

# Financial Institutions, Markets and Regulation: A Survey

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## 1. Introduction

The recent crisis has given impetus not only to an intensive regulatory reform debate, but to a deeper discussion on the role of financial systems in modern market economies and the role of financial innovation. While there has been an array of regulatory reforms, most of these reforms are aimed at avoiding the past crisis and are less forward looking than we would like them to be.

This paper takes stock of the existing literature on market failures in the financial system and the consequent fragility risks, discusses possible policy responses and discusses new areas of research. It draws on a very rich theoretical and empirical literature, partly motivated and informed by the recent crises. However, the paper also takes a more principled stance on some of the challenges faced by policy makers and regulators. While we discuss the main market failures in banking and how the recent regulatory reform address them, we also note that financial innovation, the changing border between regulated and non-regulated institutions and increasing complexity makes the optimal regulatory framework a moving target.

We conclude with a few main messages on regulatory reforms. While trying to flesh them out with some detail, we purposefully keep them on a more general level. Specifically, based on the discussion throughout the paper, we conclude that (i) a mix of complex and simple regulatory tools is needed, where the former reflects and influences market players' risk-taking decisions, while the latter are less likely to be circumvented; (ii) macro-prudential has to complement micro-prudential regulation, as the stability of individual financial institutions does not add up to systemic stability; (iii) a stronger focus on effective resolution is necessary, not just to minimize the risk of contagion and reduce the impact of fragility on the real economy but also to set desirable incentives ex-ante for all the agents operating in the financial systems (institutions, investors and policy makers); and (iv) a dynamic approach to regulation is critical, especially when it comes to defining the regulatory perimeter.

The remainder of the paper is structured as follows. The next section discusses market failures in the financial system that lead to fragility. Section 3 discusses regulatory responses to these market failures, while section 4 presents recent regulatory reforms in the wake of the Global Financial Crisis. Section 5 focuses on

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the role of financial innovation both in deepening and completing financial markets but also creating financial fragility. Section 6 is concerned with the regulatory perimeter. Section 7 draws policy conclusions from our analysis, while section 8 concludes and looks forward to new research challenges.

## **2. Purpose of financial regulation – what market failures does it try to address?**

The financial services industry is the most regulated sector in practically all economies. In almost all countries around the world there are numerous institutions in charge of regulating and supervising the banking industry as well as the financial industry more at large. Yet, we have recently experienced one of the most dramatic and widespread crises of the financial sector in history and we have seen how pervasive its effects can be also for the real economy. What happened? Why did things get so out of control? Why did this crisis come as such a surprise to regulators? How should we design regulation going forward.

Financial regulation presents a complex set of issues. At a very basic level, there are different market failures that regulation is trying to address, and there is no strong agreement on which one is more important and what the optimal tradeoff in designing financial regulation is. The current structure of banking regulation is more a series of answers to crises in the past rather than the implementation of a clear regulatory design. Starting after the Great Depression, many countries adopted a whole range of regulatory measures. Others, like France or Italy, went even further and nationalized their financial institutions. This regulation and government ownership was successful in terms of stopping crises. From 1945 until the early 1970's, there were almost no financial crises.

However, stopping financial institutions from taking risks is also not efficient as it often entails inefficient credit provision and little innovation. It is well understood that the financial sector plays a key role in the economy and that for it to play this role we need to have some risk and fragility. Hence, minimizing fragility is not necessarily the goal. The goal is perhaps to find the optimal balance between fragility and the provision of credit and risk sharing by the financial sector. That is why, starting in the 1970s, financial liberalization took place in many countries. This led to a revival of crises around the world (see, e.g., Boyd, De Nicolo, and Loukoianova (2009)), which culminated in the 2007 global financial crisis. This has led to the new wave of stricter regulatory measures. It seems that there is overall a learning process, whereby regulatory views and tools are constantly revised in response to past events. Regulation becomes stricter following periods of instability and looser following periods of stability.

