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ABSTRACT

In the course of creating a single European market for financial services and in the wake of two financial crises, regulatory frameworks in the financial services industry in the European Union have undergone significant change. One of the major reforms has been the transition from static rules-based systems towards principles-based regulation with the intent to better capture the risk situation of an undertaking. For insurance companies, the regulatory framework *Solvency II* is being finalized and is scheduled for implementation after 2013. At the same time, the regulatory regime for banking, *Basel II*, has been revised in response to the financial crisis; the new version is *Basel III*. The aim of this paper is to conduct a comprehensive and structured comparative assessment of *Basel II/III* and *Solvency II* in order to detect similarities and differences as well as the benefits and drawbacks of both regimes, which might be profitably addressed. The comparison is conducted against the background of the industries' characteristics and the objectives of regulation.

1. INTRODUCTION

Regulatory frameworks in the financial services industry in the European Union have recently undergone a significant change, as regulators move away from static rules-based systems, in which the calculation of capital requirements is based on pre-specified rules, and towards principles-based regulation, which intends to provide a better reflection of the true risk situation of an undertaking. *Solvency II*, the planned regulatory framework for insurance companies in the European Union, is being internationally debated because of the prominent role of the European insurance market and its ambitious goals, which constitute a major regulatory step forward. Just as *Solvency II* is about to be finalized, the regulatory rules for banking, *Basel II*, have been revised in response to perceived flaws and weaknesses that were revealed during the financial crisis of 2007/2008. These innovations and extensions of *Basel II* are known as *Basel III*. As Flamée and Windels (2009) state in their analysis of the ongoing cross-border and cross-sectional consolidation within the financial sector, valuable insights could be gained from a comparison of the regulatory systems for banking and insurance. In

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addition, *Solvency II* was modeled upon the *Basel II* three-pillar structure in order to create a level playing field for market participants. Therefore, the aim of this paper is to conduct a comprehensive but concise in-depth comparison between *Basel II/III* and *Solvency II* in light of different industry characteristics and the objectives of regulation in order to detect the similarities and differences in addition to the advantages and disadvantages of both schemes.

The literature on *Basel II* is extensive; thus we will refrain from a comprehensive review and concentrate on selected work. An overview of the process, the framework, and implementing measures is given by the Bank for International Settlements (BIS). References herein include the framework "International Convergence of Capital Measurement and Capital Standards: A Revised Framework - Comprehensive Version"[1] as well as guidelines for implementation. Concerning the (potential) impact of *Basel II*, two areas have been extensively discussed: the pro-cyclical effects[2] and the impact on the availability and price of credit to small and medium enterprises.[3] In terms of *Basel III*, references in the scientific literature are scarce, since these regulations have only recently been adopted. Angelini et al. (2011) study the impact of *Basel III* on long-term economic performance as well as fluctuations in economic performance,[4] while Blundell-Wignall and Atkinson (2010) critically analyze the *Basel III* proposals and find some useful elements but also raise some major concerns. In addition, a summary of these new regulatory measures and the corresponding documents can be found on the homepage of the Bank of International Settlements.

In regard to *Solvency II*, Eling, Schmeiser and Schmit (2007) and Steffen (2008) describe the development and main features, and Duverne and Le Douit (2009) discuss and compare recent developments in *Solvency II* and the International Financial Reporting Standards (IFRS). The impact of *Solvency II* on regulation in countries like Bermuda is analyzed in Elderfield (2009). Doff (2008) tests the *Solvency II* regime in terms of reaching an efficient and complete market based on seven criteria developed by Cummins, Harrington and Niehaus (1994) and concludes that, while *Solvency II* meets most of the criteria, a more balanced approach between Pillar 1 and Pillars 2 and 3 is needed. This analysis is expanded by Holzmüller (2009), who defines four additional criteria and evaluates the Risk Based Capital (RBC) Standard in the U.S., *Solvency II* and the Swiss Solvency Test (SST) using these eleven crite-

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1 See BIS (2006).

2 See, e.g., Ayuso, Perez and Saurina (2004); Heid (2007); Benford and Nier (2007).

3 See, e.g., Altman and Sabato (2005). For further analyses on market discipline, efficiency, and an analysis of implementations costs versus benefits are conducted in Decamps, Rochet and Roger (2004), Barth, Caprio and Levine (2004), and Herring (2005), respectively.

4 Their estimates of the costs of higher capital requirements are used in BIS (2010d) to assess the long-term costs and benefits of stricter regulation.

ria and concludes that *Solvency II* and the SST fulfill most of the criteria, while several shortcomings for the RBC Standard are detected. An overview of the Swiss Solvency Test and its implications are presented in Eling, Gatzert and Schmeiser (2008).

Further literature on the comparison of different regulatory schemes include Dacorogna and Keller (2010), who compare the SST and *Solvency II* and point out several differences as well as analogies in implementation and conception, and Eling and Holzmüller (2008), who compare four regulatory schemes for the insurance industry that represent different approaches to regulation, e.g., the use of static factor models or a dynamic rating-based approach. They conclude that there are major differences, especially in the applied risk measure, the potential use of internal models, and the quantification of operational and catastrophe risk. Several studies discuss and compare the U.S. RBC Standard and the *Solvency II* regime. Among these are Eling, Klein and Schmit (2009), Cummins and Phillips (2009), Vaughan (2009), as well as von Bomhard (2010). Concerning a comparison between regulations for the banking and insurance sectors, Flamée and Windels (2009) discuss the challenges of cross-country regulation as well as advantages and disadvantages of merging the regulation of different financial sectors. Warrier (2007) explains how the experiences on adopting *Basel II* can be helpful in the implementation of *Solvency II*. Additionally, as groundwork for the *Solvency II* process, CEA (2005) analyzes and compares eight insurance solvency regimes as well as the *Basel II* regime and identifies several emerging trends in regulation, including a trend towards the use of market values and the application of a total balance sheet approach.

This paper contributes to the literature by providing a comparative assessment of key framework elements of the two regulatory schemes for banking and insurance: *Basel II/III* and *Solvency II*. Such an analysis has not been conducted so far and should be of interest to different stakeholders and regulators, as *Solvency II* was created based on the same three-pillar structure as *Basel II* in order to create a level playing field for market participants and, thus, a comprehensive assessment of differences and similarities of both regulatory regimes might yield valuable insights and offer potential improvements for both schemes. The fact that *Basel II/III* and *Solvency II* have the same three-pillar structure is often mentioned in discussions of *Solvency II*. Pillar 1 states quantitative requirements concerning required capital and risk measurement, Pillar 2 involves qualitative conditions of risk management, the terms of the supervisory review process as well as the institution's own risk and solvency assessment, and Pillar 3 is concerned with disclosure requirements. We follow the three-pillar architecture and compare key framework elements of *Basel II/III* and *Solvency II* to reveal major differences and similarities as well as benefits and detriments based on selected criteria. This comparison is also intended to provide a sound basis for further discussions on banking and insurance regulation.

Our results show that even though *Basel II/III* and *Solvency II* appear to be very similar at first glance, the specific contents of the three pillars differ significantly in the *Basel II/III* and *Solvency II* frameworks, partly because of the different characteristics of the industries. For example, systemic risk is more pronounced in the banking industry, which results in a stronger emphasis on the stability of the financial system in *Basel II/III*, while *Solvency II* highlights the protection of the individual policyholder. Furthermore, the balance and focus of the three pillars differ. While Pillar 1 in *Solvency II* uses a holistic, integrated approach of the insurance company, taking into account all quantifiable risks an insurer is exposed to and aims at a one-year solvency probability of 99.5%, *Basel II/III* sets limits within each of the three considered risk categories (market, credit, and operational risks) and thus does not include a holistic risk perspective or a specific desired default probability. Therefore, an explicit objective of Pillar 2 of *Basel II/III* is to strengthen and encourage efficient and advanced risk management in order to ensure capital adequacy. Thus, the banks' own risk assessment is emphasized in *Basel II/III* to address potential deficiencies of Pillar 1 and to obtain a holistic risk perspective. Where public disclosure requirements are concerned, both regulatory regimes comprise similar requirements. However, *Solvency II* also addresses the harmonization of supervisory reporting, which *Basel II/III* does not.

The remainder of the paper is structured as follows: in Section 2, the fundamental characteristics of the banking and insurance industry as well as the objectives of the respective regulation scheme are presented. The three pillars of *Basel II/III* and *Solvency II* are explained and compared in Section 3 (Pillar 1), Section 4 (Pillar 2), and Section 5 (Pillar 3), and the results of the comparison are summarized and reflected in light of the respective objectives in Section 6. Section 7 concludes.

2. Characteristics and Regulation of the Banking and Insurance Industry

When comparing the two regulatory regimes, the European Commission suggests that two factors are kept in mind. First, the general rules in banking and insurance should, to the extent necessary, be compatible in order to establish consistent regulation across the financial sector, i.e. similar products should be treated similarly in the banking and the insurance sector to avoid opportunities for regulatory arbitrage and to create a level playing field among participants in financial markets.[5] However, due to the differences in economic and business activities, the two regulatory regimes will necessarily have to differ.[6] Therefore, we first describe the main similarities and differences in the banking and insurance sector and, based on this,

[5] See European Commission (2003, p. 3).

[6] See European Commission (2001a, p. 10).

present the fundamental characteristics and aims of each regulatory scheme. Additionally, the approval process for both regimes is shortly laid out, since this process might influence the implementation of the respective regulation in national law, especially concerning the level of harmonization achieved throughout member states. Furthermore, the main innovations of *Basel III* are pointed out to clarify its relationship with *Basel II* and to illustrate that most elements of *Basel II* will remain in force after the final introduction of *Basel III*, which justifies the use of these regulations in the following comparison.

