

Financial market regulation in Germany: capital requirements of financial institutions

DANIEL DETZER*

Since the beginning of the financial crisis in 2007 Germany has experienced a series of problems in the banking sector unseen for decades. Massive government intervention at high cost to the public purse was used to contain a more severe crisis. Similar interventions were necessary in a range of other countries. The financial crisis not only unveiled serious weaknesses in the supervision and regulation of the financial sector, but also revealed substantial flaws in financial institutions' internal risk management and governance structures. A major problem was the severe undercapitalisation of banks prior to the crisis. Therefore, capital adequacy was central in the debate on the crisis and major reforms in this area will be initiated with Basel III.

Capital requirements have a long tradition in the banking regulation of Germany (and West Germany before unification). While for many countries capital requirements were first adopted in the 1970s (Krahn and Carletti, 2007), in Germany such regulation had already been introduced in the 1930s. This paper will review the capital requirement regulation in Germany from a historical perspective, whereby it will identify general trends and point out some severe problems associated with the current approaches to capital requirement regulation. First, a short overview of the theoretical justifications for capital regulation is given. Then, the development of regulatory capital requirements in Germany before the financial crisis is examined in detail and its most

* Berlin School of Economics and Law; email: daniel.detzer@hwr-berlin.de. I would like to thank Eckhard Hein and Andreas Audretsch, as well as the participants to the EABH conference *The Challenges of International Banking Regulation and Supervision after 1945*, held on 14 January 16 2014 in Frankfurt am Main, for useful comments to an earlier version of this paper. I am indebted to the editors and two anonymous referees for very helpful suggestions. This work was supported by the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n. 266800.



important trends are highlighted. These include the gradual softening of the eligibility criteria for regulatory equity, and the reliance on internal risk models for the determination of risk weights. While the former trend has been reversed after the crisis, the latter is still pursued. Therefore, the problems inherent in using internal risk models to determine capital requirements will be discussed. The changes due to Basel II.5 and Basel III in this area and their potential to address the identified problems will be examined. The paper concludes with an outline of the implications for capital adequacy regulation.

1. Theory of capital requirements

In banking regulation capital requirements are one of the main regulatory tools and the discussion about their appropriate size and application gained new prominence in the aftermath of the financial crisis. Allen and Gale criticised the fact that the development of financial regulation was based on an empirical process – a process of trial and error – rather than on formal theory. For capital requirements there is no commonly agreed theoretical basis. However, there are different theoretical ideas and a range of intuitive arguments that enrich the general discussion (Allen and Gale, 2002).

In a hypothetical world where financial markets are complete, a world in which depositors are perfectly informed about risks and failure probabilities of banks, the Modigliani-Miller indeterminacy principle would apply and the market value of banks would be independent of their capital-asset ratio. If a bankruptcy cost is introduced banks would, due to market discipline, choose an optimal asset composition spontaneously so that failure would not occur. Perfectly informed creditors and depositors would demand higher returns when risk increases. In such a world regulatory capital requirements would not be needed (Freixas and Rochet, 2008).

In more realistic models,¹ bank depositors are not perfectly informed. Under these conditions inefficient bank runs are possible, which can lead to systemic financial crises. At the same time those bank runs are seen as a disciplinary device to ensure the prudent behaviour of banks. The prevention of inefficient bank runs and therefore of financial crises justifies the introduction of deposit insurance. However, this leads to a moral hazard problem. In combination with limited liability it can be shown that shareholder value is maximised by decreasing capital and increasing risk. Depositors' incentives to monitor banks are reduced due to the insurance. The increasing risk is at the expense of the deposit insurance. To solve this problem uniform capital requirements are a potential solution. They can reduce but not fully eliminate the problem and in some cases they may even lead to increased risk-taking by banks. The most favoured solution is risk-based capital requirements. However, an additional risk-independent capital requirement is necessary in some cases, in particular if there is limited liability (Freixas and Rochet, 2008, chapter 9). Another argument based on moral hazard relates to the too-important-to-fail argument. If it can be expected that a bank will be bailed out by the government when it is faced with the risk of default, the incentive of depositors to monitor banks' behaviour is highly limited and simultaneously may induce banks to choose higher risk levels (Labonte, 2013).

Another justification for capital requirements is the existence of external effects. Those can be found, for example, in network models of the banking sector, where the problems of one bank ultimately affect other banks and can thus lead to systemic instability. The effect can either be direct due to defaults on interbank liabilities or indirect due to fire sales and asset price collapses (Brunnermeier and Oehmke, 2013). If those externalities are taken into consideration, chosen capital levels of unregulated banks are too low from a macro-prudential point of view and the regulation of capital requirements is justified due to banks' systemic externalities.

¹ A good overview about some of the models is given in chapter 9 of Freixas and Rochet (2008) and the following paragraph is based on the models that can be found there.

Hence, there is a range of justifications for capital requirements. But as Allen and Gale (2002) pointed out, a consistent and widely agreed theoretical framework that examines the effects of capital requirements on financial stability or macroeconomic performance is still missing. This may explain why very different views on the appropriateness of capital requirements, their size and their proper application exist. The lack of such a framework may also account for the widely spread myths² about the negative effects of capital requirements, not only in the general public but also among practitioners, policymakers and academics, often used by bank lobbyists to fend off stricter regulation.

2. The development of capital requirements in Germany before the financial crisis

2.1. The national period

Capital requirements have a long tradition in Germany. The law of the German Reich on Banking (*Reichsgesetz über das Kreditwesen*) of 1934 already allowed for the implementation of capital requirements. However, corresponding guidelines were never actually enacted. After WWII, in 1951 the Bank of the German States (Bank deutscher Länder – the former central bank in West Germany) compiled a range of guidelines that specified capital requirements that banks should fulfil if they wanted to use the central bank as a refinancing facility. Despite the fact that the guidelines were not legally binding the banks at large adhered to them.

In 1961 the Banking Act (*Kreditwesengesetz*) was established. Paragraph 10 stated that banks had to ensure that their endowment of liable funds was adequate enough to guarantee the fulfilment of their obligations to their creditors and to safeguard the assets entrusted to them. It included a provision that allowed the German Federal Banking Supervisory Office (*Bundesaufsichtsamt für das Kreditwesen*) in

² For an overview of those myths, see Admati *et al.* (2013).

collaboration with the Bundesbank to formulate the details of what was regarded as adequate in the form of an ordinance. For the first time such an ordinance detailing capital requirements was enacted in 1962 and named Principle I. It required a bank to hold equity in relation to its assets, so that the amount of assets was limited to 18 times the bank's capital (i.e. capital ratio of 5.56 per cent). There was no risk weighting but some positions were excluded, e.g. loans to governmental entities or some specific collateralised loans (Deutsche Bundesbank, 1962).

