulatory capital arbitrage, it is crucial to develop an understanding of the determinants and the relationship between regulatory and economic capital. We have empirically investigated the above using the insights gained during interviews with several chief risk officers. Three areas are being discussed: general credit risk management, internal ratings and regulatory and economic capital. By commenting on the differences and similarities across the financial institutions,

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[27] Qualitative impact studies and associated outcomes already reduced the fear of the huge impact of the new accord on lending to high risk borrowers (e.g. SMEs/emerging countries).

we have set the current scene with respect to Basel II implementation and regulatory and economic capital calculations. In doing so, we have also addressed another objective of Basel II, the creation of a level playing field, albeit in an indirect way.

Banks seem to move in the same direction for regulatory capital which could imply that Basel II is increasing the level playing field. However for economic capital practices there is still a long way to go. Absent greater convergence, regulatory capital standards seem destined to become increasingly distorted due to further financial innovations and improved and new methods for regulatory capital arbitrage and economic capital calculations. So even though Basel II has a positive impact on risk management practices, the impact on regulatory capital arbitrage and associated financial stability is ambiguous and will highly depend on the financial institutions, which in itself again distorts the level playing field.

The present system focuses on mitigating the risk of bank specific shocks rather than on a systematic shock. Banks are not induced to take into account the negative externalities of their decisions on financial markets as a whole. Basel II is already a big improvement, as it is more risk sensitive and as it promotes risk management practices. However we are not convinced that this is sufficient to reduce the perverse incentives induced by capital arbitrage opportunities.

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Appendix 1: some intuition behind the IRB approach

The philosophy of the IRB approach is based on the frequency of bank insolvencies supervisors are willing to accept[28]. By means of a stochastic credit portfolio model, capital is

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[28] As mentioned before, in order to prevent moral hazard considerations for banks to take too much risk, it is not advisable to completely eliminate the credit risk.

set to assure that there is only a very small pre-defined probability for the amount of unexpected loss to exceed the amount of capital. Under Basel II, capital is set to maintain a fixed confidence level of 99.9%, implying that the probability of a bank to suffer losses that exceed capital is on average once in a thousand years. For the model used in Basel II to be widely applicable, it has to be a portfolio invariant model, i.e. the capital required for an exposure only depends on the risk of that exposure and not on the portfolio it is added to. As a result of this model restriction, the risk weight function under Basel II is based on an Asymptotic Single Risk Factor (ASRF), where all systematic risk that affects borrowers is captured in one single risk measure (Gordy, 2003). The underlying assumption is that the bank's credit portfolio consists of a large number of small exposures. If this holds, the idiosyncratic risk associated with an individual loan is cancelled out and only the systematic risk remains. In the ASRF approach, there is only one systematic risk factor, implying that all loans in the portfolio are subject to the same set of market conditions. As a result, for a large portfolio of loans, the total capital requirement equals the weighted sum of the marginal capitals for individual loans. The model was further specified taking into account Merton's (1973) and Vasicek's (2002) ground work and resulted in the following risk-weight function:

$$K = \left[LGD * N\left[(1-R)^{-0.5} * G(PD) + \left(R/(1-R) \right)^{0.5} * G(0.999) \right] - PD * LGD \right] * \left(1 - 1.5 * b(PD) \right)^{-1} * \left(1 + (M - 2.5) * b(PD) \right)$$