1) Comparison of fundamental characteristics of the banking and insurance industry

One of the main functionalities of bank and insurance undertakings is the conduct of risk transformation. While banks mainly handle (positive) term transformation between assets and liabilities,[7] i.e., the horizontal transformation of (very) short term, liquid deposits to long-term credit,[8] insurance companies mainly undertake vertical risk transformation on the liability side within the portfolio of insured and over time.[9] Thus, liability risk is more prominent in insurance undertakings.

Considering the risk profiles of the two industries, banks are exposed mainly to financial risks, i.e., to adverse changes in market conditions, which are subject to rather high correlation due to the sensitivity to common factors.[10] Insurance companies, however, are exposed to both financial and non-financial risks such as weather or demographic change, which are generally idiosyncratic and non-systematic and consequently experience a lower correlation.[11]

Another main difference between the banking and insurance industry is the availability of funding opportunities. Funding in banking is in principle conducted rather short term through deposits and borrowing,[12] while in the insurance industry, funding is mainly composed of premiums paid in advance.[13] The very short term funding of banks and the resulting positive

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7 Positive term transformation refers to the transformation of short term liabilities to long term assets, which occurs majorly in banks in the way of the transformation of deposits to credit. Negative term transformation refers to the opposite, e.g., when premium income from very long term life insurance business is invested in shorter term assets.

8 See Schierenbeck and Hölscher (1998, p. 27).

9 See Schierenbeck and Hölscher (1998, p. 27).

10 However, as stated by Zurich (2007), banks are (to a lower degree) also exposed to non-financial risks, e.g., through their credit portfolio that depends on the individual solvency of the creditor and which might be adversely affected by non-financial risks.

11 See Zurich (2007, p. 8).

12 See Lehmann and Hofmann (2010, p. 64).

13 See Geneva Association (2010, p. 29). This is also referred to as the inverted product cycle (see Hofmann and Lehmann (2009)).

term transformation lead to high liquidity needs. Moreover, the liquid nature of deposits creates a high potential for a bank run in case of bad news such as rumors about potential problems of banks, which might spread throughout the entire banking system[14] and may cause contagion effects. In insurance, however, this risk is limited due to the rather long term funding sources and small incentives for policyholders to withdraw money prematurely, for example due to high surrender costs in life insurance.[15] Additionally, the level of interconnectedness between different undertakings is generally more pronounced in the banking industry than in the insurance industry.

Thus, the risk profiles of banking and insurance differ substantially. While insurance companies are exposed to a significant amount of liability risk, resulting from financial and non-financial risks through their insurance business, banks are mostly exposed to asset risks stemming from changes in financial variables as well as liquidity risk. Due to the liquid nature of funding of banks, they are more prone to bank runs, which might spread rapidly throughout the entire banking system. Thus, systemic risk is in principle stronger in the banking sector than in the insurance industry.

2) Characteristics of banking and insurance regulatory schemes

As discussed above, one of the major differences between the banking and the insurance industry in terms of regulatory purposes is the importance of systemic risks inherent in the respective industry, which is more pronounced in banking due to the danger of the occurrence of bank runs and contagion effects. In line with this, the stated aim of *Basel II/III* is to reinforce the soundness and stability of the international banking system. *Basel II/III* hence places special emphasis to the self-regulating mechanisms of a market, where participants are highly dependent on each other and where there is necessarily a high level of systemic risk. *Solvency II*, in contrast, aims to protect policyholders against the risk of an (isolated) insurer bankruptcy. Systemic risk is thereby not deemed important enough to demand a high level of international regulatory harmonization.[16] However, the impact of supervisory decisions on the stability of the financial system and markets are still considered, but remain subordinate to the main objective.[17]

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[14] An important problem in this context is the asymmetric information, since clients might not be able to judge whether an individual bank failure is due to failure of the individual bank or a failure of the banking system as a whole. Thus, the presence of one bad bank, which becomes insolvent, might spread throughout the entire banking system and thus imply contagion effects (see Zurich (2007, p. 11)).

[15] See Lehmann and Hofmann (2010, p. 65).

[16] See European Commission (2001b).

[17] See Directive 2009/138/EC, p. 3; Directive 2009/138/EC, Articles 27, 28.

Considering the types of risks taken into account, *Basel II/III* concentrates on risks on the asset side (market, credit) and operational risk.[18] Consequently, the capital requirements of Pillar 1 are not oriented towards reaching a certain one-year default probability for the undertaking. *Solvency II* features a holistic model that combines assets and liabilities and that takes into account all types of risk faced by an insurance company.[19] Thus, insurance capital requirements are based on the economic capital necessary to achieve a certain default probability to ensure payments to policyholders, while the conception behind capital requirements in *Basel II/III* differs and aims at providing sufficient capital to absorb losses within each of the three risk categories (market, credit, and operational risks).

Concerning the approval process, the *Basel II/III* regulations were brought forward by the international Basel Committee on Banking Supervision[20] and translated into European law in two Directives (Directive 2006/48/EC and 2006/49/EC). *Solvency II*, in contrast, is a European initiative and was formalized in the Directive 2009/138/EC in 2009. Both regulatory regimes are adopted by way of the Lamfalussy approach as proposed by "The Committee of Wise Men" in 2001,[21] which intends to simplify and accelerate European legislation by means of a four-level approach. On Level 1, after a consultation process, the European Commission adopts the framework legislation by specifying the core principles and elements of the regulation as well as the extent and general nature of implementing measures.[22] On Level 2, the implementing measures of the Level 1 Directive are defined in more detail after an open consultation with market participants and end users.[23] The consultation process is conducted by the European Insurance and Occupational Pensions Authority (EIOPA) and the European Banking Authority (EBA) for the insurance and banking regulation, respectively. The aim of Level 3 is to consistently apply Level 1 and Level 2 legislation in national supervision. This should be carried out through the disclosure of consistent guidelines or periodical peer reviews, for instance.[24] Finally, on Level 4, an ongoing supervision by the European Commission is conducted to ensure that Community law is applied consistently in member states.[25] Thus, the

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[18] See European Commission (2001b).

[19] See European Commission (2001b).

[20] This committee provides an international forum for banking regulation. Member states are, amongst others, China, France, Germany, Japan, Russia, Switzerland, the United Kingdom and the United States (see http://www.bis.org/bcbs/about.htm).

[21] The Lamfalussy procedure was originally proposed for legislation concerning the regulation of the European securities markets in 2001. However, in 2002 the process was adopted for legislation in the whole financial services sector (see European Commission (2002)).

[22] See Committee of Wise Men (2001, p. 22-23).

[23] See Committee of Wise Men (2001, p. 31-32).

[24] See Committee of Wise Men (2001, p. 40-41).

[25] See Committee of Wise Men (2001, p. 43).

application of the Lamfalussy procedure should lead to a high level of harmonization and consistency regarding the application of *Solvency II* and *Basel II/III* regulations in member states.

3) Current developments – Basel III

Basel III has been developed against the background of the financial crisis of 2007/2008 and represents an extension of *Basel II*, which remains in effect. *Basel III* is planned to be in force after 2013 and its objective is to increase the stability of the international banking sector, mainly by improving the ability of banks to withstand financial and economic stress and by improving the transparency and market discipline by means of detailed disclosure of the capital base. In the following, we focus on five major novelties: the quantity and quality of regulatory capital, the risk coverage under stress, the leverage ratio, additional restrictions for systemically important institutions, and liquidity management.

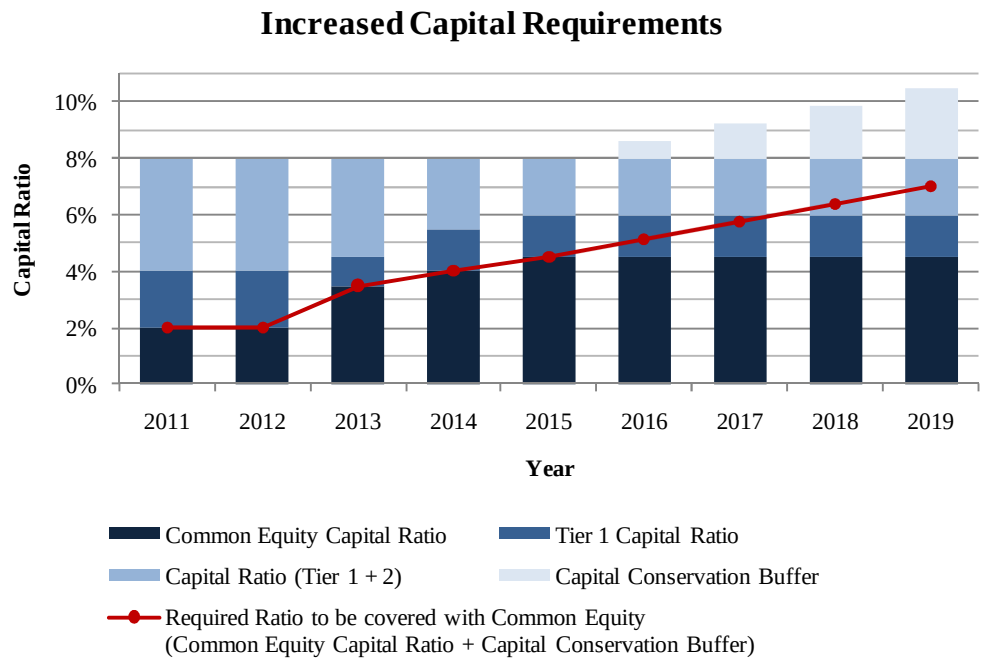
First, regulators have increased the requirements concerning the quality and quantity of regulatory capital as shown in Figure 1. Here, the definition of tier 1 capital is limited to an emphasis on common shares and retained earnings, i.e. the common equity capital base ("Core-Tier 1"), which corresponds to approximately three-fourths of the total tier 1 capital. Tier 3 capital is eliminated; under *Basel II* it could still be used to cover parts of market risk capital requirements. As shown in Figure 1, the common equity capital ratio ("Core-Tier 1 Ratio") increases from 2% of the risk-adjusted assets today to 4.5% in 2015, the tier 1 capital ratio must be raised from 4% to 6% until 2015, and the capital ratio (Tier 1 + 2) is constant at 8%. Additionally, a capital conservation buffer of 2.5% is introduced that needs to be covered by common equity capital and is intended to alleviate the pro-cyclical effects of regulation.[26] This buffer can be reduced during periods of stress and thus serves to absorb losses. When banks approach the minimum capital requirements, however, supervisory constraints on the earning distribution of the affected bank may be enforced.[27] Furthermore, a countercyclical buffer of up to 2.5% can be enforced by national supervision in case of excessive credit growth associated with a build-up of system-wide risk.[28]