This historical evolution has led to a set of regulations designed to stop specific problems as they emerged rather than a well thought out way of reversing market failures in the financial system. However, the problems inherent in financial regulation go beyond the understanding of the market failures in the financial industry. First, setting regulation involves a political process and, as well known in political economy, “pure” political factors may prevent regulation – in any sector - from being at the optimal level. Second, there is no consensus on how much regulation is optimal. Some believe that very little is optimal and that the financial system should be as free as possible to operate under market mechanisms and logics. According to this view

which starts already in the late 80s (e.g., White, 1984, Dowd, 1989), rather than repressing the financial system with complicated and restrictive regulation, the financial system should be left free to innovate and progress, and financial crises should just be seen as a natural by-product of market forces.

Whereas there is some merit in this view, we do not support the “free banking” view in light of the specialness of the financial industry and the substantial negative consequences that financial crises may entail for economic growth and real activity. There are clearly externalities in the financial sector that are not fully internalized by the various players, and so when left completely unregulated they will take actions that put the system in a too great level of fragility or inefficiency. Yet, it is still an open question how much regulation is needed and what the optimal mix is in addressing the various market failures involved.

Given this, the main scope of this survey is to analyze the various market failures affecting the financial industry and then evaluate whether the existing regulation, and in particular the numerous regulatory reforms adopted since the recent financial crisis, address them. Although our focus is mostly on the financial institutions and in particular banks, we will also touch upon the market failures present in financial markets and the regulatory reforms recently implemented in this area.

One theme we will emphasize is that financial regulation exists to preserve the stability of the financial system, but not that of individual institutions, thus protecting the intermediary and allocative roles that financial institutions and markets perform in the economy. In doing this, it should address the market failures in the financial industry that lead to financial crises and to disruptive consequences for the real economy. Given the wide scope of the survey, we restrict our attention to the main market failures as being:

1. Panics and runs, and the difference from fundamental crises.
2. Inefficient liquidity in interbank markets.
3. Bank interconnections, systemic risk, and contagion.
4. Bad incentives, bubbles, and crises.

We analyze each of them in turn, making use of the core academic insights on these topics.

## ***2.1 Panics versus fundamental crises***

Banking crises have been observed for many years in many countries. One typical feature of them is the massive withdrawal of deposits by depositors, often referred to as bank run. In the academic literature, there are two leading views on the origin of these runs, which are not mutually exclusive. One view is that runs are driven by panics or self-fulfilling beliefs. The formal analysis goes back to Bryant (1980) and Diamond and Dybvig (1983). In these models, agents have uncertain needs for consumption in an environment in which long-term investments are costly to liquidate. Banks provide useful liquidity services to agents by offering demand deposit contracts. But, these contracts lead to multiple equilibria. If depositors believe that other depositors will withdraw, then all agents find it rational to redeem their claims and a panic occurs. Another equilibrium exists where everybody believes no panic will occur and agents withdraw their funds according to their consumption needs. In this case, their demand can be met without costly liquidation of assets.

While it explains how panics may occur, the theory is silent on which of the two equilibria will be selected. Depositors' beliefs are self-fulfilling and are coordinated by "sunspots." Sunspots are convenient pedagogically but they do not have much predictive power. Since there is no real account of what triggers a crisis, it is difficult to use the theory for any policy analysis.

The second set of theories of banking crises is that they are a natural outgrowth of the business cycle. An economic downturn will reduce the value of bank assets, raising the possibility that banks are unable to meet their commitments. If depositors receive information about an impending downturn in the cycle, they will anticipate financial difficulties in the banking sector and try to withdraw their funds, as in Jacklin and Bhattacharya (1988). This attempt will precipitate the crisis. According to this interpretation, crises are not random events but a response of depositors to the arrival of sufficiently negative information on the unfolding economic circumstances.

The global-games literature offers a reconciliation of the two approaches. This literature goes back to Carlsson and van Damme (1993), who show that the introduction of slightly noisy information to agents in a model of strategic complementarities and self-fulfilling beliefs can generate a unique equilibrium, whereby the fundamentals uniquely determine whether a crisis will occur or not. Goldstein and Pauzner (2005) extended the global-games literature to a setting that matches payoffs in a bank-run problem and showed how the fundamentals of the bank uniquely determine whether a crisis will occur or not. They also link the probability of a crisis to the banking contract, showing that a crisis becomes more likely when the bank offers greater liquidity. The bank then takes this into account, reducing the amount of liquidity offered, such that the cost of runs is balanced against the benefit from liquidity and risk sharing.