This formula calculates the conditional expected loss based on conditional PDs and downturn LGDs. The average PDs that are provided by banks and reflect normal business conditions are being transformed in conditional PDs reflecting default rates based on a conservative value of the systematic risk factor, through a supervisory mapping function. As there is no such function for LGDs banks are expected to provide LGD reflecting economic-downturn conditions. The conditional expected loss includes both expected and unexpected loss, however as it was decided that capital should only cover unexpected loss (the UL concept), a correction for EL is required. Further, there is also a maturity adjustment taking into account that long-term credits are riskier than short-term credits and that these maturity effects are stronger for obligors with a low default probability. The degree of the obligor's exposure to the systematic risk component is reflected in the asset correlation (R). Under the IRB approach, the asset correlations should be determined using a formula of the Basel Committee. These formulas are based on the observation that asset correlation increases with size and decreases with increasing PD (Lopez, 2004). It should be noted that the latter has been contested by several studies (e.g. Dietsch et al., 2004). As retail and SME credit are found to be less prone to systematic risk, these loans will receive another treatment than corporate loans and will require less regulatory capital for a given default probability. Besides

the fact that the above function does not explicitly take into account portfolio and diversification effects, it also ignores the potential correlation between PD and LGD and by doing so it potentially underestimates the capital requirement.

Appendix 2: Difference between econic and regulatory capital, an example

Also under Basel II regulatory and economic capital have different determinants. Both capital numbers move in same direction, but with different slope and speed.

Regul model

Internal model

Input:

	Input:
Business Risk 4	Measure of asset./ earnings volatility
Liquidity risk 4	Funding sources and stress scenario analysis
Interest risk 4	The results from EVE (Economic Value of Equity) and duration GAP analysis
Oper risk 5	Frequency and severity loss distribution and other factors, subjective judgement
Market risk 5	VAR over liquidation period plus stress scenario analysis
Credit risk 10	PD, LGD, EAD and M, true corr, credit losses related to changes in credit quality
Divers benefit -6	Vector analysis of risk corr, copulas, variance-covariance matrices

Capital = 24

Input:

Oper risk 5	Frequency and severity loss distribution and other factors
Market risk 4	10-day VAR plus specific risk charges
Credit risk 12	PD, LGD, EAD and some maturity data, Basel II risk curves used to capture corr, credit losses related to default

Capital = 21

Other model differences:
-CI
-Input parameters

Minimum regul cap ⟶   Converge?   ⟵ Economic cap

Appendix 3: Comparison between regulatory and economic capital

	Economic capital-CreditMetrics	Economic capital-Credit Risk+	Economic capital-KMV	Regulatory Capital
Definition of risk[29]	Mark-to-market (MTM)	Default mode (DM)	MTM or DM	DM
Purpose	Investment decisions, RAROC-calculations, risk-mitigating actions, consistent risk-based credit limits, and rational risk-based capital allocations.	Investment decisions, RAROC-calculations, risk-mitigating actions, consistent risk-based credit limits, and rational risk-based capital allocations.	Investment decisions, RAROC-calculations, risk-mitigating actions, consistent risk-based credit limits, and rational risk-based capital allocations.	Financial stability External reporting
Model approach	Credit migration (Merton based option pricing) approach	Actuarial approach Reduced-form model	Structural (Merton based option pricing) approach (multiple factor)	Structural approach (single factor)
Credit event	Credit migration	Random default rate (with Poisson distribution)	Distance to default	Default
Risk horizon	Can be chosen (does not require a one year horizon)	Constant time horizon (e.g. 1 year) or hold-to-maturity horizon	Can be chosen (from a few days to several years)	1 year
Risk drivers	Asset values (proxied by equity price)	Expected default rates (no assumptions about the causes of default)	Asset values	Standardised: external rating IRB: depending on model
Data issues	Likelihood of (joint) credit quality migration, valuation estimates Data: transition matrix, credit	Parsimonious data requirements (mean loss rates and loss severities) Data: default rate, volatility,	Data: equity prices, credit spreads, corr and exposures	Standardised: external rating IRB: depending on model

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[29] MTM models also include credit migration risk, DM models only distinguish between default and non-default.