[26] An additional measure in *Basel III* to lessen pro-cyclicality consists of advocating forward-looking provisioning by promoting an expected loss approach in accounting standards (see BIS (2010a, pp. 6; 55)).

[27] See BIS (2010b, p. 2).

[28] See BIS (2010a, p. 57).

Figure 1: Increased capital requirements and timeline for introduction of liquidity ratios under *Basel III*[29]



	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Liquidity Coverage Ratio (LCR)	Begin observation period				Introduction minimum standard				
Net Stable Funding Ratio (NSFR)		Begin observation period				Introduction minimum standard			

Second, in order to improve risk coverage, the use of stressed input parameters for the calculation of capital requirements for market risk and credit risk has been introduced. For example, in the case of market risk, banks need to calculate the Value at Risk under the assumption of a 12-month-period of stress.[30] Additionally, while *Basel II* only takes into account potential losses from own default, under *Basel III*, potential mark-to-market losses resulting from a rating downgrade of counterparties are considered. Furthermore, *Basel III* intends to reduce the heavy reliance on external ratings by introducing, for example, the requirement of an internal assessment even if there is an external rating.[31]

Third, since extreme levels of leverage were a main source of losses during the financial crisis, a leverage ratio requirement is introduced to limit leverage in the banking sector. This leverage ratio is not risk-based and will consequently offer some protection against model risk

[29] Illustration based on data by BIS (2010b).

[30] See BIS (2010a, p. 3).

[31] See BIS (2010a, p. 4).

and measurement error.[32] The fourth measure concerns systemically relevant institutions that belong to the class of "too big to fail." *Basel III* will likely introduce restrictions, which have yet to be determined, and possibly impose additional capital requirements and contingent capital for systemically important institutions.[33]

The fifth issue addressed in *Basel III* is liquidity management. Here, two ratios are introduced: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). The time horizon and transition period are also shown in Figure 1. The LCR has a time horizon of one month and requires banks to provide sufficient liquidity in the form of unencumbered, high quality liquid assets to withstand a scenario of acute stress.[34] The NSFR spans a time horizon of one year and is supposed to ensure a sustainable maturity structure of assets and liabilities, e.g., by limiting reliance on short-term funding.[35]

Thus, while *Basel III* adds new requirements to compensate weaknesses of *Basel II*, such as pro-cyclical effects and liquidity issues, the basic setup and architecture of banking regulation remain intact. Therefore, in the following, for the most part, we refrain from a distinction between *Basel II* and *Basel III* and continue to refer to the respective regulatory regime as *Basel II/III*.

3. Pillar 1: Quantitative capital Requirements

In this section, the quantitative requirements of both regulatory directives are examined as defined in Pillar 1. The analysis is built upon six selected criteria used by CEA (2005) for their comparative study on solvency regimes that allow a consistent comparison of regulatory framework elements.[36] For the most part, information about *Solvency II* are based on the Directive 2009/138/EC and the fifth quantitative impact study (QIS) of the standard model for deriving solvency capital requirements laid out in the "QIS 5 Technical Specifications." While the regulations stated in QIS 5 have not yet been finalized, the standard model will probably be very similar. For *Basel II/III*, the framework "International Convergence of Capital Measurement and Capital Standards" by BIS (2006) and additional secondary literature are

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[32] The leverage ratio is defined as *Tier 1 Capital / Exposure*, using an accounting measure of exposure. At the time of writing the envisioned minimum leverage ratio is 3%, thus the exposure may not exceed 33-times the amount of equity (see BIS (2010a, pp. 4; 61)).

[33] See BIS (2010a, p. 7).

[34] $LCR = \frac{stock\ of\ high\ quality\ liquid\ assets}{total\ net\ cash\ outflows\ over\ next\ 30\ calendar\ days} > 100\%$, see BIS (2010a, p. 8), BIS (2010c, p. 3).

[35] $NSFR = \frac{available\ amount\ of\ stable\ funding}{required\ amount\ of\ stable\ funding} > 100\%$, see BIS (2010a, p. 8), BIS (2010c, p. 25).

[36] See CEA (2005, p. 4).

used. In the following, six criteria are compared: 1) risk classes and capital requirements, 2) risk measure and calibration, 3) time perspective, 4) solvency assessment typology, 5) risk aggregation and dependencies, and 6) valuation basis.

1) Risk classes and capital requirements

We begin with a comparison of the types of risks taken into account when determining solvency capital requirements, which vary considerably due to the different risks that banks and insurers are exposed to. In *Basel II/III*, three risk classes are considered: market risk, credit risk, and operational risk. In addition, *Basel III* has paid special attention to liquidity risk. *Solvency II* aims at a comprehensive assessment of all quantitatively measurable types of risks to which an insurance company is exposed. Thus, six risk classes with several submodules are included in the calculation of quantitative solvency capital requirements: underwriting risk for non-life, life and health, market risk, counterparty default risk, and operational risk[37] as shown in Figure 2. Moreover, the latest test of the standard model (QIS 5 in 2010) accounts for intangibles.[38]

In setting capital requirements, *Solvency II* adopts a two-level approach. First, the solvency capital requirements (SCR) represent the "desired" amount of capital ("target capital"), which can absorb unexpected losses and thus ensures a prescribed low one-year default probability. The SCR is risk-based and comprises all of the risk classes listed above. Second, the minimum capital requirement (MCR) is calculated based on a simple combined approach, leading to a corridor between 25% and 45% of the SCR.[39] The MCR represents the last threshold before the supervisory authority revokes the company's license, if the available capital is not sufficient to cover the MCR.[40] When breaching the SCR (but not the MCR), the insurance company is granted a period of six months, which can be prolonged a further three months to reestablish compliance with SCR.[41] In addition, the free disposal of assets may only be limited in exceptional circumstances.[42]

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[37] See Directive 2009/138/EC, Article 101, No. 4.

[38] See QIS 5 (2010, p. 90).

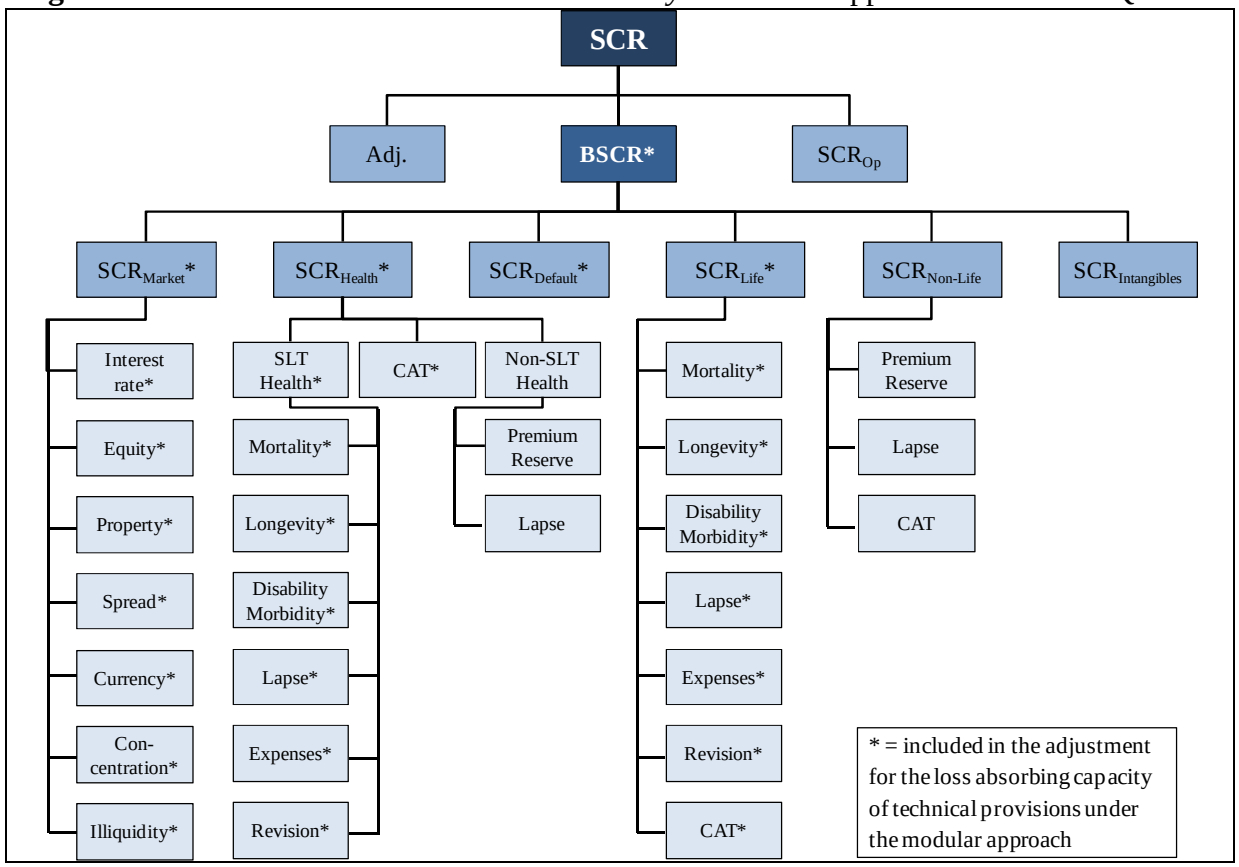
[39] See Directive 2009/138/EC, Article 129, No. 3. Note that *Solvency II* also imposes an absolute floor to the MCR, the Absolute Minimum Capital Requirements (AMCR), which only depends on the insurance type. For example, for a life insurance company the MCR cannot fall below the AMCR of 3.2 million € (see Directive 2009/138/EC, Article 129, No. 1 d).