The balance sheet positions eligible to fulfil equity requirements were quite narrow and had to comply with three principles: they needed to be fully paid-up, capable of meeting current losses and had to be permanently available to the bank (Deutsche Bundesbank, 1988). Therefore, the following positions could be included in the capital base: paid-in capital, open reserves, capital contributions of dormant partners, whereby retained net-profits could be added and net-losses had to be subtracted. A special provision allowed cooperative banks to add their members' uncalled liabilities to their regulatory equity by up to a maximum of 50 per cent of the amounts of paid-up member shares and reserves. Undisclosed reserves were not eligible as liable capital (Deutsche Bundesbank, 1962).

In two revisions made in 1965 and 1969 the range of institutions covered was extended. More importantly, a simple system of risk weights³ for loans to certain debtors (e.g. the government, other banks) or for a particular type of business (e.g. guarantees) or with certain collateral (e.g. real estate and ship mortgages) was introduced (Deutsche Bundesbank, 1964; 1969).

The next, larger, amendment was triggered by the default of Bankhaus Herstatt KG in 1974, which incurred large losses due to currency speculations. As a consequence of this default, a Commission on Fundamental Issues in Banking (*Studienkommission Grundsatzfragen der Kreditwirtschaft*) was appointed to propose regulatory reactions to issues raised in regards to the crisis. Parallel to this, the second

³ In practice, after the 1965 reform there were risk weights of 0, 50 and 100 per cent. In 1969 a 20 per cent risk weight for some positions was added.

amendment of the Banking Act in 1976 was introduced to address the most severe weaknesses of the current regulation that had been revealed. While there were changes in many areas, the area of capital requirements was also affected. The new Principle Ia was introduced, which limited the net exposure to foreign currencies to 30 per cent of a bank's equity (Deutsche Bundesbank, 1976). Here for the first time the market price risks⁴ of some positions became explicitly subject to banking regulation. Later, in 1980, it was amended to also include open positions in gold, silver and platinum.

With the next amendment of the Banking Act in 1985 a consolidation principle was introduced and the eligible forms of regulatory equity were adapted. The consolidation principle became necessary to prevent banks from using subsidiaries to build credit pyramids. Those pyramids were constructed to circumvent Principle I. It enabled banks to use equity multiple times and so to extend much more credit than allowed by the regulation. This weakness of the existing regulatory framework played a major role in the crisis of the bank Schröder, Münchmeyer, Hengst & Co. which used a range of loopholes to extend large amounts of credit to IBH-Holding, a large construction equipment manufacturer which later went bankrupt. This was possible in part because the credit was channelled through subsidiaries in Luxembourg and thus was hidden from German supervisors (Hertl, 1986). Already the report of the commission established after the 1974 crisis had proposed the introduction of a consolidation rule. Since the problem was not merely a German one, it was also recognised on a European level, where a directive had been passed that demanded the introduction of consolidation guidelines by 1985. From that moment, banks not only had to fulfil equity requirements at each single institution, but also for the group as a whole including most daughter banks and financial institutions. The German legislator chose a stricter consolidation threshold than demanded by the European directive

⁴ Market price risks relate to the risk of losses due to the changes in market prices, while credit risk refers to the risk that a borrower defaults on his contractual obligations to repay.

(Deutsche Bundesbank, 1985). About 46 per cent of the 50 biggest banks did not fulfil Principle I calculated according to the new rules. The big banks, some private commercial banks and the leading organisations of the cooperative sector had to adjust to a large degree. However, a very long transition period, up to 1991, allowed for gradual adjustments (Deutscher Bundestag, 1984).

The second, and larger, issue regarding capital requirements was the question of which forms of liabilities could be regarded as regulatory equity. One of the main issues raised was the demand of the savings banks and the municipalities to acknowledge the public guarantee (*Gewährträgerhaftung*) in the form of an addition to the savings banks' regulatory capital, similar to the allowance of cooperative banks. While the support from the German states was mixed, the Bundesbank and the central government opposed the idea (Deutscher Bundesrat, 1984). Eventually, the proposal was rejected. Instead the allowance of cooperative banks was gradually reduced to 25 per cent of their capital base over the next 10 years. Also, the eligibility criteria for capital provided by dormant partners were tightened to conform to the three principles, which were laid down with the establishment of the Banking Act (see above). The proposal to include subordinated liabilities was rejected as well, because they would not correspond to the three principles. The only concession made was that certain forms of hybrid capital (*Genussrechtskapital*)⁵ were allowed to count towards regulatory equity (Deutsche Bundesbank, 1985). While the actual changes in the form of eligible capital were less relevant, the discussion shows that there was a strong resistance to lower equity standards, in particular at the federal level and from the Bundesbank. Also, while the discussion was mainly about a level playing field for the different banking groups in Germany, there was no concern about international competitiveness. This is also reflected in the stricter consolidation threshold chosen by the authorities. The main focus at the time was on stability.

With an amendment of Principles I and Ia, in October 1990 the exorbitant growth of off-balance sheet operations in derivatives markets

⁵ A *Genussrecht* is a liability that combines elements of equity and debt instruments.

was addressed. Until then, Principle I only applied to risk from book credits and equity holdings. In its amended form, the risk stemming from counterparty failures arising from dealing in certain financial derivatives was also included. Principle I was extended from being mainly concerned with credit risk to dealing with counterparty risks in general. Principle Ia was also extended and now limited the exposure to certain derivatives deals that included a price risk to 60 per cent of equity (Deutsche Bundesbank, 1990).

2.2. The international period

The Basel Committee was formed in 1974 as a reaction to the Herstatt failure and a crisis at the Franklin National Bank of New York. It was supposed to ensure international cooperation in banking supervision. When, in an environment of increasing international exposure taken on by banks, capital ratios of international banks declined, its main focus shifted towards developing a common framework for minimum capital requirements. The result of this work was presented as the Basel Capital Accord in 1988 (Basel Committee on Banking Supervision, 2013a). The European Economic Community (EEC) adopted the Accord and based the Solvency Directive⁶ and the Own Funds Directive⁷ on it. However, while the Basel Accord was developed for internationally active banks, the directives were aimed at all banks in the EEC. They were translated into German law by the fourth amendment of the Banking Act and with a reform of Principle I in 1992. The changes to Principle I mainly contained an extension of the on- and off-balance sheet positions and transactions so that almost all assets and the most relevant uncompleted transactions had to be backed by capital. The backing of counterparty risks from financial swaps, forwards and options (the so called cover loss) was in anticipation of the directive already introduced in 1990. However, in addition to the interest and

⁶ Council Directive 89/647/EEC of 18 December 1989 on a solvency ratio for credit institutions.

⁷ Council Directive 89/299/EEC of 17 April 1989 on own funds of credit institutions.

currency contracts demanded by the Solvency Directive, Principle I included contracts with other price risks as well. Also, the risk weights for different counterparties, types of transactions and certain collateralised loans were adapted according to the directives. In addition to the broader asset base that had to be covered, the capital ratio⁸ was raised from 5.56 to 8 per cent (Deutsche Bundesbank, 1993b). The 8 per cent capital ratio was adopted from the Basel Accord. Here, it was seen as a politically agreeable minimum standard (Committee on Banking Regulation and Supervisory Practices, 1987).