	spreads, yield curve, LGD, corr and exposures)	macroeconomic factors, LGD and exposures		
Confidence level	Based on target rating of FI, E.g. AA- (= 99.95%)	Based on target rating of FI, E.g. AA- (= 99.95%)	Based on target rating of FI, E.g. AA- (= 99.95%)	Based on target rating of A- (=99.9%)
Risk classification	Ratings (credit homogeneous issuers within one rating class and transition probabilities are based on historical frequencies[30])	Exposure bands	Distance to default and expected default frequency (EDF) (issuer specific and a function of capital structure, volatility of asset returns and current asset values)	Ratings

PD, LGD, EAD	Basel II models, R-squared and maturity -PD
	
	Full *Maturity*
		Basel II models, R-squared and maturity -PD
		
		Full *Maturity*
			Basel II models, R-squared and maturity -PD
			
			Full *Maturity*
				Basel II model
				
				-*PD* subject to min of 0.03% for all asset classes except sovereigns
				-Downturn *LGD*
				-*Maturity* remaining contractual tenor:
				  -floored at 1 year, capped at 5 year
				  -not applicable to retail

Recovery rate	Variable (Beta distribution) (taking into account uncertainty)	Constant	Constant or random	Constant
Valuation	Discounted value of future CF beyond one year and discount factor is the forward yield curve	Not used	Option pricing methodology applied to contingent cash flows; more specifically the Martingale approach (discounted expected CF based on risk-	Standardised: not used IRB: depending on model

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[30] KMV has shown that this does not hold in reality and might result in an adverse selection of corporate customers in banks (Crouhy et al. (2000)).

			neutral probabilities)	
Interest rate	Fixed credit spread	Constant	Constant	Standardised: not used IRB: depending on model
Income	Not used	Not used	Risk-free rate and expected loss as proxy for expected income	Not used
Correlation	Based on joint probability of multivariate normal asset returns(determined by firm specific, country and industry factors)	Assumption of independence or correlation with expected default rate	Based on joint probability of multivariate normal asset returns (determined by firm specific, country and industry factors)	Simple, parameterized Does not use industry/country
Concentration	Recognised	Not recognised	Recognised	Not recognised

Appendix 4: Questionnaire on Bank Capital and Credit Risk[31]

GENERAL INFORMATION ABOUT THE BANK

Name of bank:

Country where headquarter is established:

What is the primary **business activity** of the bank?
        Universal bank
        Retail bank
        Wholesale bank
        Investment bank
        Private bank
        Other:

To which of the following **types of banks** does your bank belong:
        Local general bank
        Subsidiaries of foreign bank
        Consolidated international bank
        Non-consolidated international bank
        Branch of foreign bank
        Other:

Could you please indicate the **part(s) of the world** where the bank is active:
        Continental Europe
        UK
        Australia
        Northern America
        Southern America
        Asia
        Other:

If available, please provide **the external rating** of your bank given by:
        Moody's:
        Standard & Poor's:
        Fitch:
        Other:
        Not available
        No idea

In case you are a subsidiary and you do not have a rating, please give the rating of your mother company

Indicate **your desired external rating:**

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[31] All balance sheet numbers are expressed in Euro based on the exchange rate prevalent on 4 February 2009 (U.S. Dollar in Euro: 0.778271, Pond in Euro:, 1.10754, Danish Crown in Euro: 0.134174)

No idea

In case you are a subsidiary and you do not have a rating, please give the desired rating of your mother company

How would you describe the **current credit risk management** within your bank?
>Non existent
>Poor
>Needs improvement
>Satisfactory
>Good
>Very good
>No idea

How did **credit risk management** within your bank **change** over the last years?
>No change
>Slight improvement
>Big improvement
>No idea

Please indicate in what **fields** these changes have taken place.

In case you filled out "Slight improvement" or "Big improvement": **why** have credit risk management measures improved? (Please rank with 1 = best, 2 = 2nd best etc. further it is not necessary to rank all options)
>___ In order to be compliant with the New Basel Accord
>___ It is a result of better knowledge on how to measure and manage credit risk
>___ The quality and availability of the data has been improved
>___ The bank has been restructured
>___ Senior management has become increasingly aware of the need to manage credit risk
>___ Other reason:

Was Basel II a trigger in the development of credit risk management?
>Yes
>No
>No idea

In case Basel II was a trigger, could you explain how?

