

Working Papers on Global Financial Markets

No. 17

Basel III and Systemic Risk Regulation - What Way Forward?

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**GLOBAL FINANCIAL
MARKETS**

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Januar 2011



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One of the most pressing questions in the aftermath of the financial crisis is how to deal with systemically important financial institutions (SIFIs). The purpose of this paper is to review the recent literature on systemic risk and evaluate the regulation proposals in the Basel III framework with respect to this literature. A number of shortcomings in the current framework are analyzed and three measures for future reform are proposed: counter-cyclical risk-weights, dynamic asset value correlation multipliers, and enhanced transparency requirements for SIFIs.

Keywords: systemic risk, SIFIs, regulation

JEL classification: C63, E52, E58, G01, G21

I Introduction

The financial crisis of 2007/2008 unveiled the shortcomings in the regulation of systemic risk and exposed the moral hazard that is associated with systemically important financial institutions. Governments were forced to bail-out these large, complex and highly interconnected financial intermediaries as they feared the unforeseeable consequences of their default. The G20 responded to the crisis with a new framework for banking regulation, commonly referred to as Basel III.² Basel III increases the quality and quantity of banking capital, introduces two liquidity and one leverage ratio. However, the question if Basel III can effectively regulate systemic risk and resolve the moral hazard that is associated with systemically important financial institutions remains. To answer this question, this paper reviews the literature on systemic risk and evaluates the Basel III framework with respect to this literature.

The remainder of this paper is organized as follows. Section two gives an overview of the regulatory responses to the financial crisis. Section three reviews the recent literature on systemic risk. What forms of systemic risk exist and how it can be

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²Basel III comprises of a number of documents that the G20 leaders have agreed upon: The Basel Committee on Banking Supervision (2010b), "*Basel III: A global regulatory framework for more resilient banks and banking systems*", The Basel Committee on Banking Supervision (2010c), "*Basel III: International framework for liquidity risk measurement, standards and monitoring*", as well as the earlier document from The Basel Committee on Banking Supervision (2010a), "*Report to the G20: The Basel Committee's response to the financial crisis*". Downloaded from <http://www.bis.org/list/basel3/index.htm> on 12/29/2010.

operationalized. Section four outlines some shortcomings of Basel III and proposes a way forward with systemic risk regulation.

II The Regulatory Response to the Financial Crisis

In response to the financial crisis, the The Basel Committee on Banking Supervision (2010a) has compiled a set of new global standards which is commonly referred to as Basel III. These standards were recently endorsed by the largest industrialized and developing countries at the G20 summit in Seoul. They will be implemented starting with January 1, 2013 and fully established by January 1, 2019. Basel III comprises changes in all three pillars of the former Basel II standards. The first pillar consists of minimum capital requirements, while the second pillar describes the banking supervision process and the third pillar aims to enforce market discipline through transparency of bank's risks. Although Basel II was not fully implemented by the time the financial crisis struck, it was agreed upon by the G20 leaders that it has to be reformed in order to cope with systemic risk as well.

II.1 Design and Main Features of Basel III

The cornerstone of Basel III are changes regarding the first pillar of Basel II. The aim is to reduce the probability of bank failures by improving banks' loss absorption possibilities. Besides extensions in capital requirements, an additional non-risk based leverage ratio and two liquidity ratios will be established in Basel III. Capital is about to increase both quantitatively and qualitatively. After a transition period, banks will be forced to hold 4.5% common equity instead of 2%. A stricter definition of common equity augments its quality and higher risk weights for several exposures intend to cover both on- and off-balance sheet risks.

The recent financial crisis revealed how crucial the break down of the interbank market is, as many banks faced difficulties to refinance themselves. Therefore, liquidity requirements are implemented to reduce insolvency problems arising from contagion via the interbank market. Under Basel III, banks will have to meet two liquidity ratios. Whereas the liquidity coverage ratio (LCR) follows a short-term approach, the net stable funding ratio (NSFR) addresses longer-term problems arising from illiquidity. Under the LCR banks will be required to hold a sufficient amount of liquid assets with a high quality to obviate short-term disruptions. The NSFR will include the entire balance sheet to prevent structural longer-term problems arising from liquidity mismatches. Details concerning both ratios are not yet specified.

The capital requirement under Basel II form a Tier 1 risk-based ratio which is defined as the ratio between a bank's core equity, i.e. its common equity and certain other financial instruments qualifying for equity, and its risk weighted assets. In

the run-up to the crisis, the information content of this measure has been limited. Banks circumvented the constraint and increased both on- and off-balance sheet leverage levels but were able to report strong Tier 1 risk-based ratios at the same time. As high leverage levels increase a bank's probability of default, Basel III implements an additional non-risk based leverage ratio thus limiting incentives to circumvent capital requirements. Like the liquidity requirements, it is not agreed upon a concrete ratio. The Committee suggests to start the transition period with a minimum Tier 1 leverage ratio of 3%.

Beyond these increased requirements for banks, Basel III will improve the supervisory guidance of regulatory authorities under Pillar 2. The authorities' capacity to act will increase to enhance their ability to manage different kinds of risks, like liquidity, off-balance or concentration risks. Furthermore, conducting stress tests aims to assist the detection of systemic risks.

Pillar 3 comprises standards for market disclosure which will be raised in order to enhance transparency. On their websites, banks will have to report more details regarding their balance sheets like revealing the terms and conditions of all instruments of their regulatory capital base and explaining which deductions were applied. These requirements have to be fulfilled by the end of 2011.