As a compensating measure for the broader asset base and the higher capital ratio, the eligible forms of capital were extended. This can be seen as a major change in the overall direction of capital regulation in Germany. The new rules allowed banks to include positions as capital that did not conform to the three principles mentioned earlier, which were stressed intensively during the prior national discussion. During the preparation of the Basel guidelines the Bundesbank already made clear that it was opposed to such a softening of capital requirements. The new rules divided own funds into core and additional capital. The 8 per cent of the risk-weighted assets now had to be backed with core and additional capital, whereby the minimum amount of core capital was 4 per cent (Deutsche Bundesbank, 1993). Table 1 shows the composition of core capital. It consists only of items that are available to the institution for unrestricted and immediate use to cover risk or losses as soon as they occur. Therefore, core capital largely conforms to the three principles that were valid in Germany before the fourth amendment. Forms of liabilities eligible as additional capital (see table 2) can be regarded as of lower quality than core capital since they are either not visible on the balance sheet or are not directly liable or repayable. The additional capital contains some positions that had not been acknowledged as regulatory capital until then, e.g. contingency reserves,

⁸ The capital ratio is calculated as $\frac{\text{regulatory equity}}{\text{risk weighted assets}}$ (later, market and operational risks multiplied by a factor of 12.5 were also included in the denominator).

unrealised reserves⁹ and subordinated liabilities. In particular, the recognition of unrealised reserves was a highly debated issue in the German discussion. The Bundesbank and the supervisory authority were opposed to the acknowledgement of unrealised reserves at all since they were expected to generate pro-cyclical effects. The government envisaged only very restrictive use of unrealised reserves in its original proposal. Lobbying by the banks, mainly with the argument that too-strict rules would put them at a competitive disadvantage internationally, led to a relative softening of the rule. To be able to include unrealised reserves as additional capital banks needed to hold at least 4.4 per cent as core capital. The maximum eligible additional capital made up of unrealised reserves, then, was 1.4 per cent.

Table 1 – *Composition of core capital*

1. Paid-up capital
– own shares
– cumulative preferential shares
2. + Published reserves
3. + Approved transfers to reserves
4. + Assets contributed by silent partners
5. + Fund for general banking risks (section 340(g) of the German Commercial Code)
= Core capital (gross)
– Losses
– Intangible assets
= Core capital (net)

Source: Deutsche Bundesbank (1993a).

⁹ Unrealised reserves occur when the market value of an asset is above its value in the balance sheet.

Table 2 – *Additional capital since 1993*

1. Contingency reserves (section 340(f) of the German Commercial Code)
2. + Cumulative preferential shares
3. + Unrealised reserves
4. + Reserves pursuant to section 6(b) of the German Income Tax Act
5. + Capital represented by participation rights (section 10(5) of the German Banking Act)
6. + Subordinated liabilities (*up to 50% of core capital*)
7. + Commitments of members of credit institutions organised as cooperatives (*up to 50% of core capital*)

Source: Deutsche Bundesbank (1993a).

This can be seen as a compromise solution, since it is still stricter than the requirements prescribed by the directive. Therefore, the translation of the directive into German law led to major changes in capital requirement regulations in Germany. Besides broadening of the assets to be included (this was already on the agenda in Germany for some time before the directive) it led to a softening of the established eligibility criteria for regulatory capital (Deutsche Bundesbank, 1993a). Also, the issue of banks' international competitiveness became more prevalent in the discussions.

The structure of banking regulation in Germany was further affected in 1997 by the implementation of the Capital Adequacy Directive¹⁰ and the Financial Services Directive,¹¹ which again were based on a recommendation of the Basel Committee. Additionally, some elements of the Second Capital Adequacy Directive¹² were implemented. There were four main changes relevant to capital requirement regulation in Germany. A change of the eligible own funds for regulatory purposes, the

¹⁰ Directive 93/6/EEC on the capital adequacy of investment firms and credit institutions.

¹¹ Directive 93/22/EEC on investment services in the securities field.

¹² Directive 98/31/EC amending Council Directive 93/6/EEC on the capital adequacy of investment firms and credit institutions.

introduction of the trading book, the introduction of capital requirements for market price risks and the allowance for banks to use internal risk models to calculate those market risks. The changes were implemented with the sixth amendment of the Banking Act and an amendment of Principles I and Ia (Deutsche Bundesbank, 1998).

While the Financial Services Directive mainly aimed to create a level playing field for investment firms and banks, the Capital Adequacy Directive introduced the same capital requirements for the same business when carried out by banks or by investment firms. The business of investment firms is largely related to securities transactions. Now banks have to put this type of business in a so-called 'trading book' while the rest of a bank's business remains in the so-called 'banking book'. All own-account positions in financial instruments, marketable assets and equities taken on by the institution with the intention of profiting from short-term price variations have to be included in the trading book. The own funds requirements for the trading book are then equally valid for banks and investment firms. However, if a bank's trading book business is small it can be exempt from the regulation (Deutsche Bundesbank, 1998).

One of the most relevant changes was that the eligible capital base was extended again. Now Tier 3 capital could be used to cover certain risk positions of the trading book. The net profits of the trading book and short-term subordinated liabilities were recognised as Tier 3 capital (Deutsche Bundesbank, 1998). Unlike the discussion about the softening of eligibility criteria for capital with the fourth amendment of the Banking Act, this issue gained only little attention.

A further important change was made in the regulation of market price risks in 1998. Until then banks only had to back their counterparty and credit risks with capital (Principle I). Principle Ia only limited the positions with market price risks as a ratio to equity. This was changed. Principle Ia was abandoned and assets weighted for market price risks now had to be backed with own funds. This made capital requirements depend on the computation of market risk. For the computation the institutions have a choice between using a standardised method or internal risk models. Originally, the proposal of the Basel Committee included only a standard method to determine market risk. Only after

complaints by the banks, which noted that the standard method did not encourage the improvement of risk management systems and did not sufficiently acknowledge risk diversification and the internal risk measurement systems of banks, a second proposal was released, which allowed banks to use internal risk models for supervisory purposes. The use of an internal risk model avoids, according to the Bundesbank, multiple calculations for internal and supervisory purposes and so saves costs. Additionally it avoids problems of the standard methods, like the misallocation of credit. If institutions decide to use internal models, the supervisory authority needs to approve them (Deutsche Bundesbank, 1998). Only few banks use internal risk models to determine market risk. In 1997 three banks were using internal risk models, by 2006 the number had increased to 16 and by 2012 it had fallen to 11.¹³

On an international level the work on Basel II was already on-going for a while. In 1999 the first and in 2001 the second consultation papers were published. After the release of additional consultative papers and quantitative impact studies, the final version of Basel II was published in June 2004. The European Commission translated the contents of Basel II into the directives 2006/48/EC¹⁴ and 2006/49/EC.¹⁵ Those had to be implemented by 2007 and 2008 respectively (Deutsche Bundesbank, 2006). During the discussion, German negotiators had two main goals. One was related to loans granted to small and medium enterprises (SMEs), where they pushed for lower capital requirements, and the second was related to intergroup liabilities in the saving and cooperative banking groups, where they pushed for a zero risk weight. They succeeded on both issues (Deutscher Bundestag, 2006). In Germany, the directives were implemented through changes to the Banking Act, to the German Large Loans Regulation (*GroMiKV*) and in the Minimum

¹³ However since the banks using the models are most likely big banks, the share of the banking sector in terms of assets can still be substantial. For the number of banks using risk models see the yearly reports of the Bundesanstalt für Finanzdienstleistungsaufsicht for the respective years.