How do you expect that the **current credit crisis** and liquidity squeeze will impact the credit risk management in your financial institution?

Do you think in case think Basel II would already have been implemented in early 2000 that the extent of the current crisis would be less?

     Yes

     No

     No idea

Please explain your answer in the previous question.

What should happen with the current regulatory environment to circumvent what is currently happening in financial markets?

These next three questions are only relevant for countries in which Basel II is not obligatory. If you are obliged to comply with Basel II, please skip them.

Are Basel II regulations **currently present /** or **do you currently comply with the Basel II regulations** in the credit risk management process within your bank?

     Yes, to a large extent

     Yes, but only to a minor extent

     No, not at all

     No, but this will be the case in the future

     No idea

If you answered yes in the previous question, please indicate what steps your bank is currently undertaking or has already undertaken?

     Implementation PD

     Validation PD

     Implementation LGD

     Validation LGD

     Implementation EAD

     Validation EAD

     Calculation regulatory capital

     Irrelevant

     No idea

What **priority** does senior management attach to the implementation of Basel II?
- No priority
- Low priority
- Medium priority
- High priority
- No idea

The three previous questions are only relevant for countries in which Basel II is not obligatory. If you are obliged to comply with Basel II, please skip them and immediately go to the questions below.

What is your bank's **primary perception** of Basel II? *You can indicate three options at most.*
- Opportunity to enhance risk management process
- Opportunity to enhance corporate governance
- Opportunity for a more proactive risk management
- Opportunity to increase the use of derivatives to manage risk
- Opportunity to move from a buy-and-hold strategy to more active loan sales
- Opportunity for a greater specialization
- Opportunity to lower capital requirements
- It will cause more problems than resolve things
- It will have little to no added value
- Other:
- No idea

What **horizon** does your bank use with respect to:
- Credit risk:
- Market risk:
- Operational risk:
- Interest rate risk:
- Other:
- No idea

CREDIT EVENT

Which events constitute a **default event** for the counterparties of your FI?
- Failure to pay (90 days past due – Basel II definition)
- Bankruptcy
- Cross-default
- Restructuring
- Repudiation
- Moratorium
- Downgrade
- Other:
- No idea

Did your bank define a materiality threshold for the default event?
- Yes
- No
- No idea

If you answered yes in the previous question, please indicate the threshold value below:

Do you use other triggers than the Basel II default definition in your pro-active credit risk management (e.g. 60 days before you start an active collection procedure) to 90 days (Basel II))?

> Yes
> No
> No idea
> Not applicable

Is your default definition consistently applied **across asset classes**?

> Yes
> No
> No idea

In case the default definition "Failure to pay" is not consistently applied across asset classes, please indicate the different definitions (number of days past due) per asset class:

	Corporates	Banks	Sovereigns	Retail	SME Retail	SME Corp
Failure to pay definition						
No Idea						
Not Applicable						

INTERNAL RATINGS

As we expect the answers in this part might differ across asset classes, you can indicate a different answer per asset class. Please put a X when something applies to a certain asset class. In case you can not distinguish between asset classes, please indicate your answer in the column "all asset classes".

Does your bank make use of internal rating models to determine credit risk of counterparties?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME Retail	SME Corp
Yes, an internal rating model calculating the Probability of Default							
Yes, an internal rating model calculating the Probability of Default and Loss Given							

Default separately							
Yes, an internal rating model that combines PD and LGD (EL measure)							
Other							
No							
No Idea							

The next questions are only relevant when your bank has an internal rating system. So, if you answered that your bank uses internal rating models to determine credit risk of counterparties, please answer the following questions. If not, you can skip this part and go to "Regulatory versus economic capital"

A rating philosophy is the kind of information the rating intends to summarize. We are aware of the fact that Basel II states the credit horizon should be 12 months, however the rating philosophy is linked to the number of years of observations that have been taken into account when calculating the rating.

