Systemic risk, macroprudential policy frameworks, monitoring financial systems and the evolution of capital adequacy

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Abstract
This paper analyses various issues that need to be tackled when promoting financial stability, reviewing the progress made in certain key areas and the remaining challenges. It explores the measurement of systemic risk and of individual institutions’ contribution to it. It discusses aspects of macroprudential frameworks, including how the countercyclical capital buffer envisaged in Basel III takes into account the properties of the financial cycle and the strengths and weaknesses of macro-stress tests. It analyses some of the challenges of how best to monitor financial systems and the broader economy in order to detect signs of vulnerability that might lead to future bouts of financial instability and of how to set prudential policy accordingly. And it discusses the evolution of capital adequacy standards and the new emphasis on liquidity standards in international regulation.

1. Introduction
The recent financial crisis has highlighted the importance of promoting financial stability through better regulation and supervision of financial institutions. Key aspects of recent regulatory reforms include measuring and regulating systemic risk, and designing macroprudential policies appropriately. This has been a focus of institutions such as the European Systemic Risk Board (in the EU) and the Financial Stability Oversight Council (in the US, as well as at the global level).

This paper comes at a time of significant policy reform, designed to respond to the increasingly interconnected nature of financial institutions and the lessons of the Global Financial Crisis (GFC). In recent years, the collapse of numerous financial institutions has imposed significant negative externalities on governments and the economy at large. This has increased the interest in measuring the riskiness of financial institutions and appropriately allocating risks (and costs) across them in order to account for the negative externalities associated with financial instability. Against this backdrop, there is a growing awareness of the need for a macroprudential approach to regulation and of a better management of the financial cycle. Systemic risk is of the essence here. The challenges in implementing the resulting reforms should not be underestimated.

This paper begins with a discussion of systemic risk. It focuses on concerns associated with systemically important institutions which, through their size and influence, might influence the stability of the financial system. It discusses recent advances in the measurement of systemic risk, the difficulties in implementing such measures across multiple, different markets, and the need to appropriately calibrate policies according to the risks posed by banks, so-called shadow banks, and other institutions across many jurisdictions.

The paper next situates financial institutions within the financial cycle, with an emphasis on macroprudential policies. It discusses the importance of the financial cycle within macroprudential frameworks and the usefulness (or otherwise) of macroprudential stress tests. Macroprudential factors can feed into the riskiness inherent in systemically important institutions, though of course institution-specific factors such as risk appetite and business models matter as well.

The following section discusses barriers that might arise in monitoring and regulating issues associated with systemic risk and macroprudential policies. The two main challenges are those associated with monitoring and analyzing risk, and those associated with practical policy making. The paper discusses the challenges in designing regulation appropriate to multiple jurisdictions, especially if these regulations are drawn too tightly in a rule-based fashion.

The paper goes on to analyze how understanding of adequate capital requirements has changed over time, thereby highlighting
one of the challenges involved in regulation: adapting to advances in financial markets and research. The paper focuses on the evolution from the Basel I to the Basel III framework, the main lesson being that regulation must continually evolve in light of changes in our understanding of risk factors and in the risks that financial institutions face.

The structure of this paper is as follows. Section 2 discusses some of the recent developments on measuring systemic risk, including risks in large banks that could contribute to financial instability. Section 3 discusses the role of the financial cycle in shaping policy reforms. Section 4 highlights the difficulties involved in formulating policy and monitoring institutions, especially in an international context. Section 5 reinforces the points raised in Section 4 by discussing how our understanding of risk and monitoring has changed over time. Section 6 concludes.

2. Systemic risk

Achieving macroeconomic stability requires the identification of systemic risk in the financial system and of the factors that are driving it. In his speech at the 13th conference of the ECB-CFS research network, Trichet (2010), President of the European Central Bank, defined systemic risk as financial instability “so widespread that it impair[s] the functioning of a financial system to the point where economic growth and welfare suffer materially”. While there is no universally accepted definition, let alone an accepted measure to quantify this risk, there is a consensus that the regulatory and supervisory framework should have effective mechanisms to detect it and manage it.