This approach is thus consistent with the panic-based and fundamental-based views. Here, crises occur because of self-fulfilling beliefs, that is, agents run just because they think that others are going to run. But, the fundamentals uniquely determine agents' expectations and thus the occurrence of a run. Thus, the approach is consistent with empirical evidence pointing to the element of panic and to those pointing to the link to fundamentals. In the first line of work, analyzing the period 1867-1960, Friedman and Schwartz (1963) argued that the crises that occurred then were panic-based. In the second line of work, Gorton (1988) shows that in the U.S. in the late nineteenth and early twentieth centuries, a leading economic indicator based on the liabilities of failed businesses could accurately predict the occurrence of banking crises. Goldstein (2012) provides a survey on the differences between the panic-based and fundamentals-based approaches and how to test the hypotheses in the data.<sup>2</sup>

One strand of the business cycle explanation of crises stresses the role of information-induced runs as a form of market discipline. In particular, Calomiris and Kahn (1991) and Diamond and Rajan (2001) suggest that the threat of bank liquidation induced by depositors' runs can discipline the banker not to divert resources

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<sup>2</sup> Other related surveys on the origins of financial crises are provided by Bhattacharya and Thakor (1993), Gorton and Winton (2003), Allen and Gale (2007, Chapter 3), Freixas and Rochet (2008), Rochet (2008), Allen, Babus, and Carletti (2009), and Degryse, Ongena and Kim (2009).

for personal use or can ensure that loans are repaid. In this view, not only run crises can be efficient in that they prevent the continuation of inefficient banks, but can also help provide bankers better incentives, thus inducing better investment choices and better equilibrium allocations.

A final important remark is due here. Some people argue that modern banking systems have increased in complexity over the last two decades and that as such the literature à la Diamond and Dybvig with its focus on bank runs by retail depositors is no longer applicable to today's financial institutions. We argue that this is not the case. Despite running off-balance sheet vehicles or using various financial instruments to transfer credit risk, banks remained equally sensitive to panics and runs as they were at the beginning of the previous century. As Gorton (2008) points out, in the summer of 2007 holders of short-term liabilities refused to fund banks, expecting losses on subprime and subprime-related securities. As in the classic panics of the 19<sup>th</sup> and early 20<sup>th</sup> century, there were runs on banks. The difference is that modern runs typically involve the drying up of liquidity in the short term capital markets (a wholesale run) instead of or in addition to depositor withdrawals. This implies also a much stronger interplay between financial institutions and financial markets in modern financial systems, as we shall stress later in the paper. In summary, problems of runs and panics, and how to reduce their likelihood are important, as is the challenge of the regulatory perimeter, as funding and thus sources of contagion can easily move outside the traditional banking system.

## ***2.2 Inefficient liquidity in the interbank markets.***

Interbank markets play a key role in financial systems. Their main purpose is to redistribute liquidity in the financial system from the banks that have cash in excess to the ones that have a shortage. Their smooth functioning is essential for maintaining financial stability. The problem is that there are externalities in the provision of liquidity by banks, and so the equilibrium will typically not feature the optimal amount of liquidity provision. There are market breakdowns and market freezes that lead to insufficient liquidity provision due to the externalities among banks.

The main reason for the existence of the interbank market is formalized by Bhattacharya and Gale (1987). In their framework, which shares numerous characteristics with the subsequent works, individual banks face privately observed liquidity shocks due to a random proportion of depositors wishing to make early withdrawals. Since the liquidity shocks are imperfectly correlated across intermediaries, banks co-insure each other through an interbank market by lending to each other after the liquidity shocks are realized.