The time horizon of assessing the creditworthiness of borrowers in assigning ratings is part of the rating philosophy. Rating models may be characterized as being on a spectrum between:

- Point-in-time (PIT): the rating gives an indication of the borrower's current condition and/or most likely condition over a short chosen time horizon, typically one year.
- Through-the-cycle (TTC): the ratings give an indication on the borrower's creditworthiness, based on a full business or economic cycle.
- Hybrid: the rating is in the area between PIT and TTC.

Did you define a rating philosophy for the rating models?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
Yes, our rating models are PIT oriented with a rating horizon of (max) one year.							
Yes, the rating models are hybrid with a rating horizon between one and three years.							
Yes, the rating models are							

hybrid with a rating horizon between three and five years.							
Yes, the rating models are TTC oriented a rating horizon that covers a full business or economic cycle (8-12 years).							
No, we did not define a rating philosophy							
No Idea							

For the next question, please, circle the correct answer for each asset class. In case you can not distinguish across asset classes, circle the answer in the column "All asset classes".

If you answered yes in the previous question, does the **rating philosophy** in your bank differ across

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
Industry	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea
Country	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea

If you answered that your bank defined a rating philosophy for the internal rating models,

which were at that point reasons to choose for this rating philosophy / rating horizon?
State of the economy
Data availability
Procyclicality of Basel II
Other:
No idea

How many years of observations do you have **available** for constructing your rating?
…
No idea

How many years of observations do you **use** for constructing your rating?
…
No idea

How would your bank like the **internal rating philosophy** to be?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
Through-the-cycle							
Point-in-time							
Rather, through-the-cycle							
Rather point-in-time							
No Idea							

Do you feel that some **"surfing" through the cycle** is unavoidable for each internal rating system?

Yes
No
No idea

How many **rating grades** does your bank have

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
On a portfolio level Number: No idea Not applicable							
On PD level Number: No idea Not applicable							
On LGD level Number: No idea Not applicable							

When a loan of a startup-company **enters** what rating class is it assigned to?

No idea

How are "exposure types" that are characterised by limited loss rates and/or limited data (e.g. project financing) assigned to rating classes?

What rating class contains the **highest number of exposures**? Please indicate the corresponding PD as well.

	All Asset Classes		Corporates		Banks		Sovereigns		Retail		SME			
											Retail		Corp	
Rating Class	RC:	PD:	RC:	PD:	RC:	PD:	RC:	PD:	RC:	PD:	RC:	PD:	RC:	PD:
No idea														

The internal ratings that are used in your bank are intended to **reflect**

        Borrower default risk

        Facility risk

        Expected loss rate

        Other:

        No idea

On what kind of **data** do the bank's internal ratings rely?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
Public available data							
Private data							
A well-balanced mix of public and private data							
More on public than on private data							
More on private than on public data							
No Idea							

Please indicate the most important **parameters** your bank's risk rating system takes into account

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME Retail	SME Corp
Internal information							
Financial							
Ratios							
Solvency							
Profitability							
Liquidity							
Other:							
Balance sheet							
Income statement							
Cash flow statement							
Other							
Non-Financial							
Size of exposure							
Experience and quality of management							
Industry							
Size							
Age							
Education							
Relationship duration							
Other:							
External information							
Financial							
External rating							
EBIT/ total asset							
Retained earnings/ total asset							
Equity/debt							
Sales/ total asset							
Other:							
Non-Financial							
Quoted							

versus non-quoted						
Country						
Industry						
Macro-economic conditions						
No Idea						

Do you think there is a large **homogeneity** within each rating class of your bank's internal rating system?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea

When are credit ratings **updated**?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
At least once every 12 months							
When a change in a bank's commitment is to take place							
Other:							
No Idea							

Are the rating updates automated?
Yes
No
No idea

If your rating updates are automated, please indicate the frequency
…

When **mapping** default probabilities into rating classes, does your bank try to mimic the ratings of Moody's, S&P or Fitch?