[40] See Ayadi (2007, p. 18). After withdrawing a license, the insurer's in-force business is either liquidated or transferred to another insurance company.

[41] See Directive 2009/138/EC, Articles 138; No. 3.

[42] See Directive 2009/138/EC, Articles 138; No. 5.

Figure 2: Modules and submodules of the *Solvency II* standard approach as stated in QIS 5[43]



In contrast, *Basel II/III* only features one level by requiring a minimum equity capital ratio of 8% (10.5% under the finalized *Basel III* directives), also called "capital coefficient." However, when taking into account the capital conservation buffer newly introduced in *Basel III*, banking supervision can be considered as heading towards a two-level approach. The capital requirements must be covered by the companies' available capital. Both schemes classify the capital according to its quality in so-called tiers. As described in detail in the previous section, *Basel III* has increased the requirements with respect to the quality and quantity of available capital, abandoning tier 3 items. Similarly, *Solvency II* requires the MCR to be covered with basic own funds, i.e., the difference between the market value of assets and liabilities and evaluated in accordance with *Solvency II*, consisting of at least 50% tier 1 items; regarding SCR, tier 1 must at least constitute one third and tier 3 items are limited to one third.[44] Classi-

[43] See QIS 5 (2010, p. 90), BSCR = Basic Solvency Capital Requirements, Op = Operational Risks, Adj. = Adjustments for the loss absorbing capacity of technical provisions, future discretionary bonus, and deferred taxes.

[44] See Directive 2009/138/EC, Article 98, No. 1-2. However, these values only constitute a lower bound concerning the quality of capital. After experiences made during the financial crisis, regulators become more conservative with respect to capital (see van Hulle (2011b, p. 8)). Thus, in the last quantitative impact study

fication of capital into tiers is thereby based mainly on two criteria. First, funds have to be *permanently available* to cover losses. Second, funds have to be *subordinated*, i.e., in case of liquidation of the insurance company the redemption of funds is subordinated to other claims. In principle, a position fulfilling both criteria is classified as tier, a position fulfilling only the latter as tier 2, all remaining funds as tier 3 capital.[45]

2) Risk measure and calibration

To calculate minimum or solvency capital requirements, the prescribed risk measure and the required confidence level are of high relevance. Here, both regulatory schemes use in principle the Value at Risk as the relevant risk measure. However, while the Value at Risk is explicitly stated within the directives of *Solvency II*,[46] *Basel II/III* only refers to the Value at Risk in the case of market risk capital requirements.[47] Regarding credit risk, this formula includes weights that have been adjusted to cover unexpected losses with a certain prescribed probability, i.e. using a Value at Risk-type risk measure. For operational risk, the risk measure is not specified directly, but is required to meet soundness standards comparable to those used for credit risk.[48] Thus, both regulatory schemes generally refer to the risk measure Value at Risk.[49] Concerning the risk calibration, *Basel II/III* varies by the risk category: for market risk (Value at Risk), a one-tailed confidence level of 99% has to be achieved; this level is increased to 99.9% for the operational risk advanced approach and in the case of credit risk.[50] *Solvency II*, in contrast, requires a fixed confidence level of 99.5% for the insurance company as a whole.[51] Thus, while the risk calibration in *Basel II/III* is tied to the single risk categories, i.e. unexpected losses within each category are considered individually and without aggregation, the *Solvency II* capital requirements are based on the risk exposure at the company level, thus explicitly taking into account dependencies between risk categories.

3) Time perspective

In terms of time perspective and the calculation frequency as well as retrospective or prospective view, both schemes differ considerably. *Basel II/III* takes a retrospective view: new busi-

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QIS 5, these limits were further increased, requiring that at least 80% of MCR have to be met by tier 1 capital, while tier 3 capital is only allowed to cover a maximum of 15% of SCR (see QIS 5 (2010, p. 304)).

45 See Directive 2009/138/EC, Articles 93; 94.

46 See Directive 2009/138/EC, Article 101, No. 3; Article 122, No. 2.

47 See BIS (2006, p. 195).

48 See BIS (2006, p. 151).

49 Note that the Value at Risk is criticized in the scientific literature due to its non-coherence, i.e., the lack of subadditivity (see Artzner et al. (1999)). The Swiss Solvency Test, in contrast, uses the coherent Tail Value at Risk (see Federal Office of Private Insurance (2006)).

50 See BIS (2006, pp. 151; 195), BIS (2005, p. 11)

51 See Directive 2009/138/EC, Article 101, No. 3.

ness is not taken into account. For instance, the basic approach for operational risk uses the gross income during the last three years as an indicator for risk exposure.[52] Furthermore, capital requirements need to be calculated at least twice a year[53] or even daily, if an internal model for market risk is used.[54] *Solvency II* takes a prospective view, taking into account both existing and expected new business within the next twelve months.[55] Calculation is conducted on a yearly basis,[56] except in case of a significant change of the risk profile, but solvency must be ensured at all times.

4) Solvency assessment typology

An essential aspect of regulatory frameworks is the solvency assessment typology, which refers to rules-based versus principle-based supervision, simple factor-based, risk factor-based, or scenario-based solvency models, as well as the possibility to use individually developed internal models instead of a standard model provided by the regulator. In a rules-based approach, capital requirements are based on stipulated rules, while principle-based capital requirements are calculated based on a risk assessment by the financial institution, thereby following certain prescribed principles.[57]

Thus, the use of internal models – provided in case of both regulatory frameworks to a different extent – is purely principle-based and allows an individual assessment of the company-specific risk situation. If a company cannot develop its own individual internal model, a standard model is provided by the regulator, which in both cases is rather rules- and scenario-based. In particular, the *Basel II/III* standard approach constitutes a clear rules-based regime. For *Solvency II*, the standard approach is built on economic principles and for some risk-submodels such as operational risk, capital requirements are calculated based on stipulated rules, which constitutes a deviation from the principle-based nature of *Solvency II*, while other submodules are scenario-based.[58]

Concerning the applicability of internal models to derive capital requirements, considerable differences can be found with respect to the degree of individuality. Depending on the type of risk, *Basel II/III* offers two to three levels. With respect to market risk, the bank can choose

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52 See BIS (2006, pp. 144-145).
53 See Directive 2006/48/EC, Article 74, No. 2.
54 See BIS (2006, p. 195).
55 See Directive 2009/138/EC, Article 101, No 3.
56 See Directive 2009/138/EC, Article 102.
57 See CEA (2005, pp. 10-11).
58 See CEA (2007, pp. 9-14).

between the standardized measurement method[59] and the internal approach.[60] For operational risk, three approaches are available: the basic indicator approach,[61] the standardized approach, and the advanced measurement approach (AMA), which corresponds to the use of an internal model. Regarding credit risk, the standard formula or the internal ratings based approach (IRBA) can be used. However, both models have heavy restrictions. In particular, only the input parameters can be adjusted to reflect the company-specific situation. This also holds true for the IRBA, where banks may use internal estimates of certain parameters,[62] but are obliged to use the formula stated by the Bank for International Settlements for calculating capital requirement.[63] Thus, especially the treatment of credit risk is not truly principle-based.

According to *Solvency II*, insurance companies are allowed to choose among five levels of sophistication: the development of a full internal model, the use of the standard formula, the standard formula with undertaking-specific parameters, the standard formula that is partly replaced with a partial internal model (e.g. only for certain submodules), or the standard formula with simplifications for smaller companies.[64] One stated goal of both regulatory schemes is the improvement of internal risk management. Consequently, the development of internal models, which first must be certified by supervisory authorities, is advocated.[65]

Further distinctions arise in the way capital requirements are calculated in the first place. Simple factor-based models derive capital requirements by multiplying certain accounting positions by a given factor, where the number of factors is generally low. Risk factor-based models are an extension, where the factors are applied to a greater number of positions and where factors are generally calibrated to reflect a certain desired confidence level. While these approaches represent static models, capital requirements calculation can also be based on dynamic models, i.e., scenario-based or purely principle-based models.[66] The standard approach in *Basel II/III* can be classified as a static risk factor-based model for all three risk classes.[67] While the use of internal models in the case of market and operational risks is in general principle-based, this does not hold for credit risk under *Basel II/III*. In *Solvency II* such restrictions are not planned in regard to certified internal models to retain a truly purely princi-

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59 See BIS (2006, p. 166).