Additionally, Basel III includes a macro prudential approach. The recent financial crisis has revealed that micro prudential regulation is insufficient to respond to systemic risks, as it focuses only on firm-specific risks. Macro prudential regulation thus seeks to stabilize the financial system by taking into account risks arising from the interactions between financial institutions. In order to prevent systemic risks, Basel III stipulates two kinds of capital buffers. In good times, banks will have to build up a capital conservation buffer of 2.5% so that the total common equity requirement rises to 7%. In times of distress this buffer can be scaled down to absorb losses. Depending on national circumstances, the authorities will be authorized to raise an additional countercyclical buffer of 0 to 2.5% in order to counteract excessive credit growth which might induce systemic risks.

II.2 Regulation of Systemically Important Financial Institutions

The cases of Lehman Brothers and AIG have highlighted how single financial institutions might trigger contagion effects or a common shock in the financial market and thus affect not only the banking sector but the economy as a whole. Hence, macro prudential regulation seeks to impose additional requirements on institutions which are systemically important, thus reducing their default probability. Potential tools for such additional requirements might be for instance capital surcharges, contingent capital or bail-in debt. At present, neither a definition of SIFIs nor details regarding these potential tools are specified in detail. The definition of the Basel Committee on Banking Supervision (BCBS) of SIFIs is expected in

the near future is announced to include both quantitative and qualitative indicators. Moreover, the BCBS is currently conducting a survey to reveal how much additional loss absorbency potential an SIFI needs and to analyze which impact the different requirement tools might have on the financial system. The survey is expected to be published by mid-2011.

At their Seoul summit, the G20 (2010) outlined cornerstones of a framework to reduce the moral hazard risks posed by SIFIs and addresses the too-big-to-fail problem. This framework was developed in Financial Stability Board (2010b). The cornerstones of the framework are: (i) a resolution framework and other measures to ensure that all financial institutions can be resolved safely, quickly and without destabilizing the financial system and exposing the taxpayers to the risk of loss; (ii) a requirement that SIFIs and initially in particular financial institutions that are globally systemic should have higher loss absorbency capacity to reflect the greater risk that their failure poses to the global financial system; (iii) more intensive supervisory oversight; (iv) robust core financial market infrastructure to reduce contagion risk from individual failures; (v) other supplementary prudential and other requirements as determined by the national authorities which may include, in some circumstances, liquidity surcharges, tighter large exposure restrictions, levies and structural measures. Special emphasis was put on globally systemically important financial institutions (G-SIFIs). The G20 agreed that they should be subject to a sustained process of mandatory international recovery and resolution planning. Furthermore, the G20 (2010) stress, that supervisors should have appropriate tools and powers to identify systemic risks at an early stage.

The Financial Stability Board (2010a) outlines in more detail how the intensity and effectiveness of SIFI supervision can be enhanced. The findings are summarized in ten recommendations relating to the mandates and independence of supervisory authorities; the resources and supervisory powers necessary to fulfill the mandates, as well as accounts of improved techniques of banking supervision; recommendations for group-wide and consolidated supervision which relates to the supervision of a group of financial institutions; recommendations for continuous and comprehensive supervision; information-sharing of home and host countries of globally active systemically important financial institutions; measures of forward looking macro-prudential surveillance; and the use of third party services by regulatory bodies.

Going forward, the G20 plan to strengthen the regulation and supervision of hedge funds, OTC derivatives and rating agencies. They asked the FSB to develop recommendations to strengthen the regulation of the shadow banking system by mid 2011. Meanwhile, various G20 member countries launched national legislative reforms that also address systemically financial institutions.

II.3 National Legislative Reforms

The financial crisis revealed the need for a reform of the financial regulatory framework. It became clear, that unregulated systemic risk can pose a major threat to financial stability and economic growth. However, most G20 countries do not yet have a formal definition of systemic risk (see International Monetary Fund et al. (2009)) and different countries have differing views on what systemic risk is, even on a non-formal level. Despite this fundamental problem, a number of governments reacted to the public pressure that was caused by the bail-out of supposedly systemically important financial institutions and proposed changes to the national regulatory frameworks. This paper thus gives an overview of the legislative reforms and reform proposals in the United States, the Eurozone and the United Kingdom.

In the United States, the Dodd-Frank Wall Street Reform and Consumer Protection Act was signed into law on July 21, 2010. This act can be regarded as the broadest set of regulatory reforms since the reforms in response to the Great Depression. In over 2300 pages the Act comprises more than 240 rules across several federal agencies. Different aspects of the financial system are approached such as consumer protection, increasing transparency for derivatives or limits on proprietary trading and hedge funds. In order to address systemic risk the Dodd-Frank Act establishes the Financial Stability Oversight Council (FSOC). The main tasks of the FSOC are identifying systemically important institutions and gaps in regulation, collecting information and monitoring the financial services marketplace in order to identify potential risks. Both, systemically important non-bank financial institutions, as well as bank holding companies with more than \$50 billion in assets are facing stricter regulation standards under the Dodd-Frank Act. These can include increased capital and liquidity requirements, leverage and concentration limits or enhanced public disclosures revealing how the institution could be resolved. Moreover, the FSOC possesses further tools like the ability to impose the issuing of contingent capital on distressed institutions. In case an institution is nevertheless in distress the Dodd-Frank Act provides the room for takeovers or liquidations.

The main critique on the Dodd-Frank Act with respect to considering systemic risk is that most of the details regarding stricter requirements are not constituted, yet, except for the leverage limit, which should not exceed 15 to 1. Acharya et al. (2010a) argues that marking institutions as systemically important enables these institutions competitive advantages (see e.g. Akram and Christophesen (2010) for an empirical verification) and incentivizes them to conduct excessive risk taking.