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No idea	Y / N / No	Y / N / No	Y / N / No

					idea	idea	idea

Does your bank take risk mitigation techniques into account?

    Yes, the bank takes all available collateral and guarantees into account

    No, we do not take into account risk mitigation techniques

    No idea

If your bank takes risk mitigation techniques into account, how is this done?

    The bank assesses the risk mitigation on a sample which is then generalised over the portfolio.

    We use another methodology:

    No idea

REGULATORY VERSUS ECONOMIC CAPITAL

Regulatory capital/ Basel II[32]

Under Basel II, your bank

Currently uses:

    0   Standardized Approach

    0   Foundation IRB Approach

    0   Advanced IRB Approach

    0   None of these methods

Would like to use:

    0   Standardized Approach

0   Foundation IRB Approach

    0   Advanced IRB Approach

    0   None of these methods

---

[32] Focus on credit risk

Does your bank hold **a buffer** on top of the regulatory capital and **why**?

        Yes, because of the fact that Basel II fails to recognise certain types of risk

        Yes, in order to avoid supervisory intervention

        Yes, to qualify for certain activities (e.g. external funding)

        Yes, other:

        No

        No idea

In case you use/ will use the standardised approach

        What **external credit assessment institution** is used to determine the risk weights?

- Moody's
- Standard & Poors
- Fitch
- Other:
- No idea

        What portion of exposures do you expect to be covered by the ECAIs?

- …

In case it is not feasible for your bank to apply the **IRB** approach, how do you expect the implementation of the IRB approach by other banks to affect your bank's **competitive position**?

        It will hurt the competitive position of the bank

        It will enhance the competitive position of the bank

        It will have no impact on the competitive position of the bank

        Other:

        Irrelevant

        No idea

In which way will banks with a well-developed risk management process gain **competitive advantage** (Please rank, 1 = best and it is not necessary to rank all options)

___   The fact that these banks will need to have more complete and timely risk data

___   The fact that these banks will have a better understanding of risk concentrations

___   The fact that these banks will have a better understanding of the relationship between risk and return

___   The fact that these banks will have a better alignment between the risk and finance function

___   The fact that these banks will focus more on core business

___   The fact that these banks were also stronger in the past

___   Other reason:

___   They won't

___   No idea

Do you think that the new Basel II framework will enhance the **procyclicality** of capital regulations, implying that capital requirements will increase when the economy falls into recession and fall when the economy enters expansion?

        Yes

        No

        No idea

Do you use Basel II for **other purposes** than for regulatory capital calculation?

        Yes

No
No idea

In case you filled out yes in the previous question, please indicate for what **other purposes** you use Basel II

   Measuring and managing risk
   Risk-adjusted pricing
   Strategic use and optimal allocation of economic capital
   Performance measurement
   Driver of compensation
   Basel II pillar II
   Determination of total capital requirements
   External reporting
   Other:
   No idea

Economic Capital

Does your bank calculate economic capital?

   Yes
   No
   No idea

The next questions are only relevant when your bank calculates economic capital. So, if you answered that your bank calculates economic capital, please answer the following questions. If not, you can skip this part and go to "Pricing".

When did the bank first introduce the concept of economic capital?

   …
   Irrelevant
   No idea

How does your bank define economic capital?

   No idea

The economic capital model your bank uses is

   A default model: takes only the event of default into account
   A market value model: takes into account both default and deterioration in value
   No idea

Which **risk categories** does the economic capital in your bank address?

   Credit risk
   Market risk
   Operational risk
   Interest rate risk
   Business risk
   Reputation risk
   Other:
   No idea

Which **tools** does your bank use for calculating economic capital?