60 See BIS (2006, p. 191).

61 See BIS (2006, p. 144 f.).

62 See BIS (2006, p. 52), BIS (2005).

63 See BIS (2006, p. 59).

64 See QIS 5 (2010, p. 93).

65 See BIS (2006, p. 12), Ayadi (2007, p. 16).

66 For a definition of these models, see CEA (2005, p. 10).

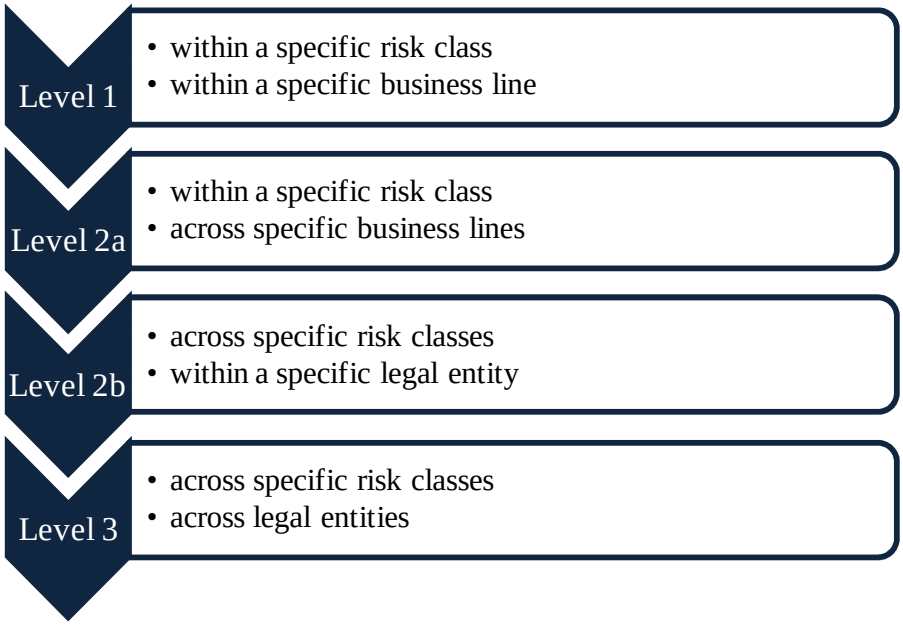
67 See BIS (2006, pp. 19-51) for credit risk, BIS (2006, pp. 144-145) for operational risk, and BIS (2006, pp. 166-191) for market risk.

ple-based model.[68] The *Solvency II* standard formula, in contrast, combines risk factor-based (e.g. for operational risk)[69] and scenario-based (e.g. market risk, life underwriting risk) approaches.[70]

5) Risk aggregation and dependencies

Another important question concerns the consideration of diversification benefits and thus dependencies among risk factors, which can imply substantial reductions in solvency capital requirements. This aspect is also relevant with respect to the treatment of financial or insurance groups. Here, CEA (2005) identifies three levels of diversification benefits as illustrated in Figure 3. Level 1 refers to diversification benefits within a specific risk class or a specific business line. Level 2 extends this view to include diversification across risk classes within a specific legal entity (or vice versa); level 3 takes a holistic perspective and accounts for diversification benefits across all risk classes and across legal entities.

Figure 3: Level of diversification benefits following CEA (2005)



As described in the previous subsections, *Basel II/III* considers only level 1 diversification within each of the three risk classes. The capital coefficient and thus the capital requirements are calculated by summing up the capital requirements (CR) resulting from the three risk classes:

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[68] See Ayadi (2007, p. 28).

[69] See QIS 5 (2010, pp. 102-104).

[70] See QIS 5 (2010, pp. 109; 147).

$$\frac{capital}{sum\ of\ credit\ risk\text{-}weighted\ assets + 12.5 \cdot (CR\ market\ risk + CR\ operational\ risk)} \geq 8\%.$$

Thus, any potential diversification effects between the three risk classes are neglected.[71] *Solvency II*, in contrast, also accounts for diversification effects among risk classes as reflected in the Basic SCR (BSCR) (see Figure 2), which is calculated using the "square-root formula"

$$BSCR = \sqrt{\sum_{i,j} Corr_{ij} \cdot SCR_i \cdot SCR_j} + SCR_{intangibles}$$

for a certain prescribed correlation matrix between risk classes *i*, *j* = Market, Health, Default, Life, Non-Life with values $Corr_{ij}$, where SCR_i stands for the solvency capital requirement of risk class *i*.[72] Thus, level 1 and 2 diversification benefits are taken into account.[73]

In the *Basel II/III* standard approach, concentrations (as the opposite of diversification) are not factored into the calculation of capital requirements. For instance, capital requirements for market risk result from a simple capital charge, independent of potential concentrations.[74] However, concentration risk is addressed by Pillar 2. In *Solvency II*, however, risk concentrations are explicitly taken into account in a separate submodule within the market risk module[75] and thus directly increase the SCR.[76]

Regarding the consideration of risk mitigation techniques in reducing SCR, *Basel II/III* accounts for, e.g., collaterals, guarantees, credit risk derivatives and on-balance sheet netting within the credit risk module under certain prescribed principles and requirements.[77] Within *Solvency II*, the risk mitigating effect of reinsurance will be acknowledged, as will other risk mitigation techniques,[78] such as hedging, insurance-linked securities, and swaps.[79]

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[71] See BIS (2006, p. 12). In *Basel III*, the capital conservation buffer and, if applicable, the countercyclical buffer will be added to this ratio.

[72] See QIS 5 (2010, p. 95).

[73] See Directive 2009/138/EC, Article 121, No. 5.

[74] See BIS (2006, p. 166).

[75] See Directive 2009/138/EC, Article 105, No. 5 (f).

[76] See QIS 5 (2010, p. 127).

[77] See BIS (2006, p. 32).

[78] See Directive 2009/138/EC, Article 101, No. 5.

[79] See, e.g., CEA (2007); Swiss Re (2007).

With respect to group supervision, *Solvency II* takes into account "the global diversification of risks that exist across all the insurance and reinsurance undertakings,"[80] thus in principle implying the consideration of level 3 diversification benefits. Overall, any diversification or concentration effects as well as potential contagion effects should be properly assessed.[81] *Basel II/III* likewise assesses financial soundness at the fully consolidated group level.[82] However, since the benefits of diversification are not acknowledged, this procedure is equivalent to adding up the capital requirements of all legal entities.[83]

6) Valuation basis

In *Basel II/III* the valuation basis depends on the risk category. Market risk positions in the trading book have to be valued market consistently, i.e., using mark-to-market if possible, and mark-to-model, otherwise.[84] For credit risk, the exposure is determined as the balance sheet value and thus constitutes an accounting value.[85] These valuation bases give rise to two main pitfalls in the *Basel II/III* regime. First, the lack of a common valuation basis circumvents the application of a consistent risk metric, and, second, valuation in Pillar 1 is not conducted using a forward-looking approach.[86] Within *Solvency II*, assets and liabilities, other than technical provisions, are valued according to the fair value criteria using mark-to-market or mark-to-model, if readily available market prices are not available. The valuation should thereby be based on the underlying principles as stated in the IFRS system only if the IFRS produce an economic value in line with the fair value criteria.[87] The value of technical provisions should reflect the price the liability could be traded for on a market, i.e. be valued following the market consistency criteria, and is consequently based on a best estimate plus an additional risk margin,[88] reflecting the cost of capital beyond the best estimate necessary to support the business.[89] Hence, *Solvency II* aims at a completely economic balance sheet and thus provides a common valuation basis. Additionally, the economic balance sheet and the valuation of technical provisions are forward-looking, while the elements of Pillar 1 in *Basel II/III* are not. As a further difference, it can be stated that while *Solvency II* takes a total balance sheet approach that includes assets and liabilities,[90] *Basel II/III* does not.

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80 See Directive 2009/138/EC, p. 10.

81 See van Hulle (2011a).

82 See Directive 2006/49/EC, p. 4.

83 See CEA (2005).

84 See BIS (2006, pp. 160-162).

85 See Directive 2006/48/EC, Article 78, No. 1.

86 This is only addressed in the internal risk management process in Pillar 2.

87 See QIS 5 (2010, pp. 6-7).

88 See QIS 5 (2010, p. 20).

89 See QIS 5 (2010, p. 55).

90 See Directive 2009/138/EC, p. 5.

7) Summary

Table 1 summarizes the main similarities and differences between the two regimes.