The European Parliament has given its final approval for a reform of the EU financial supervisory system on 22 September 2010³. The new legislation establishes a newly founded European Systemic Risk Board (ESRB) which will be hosted at the

³The adapted resolutions can be found at <http://www.europarl.europa.eu/sides/getDoc.do?language=EN&type=TA&reference=20100922&secondRef=TOC>.

European Central Bank (ECB). It will be responsible for *“macro-prudential oversight of the financial system within the Community in order to prevent or mitigate systemic risks, to avoid episodes of widespread financial distress, contribute to a smooth functioning of the Internal Market and ensure a sustainable contribution of the financial sector to economic growth”*. The proposal by the European Commission further establishes a European System of Financial Supervisors, consisting of a network of financial supervisors who will work closely with the newly created European Supervisory Authorities (ESAs). The ESAs are created by the transformation of existing European supervisory committees into a European Banking Authority (EBA), a European Securities and Markets Authority (ESMA), and a European Insurance and Occupational Pensions Authority (EIOPA). The ESRB is an entirely new European body, but will not have any binding powers to impose measures on member states or national authorities. It rather acts as a standard setter which influences the action of policy makers. The ESRB will not be limited to macroprudential supervision of banks, but rather monitors all types of entities or markets. It can issue warnings and recommendations that *“may address any aspect of the financial system which may generate a systemic risk [...] An essential role of the ESRB is to identify risks with a systemic dimension and prevent or mitigate their impact on the financial system within the EU”*.

In July 2010 the Government of the United Kingdom issued a consultation document on proposed changes to the UK regulatory framework. A more detailed proposal is expected early in 2011. HM Treasury (2010) confirms plans to replace the Financial Services Authority by a tripartite system consisting of the Financial Policy Committee (FPC), the Prudential Regulation Authority (PRA) and the Consumer Protection and Market Authority (CPMA) which all form subsidiaries of the Bank of England. The FPC will be responsible for macroprudential regulation by identifying systemic risks, deciding on macroprudential tools and recommending to the other authorities in order to reduce imbalances and weaknesses of the financial system, and to report to Parliament and the public in order to increase the action's transparency. As potential tools, the document considers countercyclical capital requirements, variable risk-weights, leverage limits, forward-looking loss provisioning, collateral requirements, and quantitative credit controls and reserve requirements. The focus of PRA will lie on the operational part of regulation and supervision by effectively coordinating macroprudential with microprudential regulation. The CPMA will be responsible for consumer protection and promoting confidence in the financial system. As information sharing among these authorities is essential a close cooperation is considered in the design of the authorities.

III Systemic Risk

Systemic risk is a broadly defined term that has changed considerably in the course of the recent financial crisis. Until then systemic risk was predominantly under-

stood as the probability of contagion effects that cause cascades of defaults. The crisis, however, revealed that systemic risk might also emerge from two other sources: (i) a common shock, leading to a simultaneous default of several financial institutions at once; and (ii) informational spillovers where bad news about one bank increase the refinancing costs of all other banks.

A categorization of systemic risks is given by Bandt et al. (2009) who distinguish between a broad and a narrow sense of systemic risk. In their classification, contagion effects on interbank markets pose a systemic risk in the narrow sense, whereas systemic risk in the broad sense is characterised as a common shock to many institutions or markets. This distinction is followed by the Financial Stability Board (FSB) who defines systemic risk as “*a risk of disruption to financial services that is (i) caused by an impairment of all or parts of the financial system and (ii) has the potential to have serious negative consequences for the real economy*” (see International Monetary Fund et al. (2009), as well as the background paper Financial Stability Board et al. (2009)). The ECB suggests that systemic risk can be described as the risk of experiencing a strong systemic event that adversely affects a number of systemically important intermediaries or markets (European Central Bank (2009)). The trigger of the event could either be a shock from outside or from within the financial system. The systemic event is strong when the intermediaries concerned fail or when the markets concerned become dysfunctional. Since all these different dimensions of a systemic event interact with each other, it is clear that systemic risk is a highly complex phenomenon.

III.1 Contagion

Contagion occurs due to direct linkages between financial institutions. Probably the most prominent example of these linkages is contagion via interbank markets. The interbank market can be described as a financial network consisting of a set of nodes, i.e. banks or other financial institutions like hedge funds or insurance companies, and a set of edges which form the connection between these institutions. An extensive review on the literature of financial networks is given in Allen et al. (2010). The interconnection in the interbank market can lead to an enhanced liquidity allocation and increased risk sharing amongst the banks, as Allen and Gale (2000) argue. At the same time, however, increased connectivity can also amplify contagion effects.

Analyzing linkages in the form of overlapping claims, Allen and Gale (2000) find that contagion is more likely to occur if the network structure is incomplete, as in comparison with complete networks it is only able to absorb smaller idiosyncratic shocks. Gai and Kapadia (2008) support the result that higher connectivity in the financial system reduces the probability of contagion. However, they identify that the consequences in case contagion nevertheless occurs are more severe as the possibility increases that institutions might repeatedly be affected. Haldane (2009)

argues that connectivity is a knife-edge property. Up to a certain point, financial networks and interbank linkages serve as a mutual insurance of the financial system and thus contribute to systemic stability. Beyond this point, the same interconnections might serve as a shock-amplifier and thus increase systemic fragility.

The stabilizing function of an interbank market might, furthermore, be affected by the structure of financial markets. Iori et al. (2006) find that contagion probability is lower in case the interacting institutions are homogeneous, i.e. they are similar their characteristics such as size or investment opportunities, as thus no institution becomes significant for either borrowing or lending. This result, however, is in contrast with Georg and Poschmann (2010) and Georg (2010), who find no significant evidence that the heterogeneity of the financial system has a negative impact on financial stability. Haldane (2009) describes the financial system in the built-up of the crisis as being characterized by complexity and homogeneity and argues why these two ingredients lead to fragility by resorting to literature on complex systems and ecology. Further structural factors are analyzed by Nier et al. (2007) who constitute that higher capitalization levels, lower interbank liabilities and a less concentrated interbank market reduce the likelihood of direct contagion in the interbank market.