¹⁴ Directive 2006/48/EC relating to the taking up and pursuit of the business of credit institutions.

¹⁵ Directive 2006/49/EC on the capital adequacy of investment firms and credit institutions.

Requirements for Risk Management (*MaRisk*), as well as through the introduction of the Solvency Regulation (*Solvabilitätsverordnung*), which replaced Principle I.

In the Banking Act, the main change regarding capital requirements was the introduction of so-called modified available capital. Modified available capital is the new key indicator of solvency regulation and therefore for the calculation of capital adequacy. Compared to the liable capital consisting of core and additional capital, modified available capital has some add-ons or deductions resulting from the use of certain calculation methods. Some examples from which such add-ons or deductions can arise include certain securitised positions or value adjustments related to the use of internal ratings.¹⁶

The new solvency regulation applied starting from January 2007. However, banks could opt for applying Principle I for one more year. The main changes introduced were capital requirements for operational risks and new calculation methods for credit risks. Until the introduction of the Solvency Regulation, risks other than market and credit risks were considered covered by the 8 per cent solvency ratio. Of particular importance among those other risks is operational risk¹⁷ that, according to the new solvency regulation, has to be explicitly determined and covered with capital. Banks can use three different methods for the calculation of operational risk. The most basic one determines the capital requirement by multiplying certain positions from the profit and loss accounts by a certain factor. The most sophisticated one allows banks to use internal risk calculation models after their prior approval by the supervisors.

The standard approach for the determination of credit risk¹⁸ was replaced by two options. Banks can choose to use the standardised

¹⁶ For more details regarding the calculation of modified capital, see the table “How to calculate modified available capital” in Deutsche Bundesbank (2006, p. 71).

¹⁷ Losses caused due to the inadequacy or failure of internal processes, of humans and systems or external factors.

¹⁸ In the standard approach, risk weights between 0 and 100 per cent were allocated to a bank’s assets, according to the type of asset and borrower, so that for example for borrowing to banks located in OECD countries a 20 per cent, or for loans collateralised with mortgages a 50 per cent, risk weight applied.

approach, which is based on the external ratings of rating agencies. Depending on the external rating different risk weights are applied. For certain types of loans, such as retail loans, SME loans or loans collateralised with residential mortgages, preferential risk weights are applied across the board without considering external ratings (Deutsche Bundesbank, 2006). As an alternative banks can use the so-called internal ratings-based approach (IRB-approach), which is based on internal ratings. To calculate the actual risk from an exposure, different risk components have to be considered: the probability of default, loss given default and exposure at default. Furthermore, the residual maturity of a loan plays a role as a risk component in the IRB approach (Deutsche Bundesbank, 2001). The banks have a choice between using the simple IRB approach and an advanced approach. For the simple approach they only need to estimate the probability of default of the rating classes themselves, while for the other components standard values provided by the supervisor are used. In the advanced approach all components are determined by the banks' internal models. Also, for the calculation of risk exposures in derivatives the range of calculation approaches available to banks was extended and the calculation could now be based on internal models (Deutsche Bundesbank, 2006). In the new approaches the range of recognised risk-reducing collateral is extended. In the standard approach most financial collateral can be used (and mortgages are already recognised with their own category). Institutions that use an IRB-approach can additionally reduce their regulatory risk weight with collateral in the form of claims or physical assets. Institutions using the advanced approach can use all types of collateral as long as they are able to determine reliable estimates of asset values. Again, only a few institutions use internal risk models. In 2011 only 47 institutions used an IRB-approach, of which 15 use an advanced approach, while 1846 institutions used the standard approach (Bundesanstalt für Finanzdienstleistungsaufsicht, 2012). According to the Bundesbank, banks using internal approaches are either big and internationally active or specialised small- or medium-sized institutions. While the number of institutions using the IRB-approach for credit risk is small, in terms of

balance sheet size they cover 62 per cent of the banking sector (Deutsche Bundesbank, 2009a).

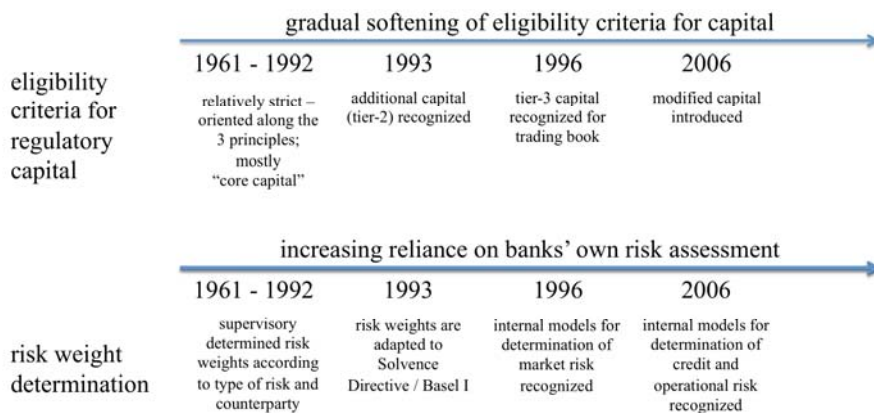
2.3. Main trends and phases

To sum up, until 1992 the development of capital requirement regulation in Germany was largely a national issue. While international coordination attempts picked up shortly after the Herstatt crisis, those only directly affected German capital requirement regulation in 1992 through EEC-directives, which in turn were mostly based on recommendations and agreements from the Basel Committee. An overarching trend in capital requirement regulation was the gradual acknowledgement of new risks. After the increased internationalisation of some banks, the Herstatt crisis unveiled that banks in this new environment were increasingly exposed to new forms of risk. In 1976 price risks due to foreign exchange positions were regulated for the first time. Later on, in 1980, other price risks from positions in gold, silver and platinum were limited as well. The increasing exposure of banks towards off balance sheet derivatives was first addressed in 1990 and the counterparty risk of those trades had to be covered with equity. Also, the total risks a bank could incur from derivatives were limited. In 1992 the range of assets that had to be backed for their credit and counterparty risk was extended. In 1998 a major change happened. Until then, market price risks were limited by Principle Ia. In 1998, this regulation was abandoned and instead asset weighted by their market price risk had to be covered with equity. Since 2007, operational risks also had to be determined explicitly and covered with equity. Until then it was assumed that those risks were covered within the 8 per cent capital ratio.