In the absence of aggregate uncertainty and of frictions concerning the structure of the interbank market or the observability of banks' portfolio choices, the co-insurance provided by the interbank market is able to achieve the first best. By contrast, as soon as a friction is present, the interbank market does no longer achieve full efficiency. For example, given that liquid assets have lower returns than illiquid ones, banks have incentives to under-invest in liquid assets and free-ride on the common pool of liquidity.

Similarly, interbank markets appear to be inefficient also when they do not work competitively. Acharya, Gromb and Yorulmazer (2011), for example, analyse the situation when interbank markets are

characterized by monopoly power in times of crisis in addition to moral hazard. They show that a bank with surplus liquidity has bargaining power vis-à-vis deficit banks which need liquidity to keep funding projects. Surplus banks may strategically provide insufficient lending in the interbank market in order to induce inefficient sales of bank-specific assets by the needy banks, which results in an inefficient allocation of resources.

Full efficiency is not achieved by interbank markets also when banks are subject to aggregate uncertainty concerning their liquidity needs. The reason is that banks set their portfolio choice before the realization of the liquidity shocks. When the shocks realize, banks can obtain additional liquidity from other banks or from selling their long term assets. As long as the liquidity shocks are idiosyncratic and independent across banks, the market works well in relocating liquidity from banks in excess to banks in shortage of liquidity. When the uncertainty concerning liquidity shocks is aggregate, the internal mechanism of liquidity exchange among banks fails. When the system as a whole faces a liquidity shortage, banks are forced to satisfy their liquidity demands by selling their long term assets. This leads to fire sales, excessive price volatility and, possibly to runs by investors, when asset prices are so low that banks are unable to repay the promised returns to their depositors.

The mal-functioning of interbank markets provides a justification for the existence of a central bank. For example, in contexts of asymmetric information, the central bank can perform an important role in (even imperfectly) monitoring banks' asset choices, thus ameliorating the free riding problem among banks in the portfolio allocation choice between liquid and illiquid assets. When surplus banks have bargaining power over deficit banks, the role of the central bank is to provide an outside option to the deficit bank for acquiring the needed liquidity. In contexts of aggregate liquidity risk, the central bank can help alleviate the problem of excessive price volatility when there is a lack of opportunities for banks to hedge aggregate and idiosyncratic liquidity shocks. By using open market operations to fix the short-term interest rate, a central bank can prevent fire sales and price volatility and implement the constrained efficient solution (Allen, Carletti and Gale, 2009). Thus, the central bank effectively completes the market, a result in line with the argument of Goodfriend and King (1988) that open market operations are sufficient to address pure liquidity risk on the interbank markets.

Motivated by the current financial crisis, several papers seek to explain market freezes. Diamond and Rajan (2009) relate the seizing up of term credit with the overhang of illiquid securities. When banks have a significant quantity of assets with a limited set of potential buyers as in times of crises, shocks in future liquidity demands may trigger sales at fire sale prices. The prospect of a future fire sale of the bank's assets depresses their current value. In these conditions, banks prefer holding on to the illiquid assets and risking a fire sale and insolvency rather than selling the asset and ensuring its own stability in the future, since the states in which the depressed asset value recovers are precisely the states in which the bank survives. In turn, this creates high expected returns to holding cash or liquid securities across the financial system, an aversion to locking up money in term loans and the possibility of market freezes as banks do keep their assets rather than trading them.

Other works relate the possibility of market freezes to problems of information revelation or, more generally, problems of asymmetric information. For example, Acharya, Gale and Yorulmazer (2009) analyse how asymmetric information revelation about the quality of banks' assets may induce freezes in markets for rollover debt. In situations where there is a constant probability that "bad news" is revealed each period, the absence of bad news in one period increases the value of the assets. By contrast, when there is a constant probability that "good news" is revealed each period, the absence of good news in one period induces investors to reduce their valuation of the bank's assets even below their fundamental values. This reduces in turn banks' debt capacity, that is banks' ability to roll over their debt against the value of their assets. This leads to a spiral in which asset values and banks' debt capacity falls further. In the limit, when the frequency of rollovers becomes unbounded, the debt capacity goes to zero even for an arbitrarily small default risk and the market freezes.