Due to their high liquidity, interbank transactions are amongst the most vital connections between banks and have thus received special attention in the literature. Eisenberg and Noe (2001) develop a liabilities matrix for a general interbank system and calculate the full impact of a bank default in the system using linear algebra. A number of authors follow this work and apply it to different countries. Furfine (1999) examines the likelihood that a failure of one bank would cause the subsequent collapse of a large number of other banks in the US using the Federal Reserve's large-value transfer system Fedwire. Mistrulli (2007) uses actual interbank exposure data from the Bank of Italy Supervisory Reports database to analyze the risk of contagion in the Italian interbank market. Gabrieli (2010) analyzes the functioning of the overnight unsecured euro money market using data on unsecured Euros-denominated loans executed through the e-MID platform. Gabrieli finds that monetary policy implementation was affected by the crisis due to "A *heightened awareness of counterparty credit risk*". Cajueiro and Tabak (2007) analyze the topology of the Brazilian interbank market by using methods from network theory. Manna and Iazzetta (2009) analyze monthly data on deposit exchanged by banks on the Italian interbank market from 1990 to 2008.

III.2 Common Shocks

Another source of systemic risk emerges from indirect linkages between banks in the form of common shocks. If a number of banks hold identical or similar assets, this correlation between their portfolios can give rise to a fire-sale which is typically associated with significant losses for a large number of banks. Acharya

and Yorulmazer (2008) point out how banks are incentivized to increase the correlation between their investments and thus the risk of an endogenous common shock in order to prevent costs arising from potential information spillovers. The banks' returns of the last period are signals according to which risk-averse depositors update priors about future returns. Compared with the situation in which both banks' signals are positive, depositors expect lower returns in the future if one bank's signal is negative and, hence, demand higher deposit rates in order to compensate for potential failures. Accordingly, a bank with a positive signal is facing higher borrowing costs if the other bank sets a negative signal. This sets an incentive for both banks to increase the correlation between their investments to increase the probability of joint success (and joint failure).

Acharya (2009) analyzes how banks are incentivized to induce an endogenous common shock in order to avoid negative externalities arising from a bank failure. The driving factor behind this behavior is that a default imposes both positive and negative effects on the surviving competitor. Negative effects arise as not all depositors are furthermore able or willing to lend their money to a bank, so that the surviving bank faces higher refinancing costs. However, the failure also leads to a reduction of monitoring and information costs by taking over staff and technology. Depending on which effect prevails the payoffs of the surviving bank's shareholders either increase or decrease in comparison to no bank failure. Accordingly, if the failure generates negative externalities banks are incentivized to increase the correlation of their portfolios *ex ante* and thus increase the probability of a joint failure.

Analyzing the impact of central bank activity in a network model with interbank market Georg and Poschmann (2010) highlight that common shocks constitute a larger threat on financial stability than contagion effects. Empirical studies confirm that correlation in the financial sector increased. De Nicolo and Kwast (2002) illustrate an increase in correlation between large and complex financial organizations during the 1990s, whereas Lehar (2005) finds that this development was more severe for North American than for European banks.

III.3 Informational Spillovers

According to Acharya and Yorulmazer (2003), as well as Nier et al. (2008), informational spillovers are another form of systemic risk that have to be taken into account. This effect is sometimes called informational contagion, but the name is misleading, since it poses a systemic risk in the broad sense of Bandt et al. (2009). The main idea of informational spillovers is that the insolvency of a bank can increase the refinancing costs of the surviving banks, since especially in times of crises financial markets exhibit a herding behaviour. Acharya and Yorulmazer (2003) develop a model of bank herding behaviour based on a bank's incentives to minimize the information spillover from bad news about other banks. In their model, the returns on a bank's loans consist of a systematic component (i.e. the business cy-

cle) and an idiosyncratic component. If there are bad news about a bank, these news reveal information about an underlying common factor and thus impact on all banks. The authors show that even the possibility of information contagion can induce banks to herd with other banks. Herding behaviour in this model is a simultaneous ex-ante decision of banks to undertake correlated investments and gives thus rise to correlations amongst the bank's portfolios. Bandt et al. (2009) give an overview of literature on bank herding as a source of systemic risk.

The different forms of systemic risk are not independent of each other and a bank default does not happen instantaneously. During the build-up of the default, the bank will start deleveraging and selling assets. This may cause fire-sales in certain asset classes and exacerbates the bank's problems. At the same time, rumors about the bank and similar banks will spread in the markets, causing market participants to tighten their liquidity provision. Since the first bank already is struggling, this tightened liquidity situation can lead to a default of this bank. This default then triggers contagion effects and possible further defaults at banks who have issued interbank loans to the first bank. As the recent financial crisis has shown, financial markets show a herding behaviour as described in Acharya and Yorulmazer (2003) and are aware of it too. In a situation of high uncertainty about the fundamental and idiosyncratic risks in the financial system, liquidity provision will dry up and market volatility will increase. While one can distinguish the various forms of systemic risk by their manifestation, it is impossible to separate them in reality. Contagion effects and common shocks will inevitably trigger informational contagion and vice versa. Therefore, informational contagion is a vivid source of systemic risk and has to be taken into account into macroprudential regulation to enhance financial stability.