Regarding the eligibility criteria of regulatory equity, one can divide the development into two phases. During the first and largely national period between 1961 and 1992, the eligibility criteria for capital were oriented alongside the three principles of being fully paid-up, capable of meeting current losses and being permanently available. The Bundesbank, politicians and the supervisory authorities strongly resisted softening these. A prime example of this resistance was the attempt by

the savings banks to get a surcharge for their public guarantee. It was rejected and instead led to the reduction of the cooperative banks surcharge for their members call liability. The parliamentary discussions were largely concerned with the stability of the banks or with the level playing field for different parts of the national financial system. Concerns about German banks' international competitiveness were limited.

Figure 1 – *Main trends in capital adequacy regulation*



Starting from 1992, when Basel I was implemented, the eligibility criteria for capital were gradually relaxed. In 1992 additional capital was introduced to implement the own funds directive. The discussion in the parliament demonstrated the resistance against a softening of the criteria. Nevertheless, lobbying by banks, which forcefully raised the argument about international competitiveness, was fruitful and led the German legislators to enact a less strict version of the law than originally envisioned. However, the eligibility criteria were still stricter than necessary to comply with the directive. In 1998 a further step was taken and the capital adequacy directive was introduced. Now Tier 3 capital was allowed to cover market price risks. Discussions on the issue were

limited. Still, the implementation was again a little stricter than demanded by the directive. A cap on the maximum net profits in the trading book was introduced to limit the amount of business that could be built on those unrealised profits. A further change in the eligibility criteria of capital was the introduction of modified capital, with Basel II. Different to preceding changes, the German legislators, instead of bolstering the regulation, stated that when drafting the necessary regulatory amendments they had adhered strictly to the minimum requirements of the EC directive to avoid any overburdening of the banks (Deutscher Bundestag, 2006). Overall, attempts at international regulation and harmonisation in this period led to a gradual softening of the capital eligibility criteria. While German legislators tended to move beyond the directives and bolster the minimum standard, the argument of international competitiveness became more influential in the discussions over time.

Another important change in capital requirement regulations was the determination of risk weights. In Germany, some crude risk weights and also deductions for certain collateralised loans were introduced relatively early. Those were adapted to an internationally agreed framework of risk weights, when Basel I was introduced. A major change in the determination of risk weights took place when the capital adequacy directive was launched in 1998. First of all, banks had to determine which of their assets were allocated to the banking book and which to the trading book. The capital requirement for positions held in the trading book was substantially lower than for the banking book (Basel Committee on Banking Supervision, 1999). For the first time, own internal models could be applied to determine market risk. This was not initially the idea of the Basel Committee, which proposed a standard framework for the determination of market risk in 1993, but was only introduced after banks lobbied for it. When the rules for the determination of credit risk were renewed with Basel II there was again a standard approach but, as with market risk, banks were allowed to use their own internal risk models to determine their capital requirements. For operational risk too banks were allowed to use their own risk models.

3. Problems with banks' internal risk models¹⁹

As demonstrated above, the international regulation led to a gradual softening of eligibility criteria for banks' capital in Germany. At the same time banks were given a major role in determining their own risk weights. As a reaction to the financial crisis there was a widely held view that those two trends were responsible for enabling some banks to become severely undercapitalised and to hold very little hard core capital. This led to major regulatory reforms in this area. The overall capital ratio was to be increased. The share of capital that has to be held as core capital was increased too.²⁰ Similar insights did not seem to have occurred for the determination of risk weights, where internal risk models were still to play a central role.²¹ The following section shows why the approach of relying on banks' internal models to determine risk, and therefore the capital necessary, is problematic.

The argument here is threefold. Firstly, it is argued there are severe incentive problems that will encourage banks to use their discretion in determining risk models to reduce their capital requirements. Secondly, even if banks behaved prudently and any incentives were correct, there are externalities that managers will not take into account and, therefore, desired private capital levels will be lower than socially optimal. Thirdly,

¹⁹ In the following the focus will be on problems of internal models in determining capital requirements from a financial stability point of view. Other problematic features, like the bias against smaller banks, which are very important in the German system, will not be addressed here. Regarding this problem and US attempts to overcome it, see for example Masera (2013).

²⁰ The ratio of common equity Tier 1 capital will increase from 2 per cent to 4.5 per cent of risk-weighted assets. In addition, a bank will have to hold 1.5 per cent of Additional Tier 1 capital. Tier 2 capital will be of less importance. It will only be able to contribute 2 per cent (earlier 4 per cent) to the total capital requirement of 8 per cent. Additionally a range of buffers can apply which, when combined, may raise the total requirement of certain institutions by 8.5 per cent. However, the capital ratio required is still far below the demands of some critics, who argue for ratios of 20 to 30 per cent (see for example Admati and Hellwig, 2013).

²¹ Even though there have been some changes that may make the models more robust, e.g. the introduction of a stressed value at risk and an incremental default and migration risk charge, or restrictions on the rating of some securitised positions, the overall methodology has been maintained and the more fundamental problems still remain.

the possibility of measuring risk accurately is flawed in its own right. Here it can be argued that banks lack the necessary data and information to do so, and even further that in a world of uncertainty it is not even theoretically possible to obtain this information. Moreover, further criticisms of the specific models used will be discussed below.

Regarding the first point, one should be reminded of the theoretical rationale for capital requirements discussed earlier. Due to limited liability and the 'too-important-to-fail' problem, managers and shareholders have an incentive to take on excessive risk levels and reduce capital. Deposit insurance and 'too-important-to-fail' weaken possible market discipline that would otherwise enforce higher capital levels. Therefore, banks choose distorted capital-risk combinations. Regulatory capital requirements are introduced to correct this distortion. It was argued that uniform or crude regulatory risk weights would lead banks to choose particular risky assets. As a response, regulators tried to fine-tune risk weights. In the search for optimal risk weights, banks' internal risk models were seen as the solution. However, in the course of this process the purpose of capital regulation was lost. The possibility that banks, which want low capital and high risk to boost their return on equity, might use their control over risk models to manipulate risk measurements in their own interest was ignored (Admati and Hellwig, 2013, p. 184). The fact that banks have sufficient leeway to manipulate models can be seen from the narrative evidence of their reaction to the need to increase capital in response to the financial crisis, and Basel III. US banks' senior officials' comments on their use of financial restructuring and managing of assets to achieve higher capital levels speaks volumes (Braithwaite, 2011). More quantitative evidence can be found for European banks. The risk-weighted assets of Deutsche Bank were reduced by 55 billion euros in the last quarter of 2012 to achieve a higher capital ratio. Only part of it was achieved by an actual reduction of balance sheet positions. About one half to three quarters of the reduction was due to 'finer calibration' of risk models. Hübner and Noonan (2013) state, that according to one of the large rating agencies, the ratio of risk-weighted assets to balance sheet size in the banking sector was reduced between 2007 and 2012 from 65 per cent to 35 per cent. This can hardly be explained by the

reduction of risky business. The British Financial Services Authority (FSA) asked 13 banks to calculate the default risk of a portfolio of securities. The highest calculated risk was six times higher than the lowest calculation for the same portfolio (Storbeck, 2012). The use of own risk models was allowed because of the argument that the risk weights of Basel I lead to distortions. Nevertheless, the use of risk models also leads to distortions. Admati and Hellwig (2013) argued that banks tend to move into assets where risk weights can be easily manipulated. In particular mortgage-backed securities (MBS) benefited from this distortion, while SME loans suffered. For example, due to lower risk weights in the trading book for MBS than for whole mortgages (1.6 vs. 4 per cent), the process of securitisation was driven by banks' attempts to economise on equity (The Financial Crisis Inquiry Commission, 2011, p. 476).