Structural Models
- o Moody's KMV
- o CreditMetrics

Reduced Form Approach
- o CreditRisk +
- o CreditPortfolio View

Other:

No idea

What are the **determinants** of the economic capital in your bank?

Credit risk
- o Default rate
- o Seniority
- o LGD
- o EAD
- o Maturity
- o Concentration risk
- o Other:

Market risk:

Operating risk:

Interest rate risk:

No idea

Do you use the same **single time-invariant risk correlation factor** as in Basel II to calculate your economic capital?

Yes

No, as it is more optimal to have different risk curves and to tolerate a greater probability of default when economy-wide bank capital is scarce relative to lending opportunities, we use different correlation factors

No idea

For which **purposes** does your bank use economic capital?

Measuring and managing risk

Risk-adjusted pricing

Strategic use and optimal allocation of economic capital

Performance measurement

Driver of compensation

Basel II pillar II

Determination of total capital requirements

Other:

No idea

How do regulatory and economic capital differ?

In your opinion, does economic capital **differ** from regulatory capital?

Yes, to a huge extent (>50%)

Yes (>20%)

Yes, to a minor extent (<20%)

No, they are exactly the same

It depends on the asset class

No idea

Compared to the economic capital, the regulatory capital of your bank is on average

	All Asset Classes	Corporates	Banks	Sovereigns	Retail	SME	
						Retail	Corp
Higher							
Equal							
Lower							
No Idea							

In your bank, which **determinants** have an impact on regulatory capital but have no impact on economic capital?

Credit risk
- o Default rate
- o Seniority
- o LGD
- o EAD
- o Maturity
- o Concentration risk
- o Other:

Market risk:

Operating risk:

Interest rate risk

Other:

None

No idea

In your bank, which **determinants** have an impact on economic capital but have no impact on regulatory capital?

Credit risk
- o Default rate
- o Seniority
- o LGD
- o EAD
- o Maturity
- o Concentration risk
- o Other:

Market risk

Operating risk

Interest rate risk:

Other:

None

No idea

Do the **PDs** used to calculate regulatory differ from the ones used to calculate economic capital?

Yes

No

No idea

If you answered yes in the previous question, please indicate **how** it differs:

     In our economic capital calculation, PD is not floored at 0.03%

     In our economic capital calculation, the credit event is not restricted to default mode

     In our economic capital calculation, the risk horizon differs from 1 year

     In our economic capital calculation, the confidence level differs from 99.9%

     Other:

Do the **LGDs** used to calculate regulatory differ from the ones used to calculate economic capital?

     Yes

     No

     No idea

If you answered yes in the previous question, please indicate **how** it differs:

     In our economic capital calculation, we do not use the fixed LGD ratios for unsecured exposures as is suggested by the Foundation approach (45% for senior claims, 75% for subordinated claims etc)

     In our economic capital calculation, we do not apply the Basel II haircuts for the secured exposures as is suggested by the Foundation approach

     In our economic capital calculation, we do not use a downturn LGD

     Other:

Do the **EADs** used to calculate regulatory differ from the ones used to calculate economic capital?

     Yes

     No

     No idea

If you answered yes in the previous question, please indicate **how** it differs:

     In our economic capital calculation, we take the full amount of guarantees and collateral into account

     Other:

Do the **maturities** used to calculate regulatory differ from the ones used to calculate economic capital?

     Yes

     No

     No idea

If you answered yes in the previous question, please indicate **how** it differs:

     In our economic capital calculation, maturity is not floored at 1 year

     In our economic capital calculation, maturity is not capped at 5 year

     Other:

PRICING

What **capital number** is currently guiding the product pricing in your bank?