2.1. Measuring systemic risk

There are at least three major issues in the field of measuring systemic risk. The first issue is how to measure the drivers of systemic risk. Some recent studies have focused on individual measures of systemic risk, which seek to predict how much the stocks of financial institutions fall in a major market downturn (the stress event). Acharya and Richardson (2009) and Acharya et al. (2010), and Acharya et al. (2012) lay the theoretical foundations of such an approach. In a downturn, financial institutions may fall short of capital, which can lead to a failure (and possible contagion) unless some other investor steps in. Governments usually want to minimize the resulting cost to the taxpayer, which Acharya et al. (2012) show to be a function of size, leverage and expected equity losses during a crisis. While the first two components are easily available, econometric techniques may be necessary to predict the expected equity loss in a financial crisis. Acharya et al. (2012) propose a simple historical estimator. Brownlees and Engle (2010) suggest a bivariate model of returns that uses asymmetric GARCH for volatility and an asymmetric DCC model for correlation. A third method eschews modeling the entire return process and only models the tail (in de Jonghe (2010)).

These models have worked reasonably well in the United States, but might require enhancement for use in other markets. Brownlees and Engle (2010) and Acharya et al. (2012) have shown that their signal worked well in predicting which US major banks would be severely affected in the 2007–2008 crisis. Their work is now being extended to other banks in Europe and in Asia. One of the challenges of researchers and institutions is to determine which, if any, of these signals about systemic risk in the US work in an international context over multiple crises while controlling for heterogeneity in economic development, financial sector structure and regulations. For example, Griffin et al. (2010) show that stock prices in emerging markets may reflect less idiosyncratic information. Allen et al. (forthcoming) show that the structure of a financial system (i.e. bank based versus market based) can influence the time required to recover from an economic downturn, implying that financial-market-structure influences the nature of banking risk within a country. Thus, more research needs to be done to verify whether signals about systemic weakness in financial firms are reliable from these markets.

Considerable work has been under way seeking to measure more precisely individual institutions’ contribution to overall systemic risk. Tarashev et al. (2010) propose the ‘Contribution Approach’ (CA) method of attributing systemic risk to separate institutions. The model is based on Shapley values, a game-theoretic concept initially applied to the measurement of the contribution of an individual to the output of a group. The idea is to determine an institution’s incremental contribution to the overall level of systemic risk, and is general enough to apply to a wide variety of systemic risk measures (e.g., a system-wide Value at Risk or Expected Shortfall). Tarashev et al. (2010) highlight that key drivers of an institution’s contribution include its relative size, its probability of default, and its exposure to a common risk factor. They suggest that regulatory tools could be calibrated with respect to such contributions.

Drehmann and Tarashev (2011) build on the framework in Tarashev et al. (2010) to propose a ‘Generalized Contribution Approach’ (GCA) to apportioning systemic risk, taking explicitly into account interbank networks, captured only implicitly through the exposures to common factors in the previous piece of work. Specifically, Drehmann and Tarashev (2011) account for how a bank can propagate shocks throughout a system by assuming that if losses are large enough, counterparties will also fail along a kind of domino chain. Relatedly, Billio et al. (2012) propose ways to measure this interconnectedness, which could then feed into the analysis of risk-allocation.

Biasas et al. (2012) survey most of the issues related to systemic risk and analyze 31 quantitative measures of systemic risk. They discuss these issues from both a supervisory and a research perspective. They also analyze the critical role of data in this process.

2.2. Banking crises and shadow banking

Another area of research that could be promoted is testing across multiple crises in different economic situations, because it is not always clear what triggers a financial crisis. In the theory on banking crises, several channels have been proposed including interconnectedness (Rochet and Tirole (1996)), liquidity spirals (Brunnermeier and Pedersen (2009)) and macro-uncertainty (Chari and Jagannathan (1988)). Borio and Drehmann (2009) show that it is possible to create indicators, such as the increase in credit and asset prices that can help to detect the build-up of risk of future banking distress originating from a common source of private-sector excesses. In the recent crisis, US banks may have been affected because of large correlated holdings (Acharya and Richardson (2009) and Acharya et al. (2010)) but banks in the Euro-zone may have been impacted because of liquidity shortages (Diamond and Rajan (2005)), a combination of both or other factors, as analyzed by Moshirian (2011). As research on systemic risk continues, one has to ensure that eventually the measures of systemic risk are robust to a variety of different channels that may have caused distress in financial institutions.

Furthermore, modern financial institutions have a complex network of contracts. During the 2007–2008 financial crisis, AIG, one of the largest insurance companies in the US, had to be rescued with $182.5 billion in loans. All the classic studies of financial networks have also used interbank network for this purposes, albeit with complex linear programming techniques.
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