However, even if banks' risk managers were most prudent and had proper economic incentives, the attempt to align economic and prudential capital requirements is problematic. Externalities, such as systemic risk, will lead to a deviation of socially optimal and privately optimal capital ratios. The economic capital that banks want to hold depends on their individual risk. It is not clear why banks should internalise externalities such as systemic risk, even if they could determine it. Therefore, basing regulatory capital requirements on economic capital calculations, when there are externalities, will lead to capital ratios that are lower than what would be socially optimal (Goodhart, 2005).²²

Additionally, attempts to measure risk with the help of risk models have severe technical flaws and weaknesses. Most regulatory risk models, e.g. the value at risk (VaR) approach, view risk as an exogenous variable. However, risk is endogenous, for example volatility is determined in markets by the behaviour of all individual agents. Financial modelling and acting on those models will change the

²² Under Basel III this problem is partially addressed by higher capital requirements for institutions or positions that increase systemic risk. Also the option of regulators to discretionarily set stricter requirements for certain institutions could be used to address those problems. However, this depends on the attitude of the supervisory authorities.

statistical laws of the process²³ and, therefore, will always leave the modeller a step behind. In normal times, where agents are heterogeneous and their actions cancel each other out, the failure to acknowledge this endogeneity is less problematic. It becomes relevant in times of crisis, when agents act homogeneously. The process that drives the underlying data will be interrupted by a structural break, violating one of the central assumptions of the VaR approach. The data preceding the structural break will be useless to estimate risk. That means those risk models are of no use at the moment they are most needed. Additionally, the use of relatively uniform risk modelling techniques across banks will only enhance the homogeneous behaviour since risk models will propose similar actions and so can aggravate the crisis. There are many other shortcomings in practice. For example, Danielsson (2002) showed that risk models, as used in practice, are not robust across different asset classes, time horizons and risk levels. Further issues are the high volatility of risk estimates and risk managers' reaction to them, the subjective choice of the model estimation horizon, the problems with calculating VaR estimates for different holding periods and the problem of changing correlations (Danielsson *et al.*, 2001).²⁴ Using different risk models and a number of observations estimating the VaR for an IBM stock he obtains results differing by a factor of two (Danielsson, 2002). He argued that:

“[g]iven current technology, risk modelling is simply too unreliable, it is too hard to define what constitutes a risk and the moral hazard issues are too complicated for risk modelling to be an effective part of regulatory design, whether for market, credit, liquidity, or operational risk” (*ibid.*, p. 1292).

Another frequently discussed flaw of risk models is their procyclicality. In good times, models will show low risk levels. That means based on a certain amount of equity banks can purchase more assets and give more loans. As soon as a crisis situation occurs, risk estimates will increase and require higher capital requirements. If the bank in this situation cannot raise additional equity, it will have to sell assets. This

²³ This also relates to what Soros called “reflexivity”.

²⁴ Another good overview about criticisms regarding the practical problems with statistical risk models is provided by Roncaglia (2012).

puts pressure on asset prices and could set off a contagious downward spiral (Angius *et al.*, 2011).

While those technical aspects are highly relevant, some of them could probably be overcome with further improvement of models and techniques. A more fundamental problem is uncertainty. The risk weights in the models are calculated based on past experience. Yet, there is nothing that guarantees that the future will be anything like the past. For many of the relevant events it is impossible to assign any probability. Additionally, one does not know what the relevant events might even be. Donald Rumsfeld's famous quote describes the idea quite well: "There are known unknowns; that is to say there are things we now know we don't know. But there are also unknown unknowns; there are things we do not know we don't know".²⁵ Therefore, all attempts to precisely measure an optimal amount of equity are flawed. One cannot know whether the actual chosen capital levels are too high or too low. Therefore, appropriate regulatory capital levels cannot be determined scientifically.²⁶ The eventual decision will be political and depend on an uncertain trade-off between the robustness of the financial system and the potential prevention of costly crisis and the potential costs to society in terms of lower growth or efficiency.^{27, 28}

The limitations of the models become particularly problematic if bankers become too confident in their risk management abilities and forget about their shortcomings. Similar to the observation that the perception of safety provided by seatbelts causes people to drive faster, the high confidence provided by risk management techniques and models

²⁵ Donald Rumsfeld speaking at a Department of Defense news briefing on 12 February 2002. Transcript available at: <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2636>.

²⁶ See Roncaglia (2012) for a very good essay on the implications of uncertainty on the use of statistical risk models for market participants and regulators.

²⁷ In addition to these costs, one has to consider that there may be costs in the short term for the transition from badly capitalised banks to well capitalised banks. If banks cannot raise additional capital and so deleveraging in the banking sector occurs, this may lead to a credit crunch. However, adequate compounding measures could minimise the problem.

²⁸ Some authors argue that while there are private costs, for society as a whole there are no or much lower costs. See, for example, Admati and Hellwig (2013).

could lead to the taking on of higher risk, since one has the apparent ability to manage it (Admati and Hellwig, 2013). Similarly, Krahnert and Carletti (2007) argued that there is an enormous capacity built up in risk management and risk measurement skills in banks. The ability of banks to quantitatively found risk measurements can enhance their ability to limit risks. However, the perceived increased risk competence can lead to increased risk appetite as well. This is particularly severe if the above-mentioned practical and theoretical problems of risk measurement techniques are not acknowledged.

There are massive problems with internal risk models ranging from theoretical issues to problems of practical implementation. Considering these problems in combination with the incentives of banks to 'game' their regulation, the central role of internal risk models in capital adequacy regulation before the crisis is incomprehensible.

Shortly after the crisis hit many adjustments were made, first through the revisions of the Basel II market risk framework (known as Basel II.5) and then through Basel III. Basel II.5 introduced an incremental risk charge (which addresses e.g. the risk of securities being downgraded) and a stressed value at risk (which assumes a crisis-like scenario). From then on, the new minimum trading book capital was composed of those together with the already used value at risk. A quantitative impact study of 43 banks estimated that capital requirements would increase on average by 11.5 per cent (median 3.2 per cent) (Basel Committee on Banking Supervision, 2009). Additionally, some securitised positions can no longer be calculated with the help of internal models. Instead a standard approach needs to be applied. For some specific positions a so-called comprehensive risk measure can be applied. With the application of Basel III some additional changes will take place. Overall, the general level of capital and, in particular its quality, is increased. Additionally, due to a countercyclical buffer and a capital conservation buffer some anti-cyclical elements are introduced, which will help to mechanically correct some of the pro-cyclical features of risk models and, if the planned un-weighted leverage ratio were to be introduced, this would limit the scope for banks to lower their capital too far.