Table 1: Differences and similarities of *Basel II/III* and *Solvency II* with respect to Pillar 1

Criteria	*Basel II/III*	*Solvency II*
1) Risk classes and capital requirements	• Mainly asset risks (market and credit risk) and operational risk; special focus on liquidity risk in *Basel III* • Only MCR, moving towards two-level approach in *Basel III* by way of introducing a countercyclical buffer	• Aims at a comprehensive approach taking into account all major risk, i.e. underwriting risk, market risk, default risk, operational risk • Two-level approach – SCR and MCR
2) Risk measure and calibration	• Value at Risk-type measure • Capital requirements specified for each risk class separately • Varying confidence level for different risk classes, i.e. 99% for market risk and 99.9% for credit and operational risk • Capital requirements intended to cover unexpected losses within each risk category with a given probability	• Value at Risk • Capital requirements based on exposure at company level • Aims at confidence level of 99.5% for the insurance company as a whole • Capital requirements intended to ensure a given one-year solvency probability for insurance company as a whole
3) Time perspective	• Retrospective • More frequent recalculation, i.e., twice a year or daily in case of an internal model for market risk	• Prospective • Recalculation in principle only once a year, but solvency must be ensured at all times
4) Solvency assessment typology	• Choice between two to three levels of sophistication, for example standard formula or IRBA for credit risk • Restrictions concerning the use of internal models for credit risk • Only risk factor-based approach in the standard model	• Choice between five levels of sophistication – from full internal model to standard formula with simplifications • No restrictions concerning internal models • Scenario-based and risk factor-based approaches in the standard model
5) Risk aggregation and dependencies	• Only level 1 diversification benefits are acknowledged	• All levels of diversification benefits are acknowledged
6) Valuation basis	• Market-based (market risk) and accounting based (credit risk)	• Purely economic balance sheet

4. Pillar 2: Qualitative Aspects of Risk Management

This section deals with the qualitative requirements with respect to risk management and the supervisory review process described in Pillar 2. Both regulatory schemes are analyzed based on six criteria: 1) principles, aims, and scope of supervision, 2) considered risks, 3) internal risk management process, 4) general governance requirements and organizational structure, 5) additional capital requirements, and 6) powers of supervision. For *Solvency II*, the Directive 2009/138/EC and partly the advice on the implementing measures by CEIOPS (2009a) are used as relevant sources. However, as stated by CEIOPS (2009a), the Level 1 text (i.e., the Directive) contains a relatively high level of detail (especially compared to the corresponding Level 1 text for *Basel II*), such that we refer as much as possible to the legally binding and finalized Level 1 text. For *Basel II/III*, the Level 1 text contains a rather limited amount of information and details. Therefore, we mainly refer to the Level 2 "Guidelines on the Application" by CEBS (2006).

1) Principles, aims, and scope of supervision

The principles underlying supervision are similar for both regulatory regimes: the proportionality principle has to be applied in both cases and the approach to supervision should be risk-based.[91] However, one important difference lies in the prospective view taken by supervision within the *Solvency II* regime, which is not explicitly required for *Basel II/III*, in particular in regard to Pillar 1. However, in Pillar 2, some elements are prospective and forward-looking, such as the Internal Capital Adequacy Assessment Process (ICAAP).[92]

In contrast to the principles, the stated main objectives of Pillar 2 of the regulatory schemes differ. *Basel II/III* explicitly states the objective of strengthening and encouraging efficient and advanced risk management in order to ensure capital adequacy.[93] In *Solvency II*, on the contrary, there is no separate goal defined for Pillar 2 in the Level 1 and 2 texts. However, the higher ranking goal of the regulatory regime is repeated and remains valid, i.e., the protection of policyholders and beneficiaries,[94] where the impact of supervisory decisions on the stability of the financial system should be accounted for as a subordinated goal, especially during times of extraordinary stress.[95]

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[91] See CEBS (2006, p. 26) for *Basel II/III* and Directive 2009/138/EC, Article 29, No. 1 for *Solvency II*.

[92] See CEBS (2006, p. 27). Additionally, the supervisory review process in Pillar 2 should identify potential problems and thus incorporates certain prospective elements.

[93] See BIS (2006, p. 204).

[94] See Directive 2009/138/EC, Article 27.

[95] See Directive 2009/138/EC, Article 28.

While the scope of supervision is almost identical as shown in Table 2, two areas are not addressed in *Basel II* in this context (but are discussed in regard to the internal risk management process): high level issues like strategies, processes and reporting procedures, as well as valuation issues concerning technical provisions, assets and own funds, which are considered in *Solvency II*.

Table 2: Scope of supervision for banking and insurance

Basel II/III	*Solvency II*
–	• Revision and evaluation of strategies, processes and reporting procedures (see Articles 30; 36)
• Assessment of internal governance, incl. ICAAP (see CEBS (2006, pp. 26-27))	• Assessment of qualitative requirements relating to the system of governance, incl. ORSA (see Article 36, No. 1)
• Assessment of all material risks (see CEBS (2006, p. 26))	• Assessment of all risks faced by undertaking (see Article 36, No. 1)
• Compliance with capital requirements (see CEBS (2006, p. 28))	• State of solvency and compliance with capital requirements (see Article 30; 36, No. 1)
• Assessment of potential deficiencies in control and risk management framework in as well as identification of existing and potential key risks (see CEBS (2006, p. 27))	• Assessment of methods and practices of undertaking for identifying potential events and changes in economic condition that may threaten solvency (see Article 36, No. 4)
–	• Establishment of technical provisions, assets and eligible own funds (see Article 30)

2) Risks taken into account

In principle, all material risks should be taken into account in *Basel II/III* as well as in *Solvency II*. For *Basel II/III*, this includes but is not limited to credit risk, operational risk, market risk – including illiquidity and concentration risks – interest rate risk in the banking book, liquidity risk, and other risks such as reputational and strategic risks. Where risks cannot be measured precisely, they should be estimated based on a reliable process.[96] Thus, by considering liquidity risk, the interactions between assets and liabilities are partly taken into account within Pillar 2, while Pillar 1 concentrates on risks on the asset side. *Solvency II* prescribes a risk management process that should at least involve all risks connected with underwriting and reserving, asset-liability management, investments (in particular derivatives), liquidity and concentration, operational, as well as reinsurance and other risk-mitigating techniques.[97] Furthermore, CEIOPS (2009a) proposes to take into account credit risk, strategic and reputa-

[96] See BIS (2006, pp. 206-208).

[97] See Directive 2009/138/EC, Article 44, No. 2, Munich Re (2009).

tional risk.[98] Thus, when comparing these risk categories, the interaction between assets and liabilities seems to receive much more attention in the insurance sector by explicitly including asset-liability management in addition to liquidity risk in risk management.

3) Internal risk management process

Another central aspect of both schemes is the internal risk management process. *Basel II/III* and *Solvency II* detail the introduction and implementation of an internal process for risk management. This process is referred to as the Internal Capital Adequacy Assessment Process (ICAAP) for banks, which must be risk-based, comprehensive, and forward-looking.[99] Thus, the potential limitations of Pillar 1, such as the retrospective view, are addressed in Pillar 2. For insurance undertakings, the Own Risk and Solvency Assessment (ORSA) process is implemented. Both processes need to form an integral part of management and decision-making. However, while in *Solvency II*, the emphasis is rather directed towards strategic decisions and issues,[100] the function of the *Basel II/III* ICAAP ranges from support in everyday decisions (e.g., individual credit decision) to higher level, strategic ones,[101] and is thus emphasized in *Basel II/III*.

The outcome of both processes is a capital requirement, which, however, does not determine legal capital requirements.[102] Still, *Basel II/III* states that deviations between the capital requirements resulting from the ICAAP and the regulatory capital requirements need to be explained to supervisory authority.[103] Insurance undertakings are obliged to explain any deviations in their risk profile to the one assumed in the standard formula,[104] since these deviations might lead to diverging capital requirements and consequently to a misleading SCR when applying the standard formula. Thus, an important function of the internal risk management process for banks and insurance companies is the support for determining legal capital requirements, which are, e.g., deduced using a one-fits-it-all standard formula with company-specific information.

4) General governance requirements and organizational structure

The principles concerning general government requirements and the organizational structure are very similar in both regulatory schemes. Regarding the government requirements, both

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98 See CEIOPS (2009a, pp. 40-42).

99 See CEBS (2006, pp. 22-23).

100 See Directive 2009/138/EC, Article 45, No. 4.

101 See CEBS (2006, p. 21).

102 See CEBS (2006, p. 24); Directive 2009/138/EC, Article 45, No. 7.

103 See CEBS (2006, p. 24).

104 See Directive 2009/138/EC, Article 45, No. 1.

prescribe a clear and transparent organization with adequate reporting lines as well as a clear allocation (and segregation) of responsibilities.[105] However, *Solvency II* emphasizes the importance of written policies[106] for risk management, internal control, internal audit, and, where relevant, outsourcing.[107] *Basel II/III*, in contrast, requires the existence of written policies only at the level of the management body.[108] A further innovation within *Solvency II* is an explicit requirement concerning the qualification of the management body running the company. These persons have to be "fit," i.e., possess the necessary professional qualifications, and "proper," in other words, to be of "good repute and integrity."[109] Furthermore, the development of contingency plans is demanded for insurance as well as for banks.[110]

Concerning the organization, the risk management function has to be effective and well integrated into the organizational structure[111] and serve as a central function,[112] thus being given special importance in both schemes. The internal control function in banks includes the three functions risk control, compliance, and internal audit,[113] whereas in *Solvency II*, internal control (including compliance) and internal audit functions are listed as separate functions.[114] In addition, both functions need to be objective and independent from operational functions.[115] For insurance undertakings, an actuarial function is the fourth mandatory function (in addition to risk management, internal control, and internal audit).