   Regulatory capital

   Economic capital

   Both regulatory and economic capital

   RAROC/RORAC

Other:
No idea

What **capital number** do you expect to guide the product pricing in your bank in the future?
Regulatory capital
Economic capital
Both regulatory and economic capital
RAROC/RORAC
Other:
No idea

What hurdle rate do you use?

| | All Asset Classes | Corporates | Banks | Sovereigns | Retail | SME | |
						Retail	Corp

COST OF CAPITAL

Do you have any idea about the **weighted average cost of capital** of the bank (including the cost of both equity capital (tier 1 and tier 2) and deposits)?
Yes
No
No idea

If yes, please indicate below how much the current WACC of your bank is:

Do you have any idea about the **cost of equity capital** (tier 1 and tier 2) of the bank?
Yes
No
No idea

If yes, please indicate below how much the current cost of equity capital of your bank is:

Do you use the weighted average cost of capital or rather the cost of economic capital?
WACC
Cost of Equity Capital (tier 1 and tier 2 capital)
It depends on the purpose
Cost of tier 1 capital
Cost of tier 2 capital
No idea

Do you apply the same cost of EquityCapital/WACC to all business units?
Yes
No
No idea

FUTURE CHALLENGES

In your opinion indicate the **top 3 Basel II- challenges** your bank will face for 2008 (1: most important; 2: 2nd most important; 3: 3rd most important):

        Embedding Basel II in the Credit Risk Business Processes
        Model validation
        Business and technology planning
        Data acquisition and maintenance
        Address operating risk management requirements
        RWA calculation (pillar I)
        Internal economic capital (pillar II)
        Home-host issues
        Disclosure requirements (pillar 3)
        Other:
        No idea

KEY FIGURES OF YOUR BANK

Size
Total Assets:
Number of employees:
Numbers of employees in credit risk department of headquarter:

P&L
EBIT:
Net income:

Balance sheet
Total equity:
Tier 1 capital ratio:
Total capital ratio:
Basel II capital ratio:

How was the *composition of your loan portfolio* per 31-12-2007?
% loans to corporates
% loans to SMEs
% loans to retail
% loans to banks
% loans to sovereigns
% other loans

PERSONAL INFORMATION

What is your current function?

Please indicate your highest educational degree.
        Secondary education
        Graduate degree
        University degree
        Post university degree
        Ph.D.

What is your educational background?
        Applied Economics

Mathematics
Econometrics
Physics
Biology
Civil Engineer
Commercial Engineer
Other…

Thank you for your cooperation!

Please fill out your email address if you would like to receive a copy of the results

Yes, I would like to receive a copy of the results.

* Email addresses will be kept strictly confidential and will not be used for commercial or other purposes.

Appendix 5: difference in PD, LGD, EAD and maturity parameters between economic and regulatory capital

Do the PDs used to calculate regulatory differ from the ones used to calculate economic capital?

	Frequency
Yes	7
No	4

	Frequency
PD is not floored at 0.03%	7
credit event is not constrained to default	7
risk horizon differs from 1 year	3
Confidence level differs from 99.9%	7

Do the LGDs used to calculate regulatory differ from the ones used to calculate economic capital?

	Frequency
Yes	7
No	4

	Frequency
In our econ cap model we do not use fixed LGD ratios for unsecured exposures as is suggested by the Foundation approach	3
In our econ cap model our LGD is not floored	1
In our econ capital model we do not use downturn LGD	5

Do the EADs used to calculate regulatory differ from the ones used to calculate economic capital?

		Frequency
Valid	Yes	3
	No	8

	Frequency
In our econ cap model we take the full amount of guarantees and collateral into account	1
Regulatory EAD calc uses higher Credit Conversion factors for some off-balance sheet products (given guarantees, letters of credit)	1
There is a difference in calculating EAD for	1

derivatives (M-to-M with add-on)	

Do the maturities used to calculate regulatory differ from the ones used to calculate economic capital?

		Frequency
Valid	Yes	6
	No	4
	No idea	1

	Frequency
In our econ cap model maturity is not floored at 1 year	5
In our econ cap model maturity is not capped at 5 year	2