Those innovations address some of the issues mentioned above, e.g. some of the weaknesses of the VaR or the problem of pro-cyclicality, and will, compared to the current situation, lead to higher capital requirements. However, they do not address the fundamental issues. While they try to improve the models, the moral hazard problem is not solved – banks still have leeway and incentives to use the models to reduce their capital requirements. The introduction of the stressed value at risk will alleviate some of the problems with structural breaks in the data, but cannot address the fundamental problem of uncertainty. Currently, the Bank for International Settlements is working on further improvements to the models used for the determination of market risk (Basel Committee on Banking Supervision, 2013b). While many of the proposed measures will indeed help to alleviate some of the technical issues and make the models more crisis-proof (e.g. the use of expected shortfall measures instead of VaR) they will still not address all the problems. No matter how well the models are designed, in a world of uncertainty they are not able to provide precise risk measures. The additional incentive problem will also not be resolved.

This does not mean we should completely abandon risk models and risk management. They can be useful tools for internal management decisions. Decision-makers in the banks need to understand the shortcomings of the models and realise that they still have some management responsibility beyond acting according to numbers retrieved from a model. While the risk models can be a valuable addition to management decisions, they should not replace them. If this is not understood, risk management may even be detrimental to the company.

Considering the current shortcomings of the models, the problem of uncertainty and the moral hazard problems, for regulatory purposes these models seem even less qualified.²⁹ It could, and is currently being tried, be possible to prescribe better models to the banks. However, with the moral hazard problem in place, banks will go on trying to ‘game’ the

²⁹ See also Roncaglia (2012), who argues that under uncertainty, properly applied statistical risk models can be a useful guide in day-to-day banking management, but are of little use for regulatory purposes from a systemic perspective.

models so that regulators will have to make very precise specifications. This, in turn, will lead to a homogenisation of the models and so aggravate the problem of endogenous risk. At the same time, the innovative capacity for risk modelling in the banks will be undermined. Given those constraints, banks' internal risk models should not be used for regulatory purposes. Instead, one could focus on the standardised approaches and try to minimise the problems by refining them and reduce the incentives for regulatory arbitrage. Alternatively, one could think about prescribing a high capital floor so that risk models only matter at the margin. Tarullo (2014) argues that stress test based capital requirements combined with a leverage ratio would be the better solution and that internal risk models should be abandoned altogether, as currently discussed in the US.

4. Conclusions

This paper attempted to give the reader an overview of the development of capital requirement regulations in Germany. After a theoretical discussion of reasons for capital requirements, the development of regulation in this area since the 1930s is reviewed. Different trends were identified. Overall, through the increased internationalisation and complexity of banking, new risks emerged, risks that were gradually addressed by regulation. While in the beginning regulation focused on credit risk, later market risks, counterparty risks and operational risks became subject to regulation, too. Since 1992 capital requirement regulation is largely determined on an international level. Since then, the overall trend demonstrates a gradual softening of the notion of capital and the increased determination of risk weights with the help of banks' internal risk models. Both trends are seen as problematic and contributed to the incomprehensibly low capital endowments of some banks prior to the financial crisis. While the trend towards softening the eligibility criteria for regulatory equity has been reversed with Basel III, the trend towards using internal risk models in

determining regulatory capital charges was not. Therefore, this paper outlined the problems of using risk models.

Besides technical problems, there are problems with banks' incentives, with the difference between social and economic capital adequacy, with uncertainty and with increased trust in models as a basis for decision-making. Currently, regulators are trying to improve the models to fix their technical problems and make them more crisis-proof. However, this is problematic. It is argued that since many of the aforementioned problems are not addressed properly or even recognised, the further reliance on models as a central tool for capital adequacy regulation is a mistake at least within the current regulatory framework. So what would be an appropriate regulatory response to the different issues identified?

The *technical shortcomings* of the models are probably the most obvious problem that can be addressed. Experts are already working on improvements to overcome many of the issues associated with the risk models currently used in practice. The planned replacement of VaR with a measure of the expected shortfall is only one example and others have been discussed above. Therefore as we have seen in the past, through better technology and more research, risk measurement techniques will gradually improve. They will become more accurate, reliable and robust.

The *problem of pro-cyclicality* can be addressed as well. One approach in Basel III is to solve it mechanically by introducing a counter-cyclical capital requirement triggered when the financial sector is growing excessively. This approach is similar to ideas that some economists and central bankers, such as Charles Goodhart, have proposed before.³⁰ An alternative or supplementary instrument to address this problem could be the application of Asset-Based Reserve Requirements. This would be particularly helpful if it is intended to address problems in specific markets and would give an additional instrument to regulators.³¹ Using a through-the-cycle instead of a point-

³⁰ See for example Goodhart (2005).

³¹ For a discussion of Asset Based Reserve Requirements in this context, see Detzer (2012).

in-time approach could help to alleviate the problem directly in the models (Masschelein, 2007). Overall, there are promising attempts and possibilities to address the problem of pro-cyclicality at the banks' level or through intervention by the supervisors.

The problem of *differences in economically and socially optimal capital levels* needs to be addressed by the supervisors. The most apparent issue here is systemic risk. Individual banks lack the incentive but also the necessary information to internalise systemic risk automatically into their capital ratios. The supervisors' role, therefore, is to develop appropriate measures to capture systemic risk. Capital charges for this risk would be added to the individually appropriate capital requirement. Basel III incorporates some of those ideas. There will be higher capital requirements for systemically important institutions and supervisors have the ability to add, at their discretion, additional relatively flexible capital charges that can be applied on a sectoral level, for groups of institutions or for specific activities or claims.

The *moral hazard problem* of banks' incentives to understate their individual capital requirements still remains. Bank managers and owners prefer lower capital to boost their return on equity. There are attempts to address this problem. Higher overall capital requirements so that owners have more skin in the game, living wills and regulations on managers' compensation packages may help to alleviate the moral hazard problems. Whether they are able to fully address the issue remains doubtful.

The remaining problem is *uncertainty*. Even if regulation manages to alleviate the moral hazard problem, the technical problems of the models are resolved and the regulators apply correct systemic risk charges, the determined capital ratios may still be inappropriate. There are events whose probabilities cannot be determined and there will be events no one could ever have imagined happening. There is fundamental uncertainty about the future. If one accepts this, the determined risk measures and the derived capital ratios can only be rough guides to determine capital requirements. The eventual decision is an uncertain political decision. A society needs to decide between the uncertain benefits of a better capitalised financial system for when the next unforeseen shock arrives and the potential costs of asking banks to hold

higher levels of capital. Politicians should be aware that there is a political decision to make and that their task cannot be taken over by ‘scientifically’ derived figures, no matter how well they are derived. For academics, the task remains to develop a theory of optimal capital requirements.