5) Additional capital requirements

Concerning additional capital in excess of the Pillar 1 capital requirements, a fundamental difference between the two supervisory regimes exists. While according to *Basel II/III* banks are expected to operate above the capital requirements stated in Pillar 1, i.e., to hold additional buffer capital for bank-specific uncertainties,[116] this is not explicitly planned in *Solvency II*. The stated reasons for this capital buffer for banks are, amongst others, fluctuations in economic conditions leading to changes in the capital ratio, costs associated with raising additional capital, the severe consequences of falling below a capital ratio of 8%, and the presence

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[105] See CEBS (2006, p. 11), Directive 2009/138/EC, Article 41.
[106] See CEIOPS (2009a, p. 3).
[107] See Directive 2009/138/EC, Article 41, No. 3.
[108] See CEBS (2006, p. 12).
[109] See Directive 2009/138/EC, Article 42, No. 1.
[110] See CEBS (2006, p. 23), Directive 2009/138/EC, Article 41, No. 4.
[111] See Directive 2009/138/EC, Article 44, No. 1.
[112] See CEBS (2006, p. 12).
[113] See CEBS (2006, p. 16).
[114] See Directive 2009/138/EC, Articles 46; 47.
[115] See CEBS (2006, p. 16), Directive 2009/138/EC, Article 47.
[116] See BIS (2006, p. 211).

of potential risks not taken into account in Pillar 1.[117] As described in the previous section, *Solvency II*, in contrast, uses a two-level approach to derive capital requirements in Pillar 1, where SCR constitutes the desired target capital and MCR represent the minimum capital requirements.[118] Thus, a breach of SCR does not have as severe consequences as a breach of the capital requirements in *Basel II/III*. However, as the market consistent valuation approach adds volatility, insurance companies will likely also be forced to operate with higher own funds to counterbalance this effect. Thus, while Pillar 1 of *Solvency II* sets two levels of capital (MCR and SCR), only one level is set in *Basel II*, supplemented with the countercyclical buffer in *Basel III*, which is then complemented by the described requirements in Pillar 2, such that banks are consequently also generally obliged to hold capital in excess of the minimum capital requirements.

6) Powers of supervision

Both regulatory schemes emphasize the possibility for early intervention on the part of supervisory authorities. Within the *Solvency II* framework, supervisory authorities have the power to take "preventive and corrective measures,"[119] and *Basel II/III* prescribes intervention at an early stage to prevent banks to fall below the capital requirements.[120] The explicit measures of the supervisory authority are addressed in more detail in *Basel II/III*. In particular, Article 136, No. 1 of Directive 2006/48/EC specifies the following five measures: increasing minimum capital requirements, requiring internal governance to comply with stated rules, application of a specific provisioning policy or treatment of assets in terms of own funds requirements, restriction or limitation of business, operations or network of credit institution, and reduction of risk.[121] *Solvency II*, in contrast, only very generally states that any financial or administrative measures may be taken if deemed necessary.[122] Additionally, a capital add-on may be imposed after the supervisory review process in exceptional and clearly defined circumstances.[123]

7) Summary

Table 3 summarizes the main similarities and differences between the two regimes with respect to Pillar 2.

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[117] See BIS (2006, p. 211).
[118] See Barnier (2011, p. 2).
[119] See Directive 2009/138/EC, Article 34, No. 1.
[120] See BIS (2006, p. 212).
[121] See Directive 2006/48/EC, Article 136, No. 1.
[122] See Directive 2009/138/EC, Article 34, No. 2.
[123] See Directive 2009/138/EC, Article 37.

Table 3: Differences and similarities of *Basel II/III* and *Solvency II* with respect to Pillar 2

Criteria	*Basel II/III*	*Solvency II*
1) Principles, aims, and scope of supervision	• Proportionality principle • Risk-based supervision • Objective: encourage the advancement of efficient risk management; capture all risks that are not captured within Pillar 1	• Proportionality principle • Risk-based supervision • Objective: no separate goals defined; higher ranking goal remains valid, i.e. protection of policyholder; subordinated goal: stability of the financial system
2) Risks taken into account	• All material risks • Including, but not limited to: credit risk, operational risk, market risk – including illiquidity and concentration risks –, interest rate risk in the banking book, liquidity risk, other risks such as reputational and strategic risks	• All material risks • Including, but not limited to: underwriting and reserving, asset-liability management, investments (in particular derivatives), liquidity and concentration, operational, reinsurance and other risk-mitigating techniques
3) Internal risk management process	• Integral part of risk management and decision making • Function: support of everyday as well as strategic decisions and issues; complement capital requirements deduced in Pillar 1 by company specific information • Outcome: capital requirement	• Integral part of risk management and decision making • Function: support of strategic decisions and issues; complement capital requirements deduced in Pillar 1 by company-specific information • Outcome: capital requirement
4) General governance requirements and organizational structure	• Clear and transparent organization accompanied by the respective reporting lines; clear allocation of duties • Written policies only at the level of the management body • Mandatory functions: Effective and well integrated risk management, internal control (including risk control, compliance, and internal audit)	• Clear and transparent organization accompanied by the respective reporting lines; clear allocation of duties • Emphasis on written policies for risk management, internal control, internal audit, and outsourcing • Mandatory functions: Effective and well integrated risk management, internal control, internal audit, and actuarial function • Government body has to be “fit” and “proper”
5) Additional capital requirements	• Banks generally need to operate above capital requirement stated in Pillar 1	• Not envisioned by supervisory authority
6) Powers of supervision	• Possibility to intervene at an early stage – emphasis on prevention	• Possibility to intervene at an early stage – emphasis on prevention

5. PILLAR 3: DISCLOSURE REQUIREMENTS

Pillar 3 addresses disclosure requirements. While in *Basel II/III*, only public disclosure is discussed, *Solvency II* addresses public disclosure as well as the harmonization of supervisory reporting.[124] Since supervisory reporting is not addressed in *Basel II/III*, we concentrate on public disclosure requirements. As in the previous sections, we will hereby refer to the Level 1 and Level 2 texts of the respective regulation. In both regulatory regimes, mandatory quantitative reporting templates are defined on Level 3 of the Lamfalussy process, which might require a higher level of detail concerning the information to be disclosed than the previously mentioned regulations stated in Level 1 and 2 texts. However, for *Solvency II*, these have not been finalized yet, so that we do not take them into account for either regime to avoid inconsistencies.

1) Aim and application

The aim of Pillar 3 for both regulatory schemes is the promotion of market discipline and market mechanisms[125] by providing market participants with all material information. Materiality is thereby defined identically in both regulatory regimes in line with the definition given by the International Financial Reporting Standards (IAS-IFRS) as any information the omission of which would change or influence economic decisions.[126] In *Basel II/III*, public disclosure requirements apply at the consolidated top level and, consequently, individual entities are not obliged to fulfill the criteria laid out in the following subsection.[127] Under *Solvency II*, however, disclosure requirements apply both at the level of the individual undertaking and at the group level.[128]

2) Content of report to public

Table 4 shows the content of the public disclosure report for banks and insurance undertakings, separated into four subcategories. Concerning own funds, the composition as well as the amount and quality of own funds has to be publicly disclosed. *Basel II/III* prescribes publication of any restrictions on capital transfers within the group, since public disclosure requirements apply only at the top consolidated level. In *Solvency II*, this is not deemed necessary since publication of all information also has to be conducted on the individual company level.

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[124] See European Commission (2006, p. 7).

[125] See BIS (2006, p. 226), CEIOPS (2009b, p. 12).

[126] See BIS (2006, p. 227), CEIOPS (2009b, p. 23).

[127] An exception to this rule constitutes the requirement to disclose the total as well as the tier 1 capital ratio for all significant bank subsidiaries (see BIS (2006, p. 229)).

[128] See CEIOPS (2009b, p. 26).

Table 4: Content of public disclosure report

Criteria	*Basel II*	*Solvency II*
Own funds	• Restriction on capital transfer within group	–
	• Description of main features of capital	• Structure of own funds
	• Amount of tier 1 capital (separated into 8 specific subcategories) as well as amount of tier 2 and 3 capital	• Amount and quality of own funds
Capital requirements	• Total and tier 1 capital ratio calculated on a consolidated basis and for significant subsidiaries	• Size of SCR and MCR (incl. if applicable capital add-on)
	• Capital requirements for separate risk types	–
	–	• Additionally any non-compliance with MCR and/or SCR
Information concerning qualitative requirements in Pillar II	–	• Description of business and performance
	• Discussion of approach used for assessing capital adequacy • Description of objectives and policies for risk management; for all risk types separately	• Description of system of governance and assessment of its adequacy in light of the risk profile
	–	• Main differences between assumptions of standard formula and risk profile of undertaking
Additional information for separate risk categories[*]	• Most detailed disclosure requirements for credit risk, including, e.g., definition of past due and impaired loans, risk management policies concerning credit risk, gross risk exposure, distribution of exposures (geographic, counterparty, industry, residual contractual maturity etc.), amount of impaired loans • For market risk capital requirements: separately for four subcategories • For operational risk methods: for assessing operational risk the bank is qualified to use	• Risk profile (see CEIOPS (2009b), p. 31), i.e., information concerning risk exposure, concentration, mitigation, and sensitivity; separately for all risk types

Source: BIS (2006, pp. 229-241), Directive 2009/138/EC, Article 51

[*] We concentrate on basic requirements for banks and insurance undertakings using the standard approach. In case of the use of an internal model, additional disclosure requirements must be fulfilled.

Even though both banks and insurance companies are obliged to disclose capital requirements, the level of detail varies in the Level 1 and 2 texts. While *Solvency II* demands the publication of the SCR and the MCR for the undertaking as a whole, *Basel II/III* prescribes the disclosure of capital requirements for the separate risk types, i.e. credit risk, market risk, and operational risk, in addition to the total capital ratio and the Tier 1 capital ratio. Public disclosure demands concerning qualitative requirements for risk management are more detailed in *Solvency II*. For example, the report should contain a description of the business and performance as well as all major differences between the assumptions underlying the standard formula for calculating SCR and the institution's individual risk profile. Both regulatory schemes further demand publication of quantitative and qualitative information for separate risk categories. Some examples are shown in Table 4.