III.4 Operationalizing Systemic Risk

In order to derive meaningful policy measures for regulating systemic risk, it is necessary for regulatory authorities to measure and operationalize systemic risks. It was recently emphasized by e.g. Borio (2010) that the distinction between the time- and cross-sectional dimensions of aggregate risk is critical. In the time-dimension leading indicators of financial distress are needed, while in the cross-sectional dimension a robust quantification of the contribution of each institution to systemic risk is necessary. There are various approaches in the literature to achieve these goals. The European Central Bank (2010) differentiates between four types of indicators to measure systemic risk: (i) coincident indicators of financial stability measure the current state of instability in the financial system; (ii) early-warning signal models to detect the build-up of systemic crises; (iii) macro stress-tests can assess the resilience of the financial system to aggregate macro-shocks; (iv) contagion and spillover models are used to analyze the impact of a crisis on the stability of the financial system. By using a set of such indicators, central banks and regulatory authorities try to assess the different dimensions of systemic risk. It is a precondition

for a useful measurement concept of systemic risk that it takes all dimensions of systemic risks into account and will thus be a combination of at least some of the systemic risk indicators. The main problem to date is, that there does not exist a reliable indicator to measure the informational contagion of a financial institution's default. This leads to a significant element of uncertainty when assessing systemic risks.

Systemic Importance of Individual Financial Institutions. A number of approaches assess the systemic importance of individual financial institutions. Their common goal is to impose additional regulatory requirements and oversight in accordance with the individual systemic importance of a financial institution. Zhou (2009) considers three different measures of systemic importance of interconnected financial institutions and correlates them with the size of the institution. The author finds that there is not always a relationship between the systemic importance of a financial institution and its size. The “too-big-to-fail” argument does not always hold true and thus alternative measures of systemic importance have to be considered. The paper follows Segoviano Basurto and Goodhart (2009) and defines a systemic importance index that resorts to multivariate Extreme Value Theory. Another approach stems from cooperative game theory. Tarashev et al. (2009) use the Shapley value to attribute each individual institution's contribution to overall systemic risk. They apply their methodology to a sample of 20 large internationally active financial institutions and derive their contribution to overall systemic risk as a function of the institution's size, probability of default and exposure to a common factor.

Adrian and Brunnermeier (2009) introduce *CoVaR* which is the Value at Risk of the financial system conditional on an individual institution being under stress. The methodology thus focuses on how much an individual institution contributes to overall systemic risk. International Monetary Fund (2009) uses *CoVaR* to assess systemic risk in the US banking sector using CDS spreads. Fong et al. (2009) applies *CoVaR* to the Hong Kong financial system. Arias et al. (2010) apply *CoVaR* to the Colombian banking system analysing the systemic market risk contributions of banks, pension funds, and between different types of financial institutions. A comparison of different sets of systemic risk measures is performed by Rodríguez-Moreno and Peña Sánchez de Rivera (2010). The authors argue that simple indicators are better suited for analysing systemic risk and find that the best indicators are the first Principal Component of the single-name CDSs and the LIBOR-OIS or LIBOR-TBILL spreads, respectively. According to Rodríguez-Moreno and Peña Sánchez de Rivera (2010), the least reliable indicators are the Co-Risk measures and the systemic spreads extracted from the CDO indexes and their tranches.

Huang et al. (2009b) propose a framework for measuring and stress testing the systemic risk of a group of major financial institutions. They construct an hypothetical insurance premium against systemic risk, called the *distress insurance premium* (DIP). The DIP is based on on ex ante measures of default probabilities of indi-

vidual banks and forecasted asset return correlations. In order to construct the probability of default of individual banks and asset return correlations are calculated from CDS spread data. Huang et al. (2009b) applies the DIP to 12 major U.S. banks during a sample period 2001-08 and are able to show a substantial increase in the indicator after the onset of the subprime crisis. Huang et al. (2009a) furthermore applies the DIP methodology to twenty-two major banks in Asia and the Pacific and illustrate the dynamics of the spillover effects of the financial crisis into the region. Brownlees and Engle (2010) construct the Marginal Expected Shortfall (MES) as a measure of the systemic risk of an individual financial institution. The MES of a financial firm is based on market data and describes the expected loss of an equity investor should the overall market decline substantially. It depends on the volatility of a firm equity price and is determined by using advanced econometric models. Acharya et al. (2010b) define the contribution of a financial institution to overall systemic risk as the institution's systemic expected shortfall (SES). The systemic expected shortfall of an institution increases with the leverage of this institution and with its MES. The authors demonstrate how SES can be used to predict the outcome of stress tests, decline in equity valuations of large firms during the financial crisis and the increase in their CDS spreads. Both papers are the building blocks of the NYU Stern systemic risk ranking⁴ that measures the systemic risk contributions of the largest U.S. financial institutions.

Integrated Measurements of Systemic Risk. Besides attributing systemic risk to individual financial institutions, it is also possible to derive measurements of overall systemic risk in a financial system. These approaches have in common, that they use more than one indicator of systemic risk, typically based on market data (i.e. CDS spreads) and network data (i.e. about the interbank network structure). Gauthier et al. (2010) compare different methods of attributing systemic importance to individual institutions using data from the Canadian banking system. The authors find that macroprudential capital requirements can reduce the risk of a systemic crisis by 25% and that the macroprudential capital requirements can differ from the observed capital levels by up to 50%. This difference is furthermore not trivially related to a bank's size or its default probability. Schwaab et al. (2010) propose an econometric framework for the measurement of global financial and credit risk conditions based on state space methods. Furthermore, they propose a coincident indicator for unobserved default stress as a measure for overall financial system risk. They find that credit risk conditions can significantly and persistently decouple from business cycle conditions due to e.g. unobserved changes in credit supply and that such decoupling can be an early warning signal for macro-prudential policy.