REFERENCES

- ADMATI A. and HELLWIG M. (2013), *The Bankers’ New Clothes: What’s Wrong with Banking and What to Do about It*, Princeton (NJ): Princeton University Press.
- ADMATI A., DE MARZO P.M., HELLWIG M.F. and PFLEIDERER P. (2013), “Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity Is not Socially Expensive”, *Working Paper*, n. 161, Rock Center for Corporate Governance, Stanford University, Stanford.
- ALLEN F. and GALE D.M. (2002), “Capital Adequacy Regulation: In Search of a Rationale”, *Working Paper*, n. 03-07, Wharton Financial Institutions Center, University of Pennsylvania, Philadelphia.
- ANGIUS S., FRATI C., GERKEN A., HÄRLE P., PICCITTO M. and STEGEMANN U. (2011), “Risk Modeling in a New Paradigm: Developing New Insight and Foresight on Structural Risk”, *McKinsey Working Papers on Risk*, n. 13, McKinsey & Company, Washington (DC).
- BASEL COMMITTEE ON BANKING SUPERVISION (1999), “Capital Requirements and Bank Behaviour: The Impact of the Basel Accord”, *BCBS Working Papers*, n. 1, Bank for International Settlements, Basel.
- (2009), *Analysis of the Trading Book Quantitative Impact Study*, Basel: Bank for International Settlements.
- (2013a), *A Brief History of the Basel Committee*, Basel: Bank for International Settlements.
- (2013b), *Fundamental Review of the Trading Book: A Revised Market Risk Framework*, Basel: Bank for International Settlements.
- BRAITHWAITE T. (2011), “Banks Turn to Financial Alchemy in Search for Capital”, *Financial Times*, 24 October.
- BRUNNERMEIER M.K. and OEHMKE M. (2013), “Bubbles, Financial Crises, and Systemic Risk”, in Constantinides G.M., Harris M. and Stulz R.M. (eds.), *Handbook of the Economics of Finance*, Oxford: North Holland, pp. 1221-1288.
- BUNDESANSTALT FÜR FINANZDIENSTLEISTUNGSAUFSICHT (2011), *Jahresbericht 2010*, Bonn: Bundesanstalt für Finanzdienstleistungsaufsicht.
- (2012), *Jahresbericht 2011*, Bonn: Bundesanstalt für Finanzdienstleistungsaufsicht.
- COMMITTEE ON BANKING REGULATION AND SUPERVISORY PRACTICES (1987), “Proposal for International Convergence of Capital Measures and Capital Standards”, *Consultative Paper*, Basel.

- DANIELSSON J. (2002), "The Emperor Has no Clothes: Limits to Risk Modeling", *Journal of Banking and Finance*, vol. 26 n. 7, pp. 1273-1296.
- DANIELSSON J., EMBRECHTS P., GOODHART C., KEATING C., MUENNICH F., RENAULT O. and SHIN H.-S. (2001), "An Academic Response to Basel II", *Special Paper Series*, n. SP130, LSE Financial Markets Group, London.
- DETZER D. (2012), "New Instruments for Banking Regulation and Monetary Policy after the Crisis", *Intervention: European Journal of Economics and Economic Policies*, vol. 9 n. 2, pp. 233-254.
- DEUTSCHE BUNDESBANK (1962), *Monthly Report*, March, Frankfurt: Deutsche Bundesbank.
- (1964), *Monthly Report, December*, Frankfurt: Deutsche Bundesbank.
- (1969), *Monthly Report, March*, Frankfurt: Deutsche Bundesbank.
- (1976), *Monthly Report, July*, Frankfurt: Deutsche Bundesbank.
- (1985), *Monthly Report, March*, Frankfurt: Deutsche Bundesbank.
- (1988), *Monthly Report, January*, Frankfurt: Deutsche Bundesbank.
- (1990), *Monthly Report, August*, Frankfurt: Deutsche Bundesbank.
- (1993a), *Monthly Report, January*, Frankfurt: Deutsche Bundesbank.
- (1993b), *Monthly Report, March*, Frankfurt: Deutsche Bundesbank.
- (1998), *Monthly Report, May*, Frankfurt: Deutsche Bundesbank.
- (2001), *Monthly Report, April*, Frankfurt: Deutsche Bundesbank.
- (2006), *Monthly Report, December*, Frankfurt: Deutsche Bundesbank.
- (2009a), *Monthly Report, January*, Frankfurt: Deutsche Bundesbank.
- (2009b), *Monthly Report, September*, Frankfurt: Deutsche Bundesbank.
- (2011), *Zweite Verordnung zur weiteren Umsetzung der geänderten Bankenrichtlinie und der geänderten Kapitaladäquanzrichtlinie*, Frankfurt: Deutsche Bundesbank
- (2013), *Monthly Report, June*, Frankfurt: Deutsche Bundesbank.
- DEUTSCHER BUNDESRAT (1984), 545. Sitzung, 20 December, Bonn: Deutscher Bundesrat.
- DEUTSCHER BUNDESTAG (1984), "Entwurf eines Dritten Gesetzes zur Änderung des Gesetzes über das Kreditwesen, Drucksache 10/1441", 14 May, Bonn: Deutscher Bundestag.
- (2006), *Plenarprotokoll 16/18*, 15 February, Berlin: Deutscher Bundestag.
- THE FINANCIAL CRISIS INQUIRY COMMISSION (2011), *The Financial Crisis Inquiry Report*, Washington (DC): U.S. Government Printing Office.
- FREIXAS X. and ROCHET J.-C. (2008), *Microeconomics of Banking: Second Edition*, Cambridge (MA): MIT Press.
- GOODHART C.A.E. (2005), "Financial Regulation, Credit Risk and Financial Stability", *National Institute Economic Review*, vol. 192 n. 1, pp. 118-127.
- HÜBNER A. and NOONAN L. (2013), "Banken rechnen sich ihre Bilanzrisiken schön", *Format.at*, 13 February.
- KRAHNEN J.P. and CARLETTI E. (2007), "Kapitalregulierung von Banken und systemische Risiken im Lichte von Basel II", *Zeitschrift für das gesamte Kreditwesen*, vol. 60 n. 8, pp. 374-376.
- LABONTE M. (2013), "Systemically Important or 'Too Big to Fail' Financial Institutions", *CRS Report*, n. R42150, Congressional Research Service, Washington (DC).

- MASERA R. (2013), "US Basel III Final Rule on Banks' Capital Requirements: A Different-Size-Fits-All Approach", *PSL Quarterly Review*, vol. 66 n. 267, pp. 387-402.
- MASSCHELEIN N. (2007), "Monitoring Pro-Cyclicality under the Capital Requirements Directive: Preliminary Concepts for Developing a Framework", *Working Paper Document*, n. 120, National Bank of Belgium, Brussels.
- RONCAGLIA A. (2012), "Keynesian Uncertainty and the Shaky Foundations of Statistical Risk Assessment Models", *PSL Quarterly Review*, vol. 65 n. 263, pp. 437-454.
- STORBECK O. (2012), "Wie Banken ihre Risiken klein rechnen", *Handelsblatt.com*, 19 February.
- TARULLO D.K. (2014), "Rethinking the Aims of Prudential Regulation", presented at the *50th Annual Conference on Bank Structure and Competition: Transitioning to the 'New Normal' in Banking*, Chicago (IL), 8 May.