6. Summary of Main Differences and Similarities

Although *Basel II/III* and *Solvency II* appear very similar because of the same three-pillar structure, the comparative assessment of both regulatory frameworks revealed several major discrepancies in the specifications of the three pillars, particularly with respect to the quantitative requirements laid out in Pillar 1. This can in part be attributed to the different characteristics of the industries, and to the different goals of supervision. In the banking industry, the focus on systemic risk and system stability is more pronounced, particularly because of the highly liquid nature of funding, which might lead to contagion effects spreading throughout the entire financial system, endangering even sound banking institutions, as well as the high interconnectedness, enabling negative shocks to spread faster throughout the entire banking system. This results in a stronger emphasis on promoting the stability of the financial system in *Basel II/III*, while the main objective of *Solvency II* is the protection of the individual policyholders, with stability of the financial system and the consideration of pro-cyclical effects rather representing side goals.[129]

In contrast to *Solvency II*, *Basel II/III* does not aim at achieving a safety level for the whole company, but instead focuses on the three individual risk classes on the asset side: market risk, credit risk, and operational risk. *Solvency II* requires a holistic perspective and, based on a total (economic) balance sheet approach, accounts for assets and liabilities in order to achieve a one-year company solvency probability of at least 99.5%. This implies that while risk calibration in *Basel II/III* is tied to the three single risk categories by considering unexpected losses within each category individually, the *Solvency II* capital requirements explicitly account for dependencies and diversification benefits among risk categories. In general, insur-

[129] See Directive 2009/138/EC, Articles 27, 28; Wandt and Sehrbrock (2011).

ance companies are exposed to considerably more risks on the liability side due to the vertical risk transformation and the resulting insurance risks, while the liability side of banks mainly consists of deposits with a fixed value. Yet, in combination with the asset side, liquidity risk arises, which is addressed in Pillar 2 of *Basel II* and further strengthened in *Basel III*.[130] Overall, supervisory authorities expect banks to exceed minimum capital requirements, so the capital requirements calculated in Pillar 1 do not actually constitute the final constraint that has to be satisfied. In *Solvency II*, the two-level approach will probably enable insurance companies to operate closer to the SCR. However, the added volatility, coming along with market consistent valuation, might partly counteract this effect.

Another important difference between the two schemes is that *Basel II/III* is not purely principles-based, in particular with respect to deriving capital requirements for credit risk, which even in the case of an internal model has to comply with strong restrictions. In *Solvency II*, in contrast, the use of internal models is purely principles-based and planned to be encouraged to integrate regulatory requirements into internal risk management processes. However, crucial success factors in this respect are the resources and capacity of the certifying regulatory authority, their willingness to accept internal models, as well as the ability to avoid an excessive bureaucracy implying high impediments for insurers.

Hence, *Solvency II* can be considered as a further development of *Basel II* in some aspects, in particular with respect to Pillar 1 and its holistic approach, which, however, comes along with a considerably higher degree of complexity. Especially the latest quantitative impact study in 2010, QIS 5, introduced a high level of complexity when testing the fifth version of the standard model for calculating capital requirements according to Pillar 1. While the instructions of the last quantitative impact study for *Basel II* filled about 50 pages, the *Solvency II* technical specifications of the standard model have more than 300. The higher degree of complexity may in some cases even prevent a more frequent calculation (even though listed stock insurers typically need to publish at least quarterly) at acceptable costs as compared to the case of the simpler and easier to implement rules-based model of *Basel II/III*, which, however, offers less flexibility to adjust the model to the company-specific risk situation and is mainly based on book values, thus not providing a market-based or economic viewpoint. There is thus a tradeoff between the benefits of a total balance sheet approach along with its deeper insight into a firm's risk situation and the associated costs, which has not been empirically analyzed to date.

[130] Additional restrictions concerning liquidity of e-money institutions are stated in Directive 2000/46/EC.

However, *Solvency II* still offers a wide range of flexible solutions, e.g., by means of using institution specific input parameters for the standard formula, which allows an adaption to the individual institution. In particular, two to three levels of freedom in deriving capital requirements are given in *Basel II/III*, while *Solvency II* offers up to five, ranging from a complete internal model to the use of a simplified version of the standard model. Yet, at the current stage, more transparency is needed with respect to the origin of the input parameters used in the standard model and the presumed type of company, for which a safety level of 99.5% is actually achieved when implementing the standard model as, e.g., laid out in QIS 5. For instance, with respect to premium and reserving risk in non-life, Hampel and Pfeifer (2011) show that the calculation of the standard formula seems to implicitly assume a loss ratio of 100%, which is not stated in the technical specifications and cannot be considered as prudent for all branches. Hence, companies with a lower loss ratio are advised to insert their own loss ratio to reduce capital requirements. This example illustrates the importance of providing transparency for insurers with respect to the background of the input parameters stated in the technical specifications to enable them to adjust their model accordingly.

The Solvency II standard model also exhibits several other problems in its details. For instance, the liquidity premium added to the risk-free interest rate provided by the regulators may imply undesirable incentives with respect to firms' asset-liability management, amongst other effects, as insurers with an actually insufficient asset-liability management are able reduce the value of their liabilities in times of financial distress and may thus appear similarly stable as firms with an adequate risk management.[131] Furthermore, government bonds of EEA-member states are currently not subject to capital requirements, independent of their credit quality, also implying that corporate bonds with longer contract term have a disadvantage in this respect. This induces possible adverse interaction effects between the two regulatory regimes in insurance and banking, especially with respect to financing issues, as, e.g., banks are envisioned to issue more bonds with longer contract terms following *Basel III*, which in *Solvency II*, however, are subject to higher capital requirements as compared to EEA-government bonds.

In Pillar 2, the function of the ICAAP in supporting operative, daily business decisions is emphasized more heavily in *Basel II/III* as compared to the ORSA in *Solvency II*. Requirements concerning general government requirements and the organizational structure are otherwise very similar; this also holds true for the reporting requirements in Pillar 3.

[131] See Gründl (2011).

7. CONCLUSION

In conclusion, the comparative assessment of *Solvency II* and *Basel II/III* allowed the detection of similarities and differences as well as benefits and shortcomings of both regimes, which provides an opportunity to rectify their drawbacks. With respect to *Basel II/III*, this especially concerns the lack of a common valuation basis in Pillar 1, which prevents a consistent risk metric, as well as the use of forward-looking valuation approaches. Furthermore, the financial crisis emphasized that liquidity risk arising from an asset-liability mismatch can be substantial. Thus, while *Basel II* mostly concentrates on risks on the assets side, a stronger emphasis on the relationship between assets and liabilities – along the lines of the total balance sheet approach of *Solvency II* – and the resulting liquidity risk management could potentially be advantageous. In addition, the principles-based nature and the use of internal models as in *Solvency II* might also be profitably adapted to *Basel II/III*, especially as a truly principles-based regulation is the best way to ensure sufficient flexibility to adopt regulation to the constantly changing business environment as laid out in Schiro (2006), and since internal models might harbor further advantages as also pointed out by Liebwein (2006).

For insurance companies, the introduction of the integrated *Solvency II* approach will overall certainly improve the risk perspective of insurance companies and their ability to achieve a comprehensive and adequate picture of the risk situation. However, as described before, while the standard model of *Solvency II* provides an integrated perspective on an insurer's risk situation, there is a tradeoff due to its complexity, which in turn introduces the potential for model risk due to numerous assumptions regarding processes and dependencies. This should be dealt with by means of, e.g., sensitivity analyses to avoid wrong incentives. In addition, several details of the standard model require reconsideration as laid out in the previous section.

While *Solvency II* might be less prone to pro-cyclical effects than *Basel II/III*, since it is calibrated to long-term observations and because its principles-based nature makes it more flexible,[132] the possibility of pro-cyclical effects, especially concerning the investment behavior and its potential impact on financial markets, including prices of stocks as well as corporate and government bonds, should be subject to further research. This also concerns the effectiveness of the current measures against pro-cyclicality planned in the standard model.[133] Furthermore, as pointed out by Doff (2008) and Ashby (2011), a more balanced approach be-

[132] See Geneva Association (2010, p. 109).

[133] Heid (2007), for example, finds that capital buffers as introduced in *Basel III* can be very efficient in reducing the impact of the volatility of capital requirements, which can substantially vary during an economic cycle, and thus lessen pro-cyclical effects.

tween Pillar 1 and Pillars 2 and 3 in *Solvency II* appears reasonable. Here, *Basel II/III* could in some aspects serve as an example, where regulations of Pillar 1 are supplemented by specific regulations in Pillar 2. This might as well be useful for lowering the level of complexity currently envisioned in QIS 5.

Caution is also advised with respect to regulatory bureaucracy and impediments that may prevent a true principles-based approach and induce a trend towards a rules-based regime or one that actually lowers transparency. In this context, the proportionality principle is essential, implying that risk management, capital requirements, and reporting requirements should correspond to a firm's risk situation. In addition, a high degree of transparency is needed with respect to assumptions that constitute the basis for capital requirement and in regard to the way in which regulators actually deal with companies that do not achieve a safety level of 99.5% (but instead, e.g., 97.5%), which should be clearly addressed and communicated. Finally, besides studies on possible pro-cyclical effects, cost-benefit analyses are needed to gain deeper insight with respect to the consequences of the new European regulatory framework for insurance companies, along with a consideration of possible adverse interaction effects between the two regulatory regimes.

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