Chan-Lau (2010) proposes to base additional capital charges for systemically important financial institutions on their incremental contribution to systemic risk. The proposed framework to measure a financial institution's contribution to systemic risk uses CoRisk, network analysis and one-factor credit risk portfolio models.

⁴<http://www.systemicriskranking.stern.nyu.edu/>

Chan-Lau uses the expected societal loss as a proxy for the systemic importance of a financial institution. In contrast to Tarashev et al. (2009) and Gauthier et al. (2010), Chan-Lau also factors in the increase in default risk of other institutions triggered by the failure of one institution. Aikman et al. (2009) develop a model that uses macro-credit risk, income risk, network interactions, feedback effects and funding risk to assess the impact of macroeconomic and financial shocks on the banking system. Their “Risk Assessment Model for Systemic Institutions” (RAMSI) is based on detailed balance sheet data and can be used to assess the impact on shocks on individual financial institutions and the financial system as a whole. One particular interesting point about the RAMSI model is, that it incorporates a mechanism to model informational contagion. Three indicators, solvency concerns, liquidity position and confidence are used to describe a bank’s ability to refinance on funding markets.

IV Policy Conclusions

A number of authors have critically analyzed the Basel III framework and proposed regulatory reform measures. Hellwig (2010) argues that there exist a number of asset correlations that went unnoticed prior to the crisis. Firstly, correlations arising from a common dependence on underlying macroeconomic factors, i.e. of credit risks in mortgages or mortgage-backed securities and other derivatives, were underestimated. And secondly, correlations of risks via similar contracts, such as counterparty credit risks and underlying risks in derivatives, were insufficiently taken into account. This underestimation of correlations has drastic consequences, as banks were enabled by Basel II to conduct internal risk models in order to determine the appropriate amount of risk. Hellwig, however, points out that the empirical basis for this internal risk modelling is unsatisfactory: time series that are being used are often very short and do not allow reliable estimations of the underlying process; credit risk events are very rare, which makes them hard to estimate; these problems are amplified when it comes to the estimation of asset correlations. He further argues that the model-based approach amplified the interconnectivity in the financial system and thus contributed to systemic risk. Hellwig (2010) proposes two major changes to the system of banking regulation: (i) eliminate the risk-calibration of regulatory capital; and (ii) substantially higher regulatory capital.

Rochet (2010) argues that the explicit bail-out guarantees that were issued by the G20 to large financial institutions erode market discipline and create moral hazard. He further argues that the lack of resiliency of the interbank money market to the relatively small shocks from the sub-prime mortgage market is a major challenge for banking supervisors as banks were, prior to the crisis, deemed to be very resilient on the micro-level. The author emphasizes the major difficulties of identifying financial institutions that are too big to fail (TBTF) and would thus require

additional supervisory oversight. The paper suggests to adopt central counterparty clearing for all “vital” market infrastructures (i.e. interbank transactions and derivatives) instead of opaque over-the-counter transactions. Furthermore, Rochet (2010) proposes that financial supervision should shift from protecting individual banks to protecting “platforms” (i.e. interbank markets, money markets, some derivative markets and large-value payment systems) and that the mandate of central banks should be refined accordingly.

Blundell-Wignall and Atkinson (2010) point out a number of shortcomings with the Basel III framework, part of which are rooted in Basel II. They criticize that promises in the financial system are not treated equally, regardless of where they are located. This allows for regulatory arbitrage. They further point out, that with increasing regulation in the banking sector, more capital will be invested in the unregulated shadow banking sector, as the cost of capital in the regulated sector increases. Blundell-Wignall and Atkinson (2010) show that the Basel II risk-weighting resulted in a “*perverse outcome in the crisis*” as banks with higher Tier 1 capital prior to the crisis generated higher losses when crisis struck. As Basel III brings only minor changes to the risk-weighting procedure, the danger of perverse incentives still exists. The authors further argue that the risk-weighting approach might not work well together with the leverage ratio. Blundell-Wignall and Atkinson (2010) propose to apply a quadratic minimum capital penalty for deviations from a benchmark portfolio in order to deal with lump-sum risks and argue that liquidity management should best be left to the market, as the crisis was primarily a crisis of solvency and confidence.

IV.1 Shortcomings of the Existing Reform Proposal

While Basel III can be considered a necessary step forward, it has a number of shortcomings with respect to the regulation of SIFIs and systemic risk. Stronger capital requirements can help to enhance the resilience of the financial system to contagion effects, common shocks, and informational spillovers, as they effectively reduce counterparty risk. In this respect, the increased core capital requirements, as well as the increase in capital quality were steps in the right direction. This is especially the case for the leverage ratio and liquidity requirements. A number of problems remain, however.

- (i) The core problem with capital requirements is their dependency on risk-weighted assets. As long as the risk-weights for interbank loans and other financial assets do not reflect the true risk associated with these assets, even the strongest capital requirements are rendered useless. In fact, the risk-weights currently implemented largely contributed to the creation of systemic risk as they incentivized banks to hold financial assets (interbank loans, derivatives, etc.) instead of real assets (corporate loans, corporate bonds, etc.) that have

lower correlation. Basel III has missed the opportunity to reform the risk weights and rule them out as a source of systemic risk.

The asset value correlation (AVC) factor proposed for large financial institutions in Basel III is a global factor and does not take into account the different magnitudes of correlation of different assets. The correlation between two asset classes (i.e. the correlation between corporate loans and interbank loans) will in general be lower than the correlation of two assets of the same asset class. Banks thus have no incentive to diversify their portfolios but will rather specialize on holding assets of a certain class and gain profits from economies of scale and specialization, effectively creating portfolio lump risks. Portfolio lumpiness, however, is a significant source of systemic risk, as e.g. Georg and Poschmann (2010) show.

Therefore, the risk-weights and asset value correlation factor of Basel III fail to mitigate systemic risk. As banks lack the relevant information about the network structure of the financial system, they will necessarily underestimate the correlation of their portfolios and are thus unable to conduct optimal risk management. Only the supervisory authority is able to appropriately map the financial network in a macroprudential risk analysis. The network effect is amplified for SIFIs as the correlations between interbank loans from smaller banks to SIFIs will be larger, as it is the very definition of a SIFI that its default causes widespread failure in the financial system.

- (ii) Basel III aims at regulating SIFIs by imposing additional capital requirements that are deemed to be commensurate with their systemic importance. The systemic importance of a bank, however, is a highly volatile quantity that can rapidly change over time. As it is impossible for banks to raise banking capital over night, they will be forced to hold as much banking capital as is required at the time of their largest systemic importance for the capital requirement to be effective. This argument makes it difficult for regulatory authorities to justify the additional requirements to the banks. Furthermore, capital requirements to prevent banks from gaining systemic importance can only be effective, if these requirements generate costs for the banks that are higher than the benefits from bail-out guarantees (see e.g. Akram and Christophersen (2010) for an analysis of gains from systemic importance). Otherwise, banks would still have an incentive to gain systemic importance. The benefits of bail-out guarantees can be estimated from two factors: (i) the amount of money governments had to spend on recent bail-outs; and (ii) the implicit gains that stem from the extraordinary monetary policy measures.⁵ It seems therefore unlikely that imposing additional capital requirements for SIFIs works in practice. This raises the question of what is left of the promise

⁵One example would be that banks were able to use the extended collateral standards of central banks and obtain central bank liquidity at a rate of 1% by depositing e.g. Greek sovereign bonds that pay a much higher interest.

to regulate banks that are too large, too interconnected, or otherwise of systemic importance. Basel III fails to provide a valid answer to that question.

- (iii) Another problem with imposing additional capital requirements for SIFIs is, that the G20 yet failed to agree on a global lower bound of these requirements. This will lead to a race to the bottom amongst countries, as no country will voluntarily weaken its financial sector by imposing large capital requirements for systemically important financial institutions. I have argued that it is very difficult to properly measure the systemic importance of an individual financial institution and regulatory authorities will always have to justify additional capital requirements for those banks that they deem to be of systemic importance. Without the appropriate measures of individual financial institutions, it is almost impossible for a regulatory authority to justify any additional capital charges of significant order. The Financial Stability Board (2010a) addresses the same problem with respect to the requirement that supervisory authorities be pro-active and intervene early during the build-up of systemic risks. It is stated that *“when supervisors take an early intervention approach, there are often no tangible risk indicators (i.e. losses) to confirm that this intervention is needed, so this makes it difficult to convince a firm and their boards that such measures are necessary to deal proactively with emerging areas of risk within a SIFI”*. The key question is, if it is generally possible to construct measures that detect systemic risks while they are building up. While the indicators currently available in the literature are a huge step forward when compared to the literature before the crisis, they might still fail this particular task.
- (iv) The different forms of systemic risk are interdependent and reinforce each other. However, informational spillovers are a rarely addressed issue in the G20 discussion on systemic risk. One of the few places where informational spillovers are mentioned is the Financial Stability Board (2010a), stating that *“Having a capital level that is too low vis-a-vis the risks being taken, especially for SIFIs, can lead to a highly vulnerable financial system. This shortfall contributed to the loss of confidence among counterparties, funds providers and investors”*. The enhanced capital requirements of Basel III will reduce the default probability of financial institutions. Therefore it will also reduce the risk of informational spillovers and herding behaviour, as market participants are aware of the higher resilience of the financial system. This will strengthen the trust amongst banks, but the question remains if it will prevent liquidity hoarding and fire-sales in a future crisis. The recent experience suggests that banks are well aware of the shortcomings of their risk-assessment and the devastating effects of informational contagion. This manifested with the insolvency of Lehman brothers in September 2008. The systemic impact of this particular insolvency was modest in terms of contagion effects and common shocks. But it was a signal to the remaining banks that they had underestimated the risks they had taken in their asset portfolios. The regulatory reform process

thus has to focus on addressing informational spillovers as a relevant form of systemic risk and propose measures to address this issue.⁶

IV.2 A Way Forward for Systemic Risk Regulation

The aforementioned shortcomings have to be addressed in the regulatory reform process in order to effectively regulate systemic risk. Some authors have made proposals about how the way forward with systemic risk regulation could look like. Rochet (2010) proposes a rather radical approach and suggests that financial supervision should shift from protecting banks to protecting what he calls “platforms”. These platforms are markets, such as the interbank market, money markets, some derivative markets, but also large value payment systems. This approach is appealing, but might be of purely academic interest, as it would require a completely different financial architecture, and as the author suggests himself, a new mandate for central banks and regulatory authorities. Hellwig (2010) proposes to eliminate the risk-calibration of regulatory capital altogether and a substantial increase in required capital. This would solve all problems with the current risk-weights, but does not seem to be a realistic solution as banks will lobby hard to prevent such an “thorough overhaul” of the financial system. Blundell-Wignall and Atkinson (2010) propose to apply a quadratic minimum capital penalty for deviations from a benchmark portfolio in order to deal with lump-sum risks. This proposal is appealing for two reasons: it would solve the lumpiness-problem of Basel II (and Basel III) and is more realistic than the rather radical approaches of Rochet (2010) and Hellwig (2010).

While acknowledging that the crisis calls for a much more fundamental reform of the financial system than currently provided by Basel III, this paper tries to outline a realistic and viable way forward for systemic risk regulation. In order to address the identified shortcomings of Basel III, this paper proposes three measures.

- (i) Risk-weights for interbank loans have to reflect the knife-edge property of interbank markets in some way. In normal times the low risk-weights for interbank loans are justified by the mutual insurance aspect of interbank markets. In times of crisis, however, interbank loans will amplify systemic risk and their respective risk-weights should be much larger. Thus, the static risk-weights as currently implemented in Basel III exhibit a pro-cyclicality with respect to systemic risk and a counter-cyclical risk buffer should be put in place. While Basel III proposed a counter-cyclical capital buffer, this is implemented as a global factor and does not change the incentive structure of the risk-weights. The effect of a counter-cyclical capital buffer could be realized

⁶An interesting remark is made by Haldane and May (2011) who argue that liquidity ratios will effectively limit liquidity hoarding shocks. While their point is arguably true, Acharya and Yorulmazer (2008) show that informational spillovers also increase the endogenous correlation of banks’ assets.

by allowing national authorities to implement it as a counter-cyclical buffer on the risk-weights. Such a counter-cyclical risk-weight would counteract the time-dimension of systemic risk.

- (ii) To enhance the risk-management capabilities of banks, the asset value correlation multiplier should be dynamic. Banks should be given a set of dynamic AVC for all asset classes (including cross sections) and then calculate their individual multiplier. This would enable banks to enhance their risk management and set an incentive for portfolio diversification. An additional advantage of such a dynamic multiplier is that it can be used as an effective regulatory tool in times of low economic growth but increasing systemic risk. In such times there will be a lot of political pressure on central banks to take measures stimulating growth. Even though most central banks are independent, a dynamic AVC would be a much more fine-tuned tool than just increasing the counter-cyclical buffer or imposing additional capital requirements on SIFIs. A further argument for the introduction of a dynamic multiplier is that the correlation of assets captures the cross-sectional dimension of systemic risk, and should thus be regulated accordingly. This line of argument is the rationale to distinguish between counter-cyclical risk-weights and a dynamic AVC multiplier as regulatory measures.
- (iii) Basel III does not provide adequate measures to regulate systemically important financial institutions. This is a particular shortcoming and should be addressed in future regulation proposals. Instead of focussing on capital requirements, this paper proposes to focus on market transparency. I have argued above why informational spillovers played an important role in the recent financial crisis and that Basel III does not take this source of systemic risk into account. While increased capital buffers can help strengthen the trust amongst market participants, they are not sufficient to counteract the herding behaviour that was seen during the current crisis. In order to counteract informational spillovers, asymmetric information between market participants has to be reduced. It is thus necessary to emphasize the third pillar of Basel III and to enhance market transparency considerably. Especially banks that are considered to be of systemic importance should be required to publish more frequently more detailed information. A practical way to achieve this goal would be to introduce three categories of systemic importance, low, medium and high. This simple scheme would account for the high volatility of systemic importance. Banks that have a high systemic importance only a limited amount of time are considered to be of medium systemic importance while those who are almost always of high systemic importance are in the high group and the rest is in the low group.⁷ Due to the enhanced reporting and data publication requirements for systemically important financial insti-

⁷One could envisage a rule that each bank will be put into the next higher (lower) peer group if it has a higher (lower) ranking for two consecutive time periods. This would reduce the number of up- and downgrades and still detect structural changes when systemic risks are building up.

tutions there is no use in keeping the names of the SIFIs secret. All market participants are aware who has which level of systemic importance and they are aware that this level might change over time. The regulators could publish a quarterly update on the systemic risk ranking. This time interval is frequent enough in order for banks to react to it and timely enough in order to detect the emergence of lump systemic risk at a given financial institution.

Such a simple scheme would allow different countries to use different measures of systemic importance in order to take the country-specific details of their banking system into account. For banks that are of global systemic importance there should be an internationally agreed upon minimum requirement for reporting and data publication. In order for such a regulation scheme to be effective, it is necessary to have a transparent communication what criteria are taken into account when the systemic importance of an individual financial institution is measured. Note that this does not give rise to moral hazard, as each bank only knows its local properties but cannot say with certainty how the rest of the banking system evolves. Even if banks decide to gain systemic importance (i.e. if they want to benefit from implicit bail-out guarantees) they cannot be sure that other banks do not behave similar. Therefore all measures of systemic importance have to be relative measures in the sense that they measure the relative systemic importance of a bank with respect to other banks.

The approach of enforcing additional reporting and data publication of SIFIs (or those who are suspected to be SIFIs) is a much weaker approach than requiring banks to hold additional capital. As I have argued above, it takes banks some time to acquire new capital, especially in times when they most need it. Therefore additional measures have to be taken to prevent banks from trying to gain systemic importance. It is safe to assume that a bank with high systemic importance index over a long period of time is considered to be relevant for the system stability by other market participants. An insolvency of such a bank will thus give rise to considerable informational spillovers which are almost impossible to predict. Therefore, these banks are subject to implicit bail-out guarantees which should not come without a price. This price will not be imposed on the bank by other market participants. The systemic importance of a bank does not relate to its probability of default, which is the ultimate driver of refinancing costs for the bank. Therefore, it might prove useful to impose a levy or tax on systemic importance in order to set the appropriate incentives.

The proposed policy measures only sketch a way forward for systemic risk regulation. Some parts of the picture are still missing, as the regulation of the large shadow bank sector has not yet been discussed in detail. The measures aim to be realistic in the sense that they do not call for a complete overhaul of financial regulation, but rather try to improve the steps along the way that are already taken.

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