More general problems of asymmetric information can generate freezes on the interbank market, if they are severe enough. For example, Heider, Hoerova and Holthausen (2009) shows that interbank market freezes are possible in extreme situations when banks invest in risky long-term investments and there is asymmetric information on the prospects of these investments. This is because the existence of counterparty risk increases interbank market spreads and, in extreme situations, it leads to non-viable spreads. A similar mechanism but based on banks' desire to avoid fire sales is present in Bolton, Santos and Scheinkman (2008). The idea is that they may prefer to keep assets on whose value they have private information in their portfolios rather than placing them on the market in order to avoid to have to sell them at a discount. The problem, however, is that by keeping the assets on their portfolios, banks run the risk of having to sell them at even a lower price at a later stage if the crisis does not cease before they are forced to do so. This so-called "delayed trading equilibrium" in which intermediaries try to ride out the crisis and only sell if they are forced leads to a freeze of the market for banks' assets but may be Pareto superior.

A different mechanism for market crashes is proposed by Huang and Wang (2009, 2010). Instead of relying on the presence of information asymmetry among investors about the fundamentals, they show that purely idiosyncratic and non-fundamental shocks can cause market crashes if capital flow is costly. Agents trade to smooth out idiosyncratic shocks to their wealth. Since there is no aggregate uncertainty, their trades will be perfectly synchronized and matched, and there will be no need for liquidity if market presence is costless. In this case, the market-clearing price always reflects the fundamental value of the asset, and idiosyncratic shocks generate trading but have no impact on prices. In contrast, when market presence is costly, the need for liquidity arises endogenously and idiosyncratic shocks can affect prices via two channels: first trading becomes infrequent which makes traders more risk averse, and second the gains from trading for potential sellers are always larger than the gains from trading for potential buyers. The asymmetry in their appetite to trade leads to order imbalances in the form of excess supply, and the price has to decrease in response.

A freeze will also arise when there are strategic complementarities among banks in the decision to provide credit. This has been analysed by Bebhuk and Goldstein (2011). Suppose that the success of banks' projects depends on how many banks invest in these projects. This can occur due to network externalities in the real economy, for example. Then, the expectation that other banks are not going to invest will make it optimal for an individual bank not to invest, and so making this a self-fulfilling belief. Bebhuk and Goldstein use this framework to compare various types of government policy aimed towards assisting the financial sector and analyse which one is more effective under what circumstances.

### **2.3 *Bank interconnections, systemic risk, and contagion.***

The prevalence of financial crises has led many to conclude that the financial sector is unusually susceptible to shocks. What is striking is the fact that many crises are systemic, that is, they affect several banks and not just individual intermediaries. The breadth of the recent financial crisis has made it clear that the financial industry presents important externalities that have to be well understood and tackled with appropriate regulation and interventions. In fact, a typical justification for intervention by central banks and governments to prevent the bankruptcy of systemic financial institutions is the fear that their failure will lead to a chain of failures in other institutions. This was for example the argument used by the Federal Reserve for intervening to ensure Bear Stearns did not go bankrupt in March 2008, for example (see Bernanke (2008a)) but in many other cases as well.

The so-called "systemic risk" can originate from aggregate adverse shocks that lead to simultaneous failures of several intermediaries or from contagion, that is from the propagation of one bank's failure to other banks in a sequential fashion. The most common form of aggregate shock is the bursting of asset price bubbles (as we will discuss more in the next subsection) and in particular real estate bubbles (Reinhart and Rogoff, 2009). Other possible sources of systemic risk are panics and multiple equilibria, liquidity trading and cash-in-the-market pricing, that is the sale of assets at fire sale prices below fundamental values, and sovereign risk, especially in the Euro area. By contrast, contagion requires an idiosyncratic shock affecting one individual or a group of intermediaries and a propagation mechanism that transmits failures from the initially affected institutions to others in the system. Various forms of propagation mechanisms have been analyzed ranging from information spillovers (Chen, 1999), and interbank connections via interbank deposits (Allen and Gale, 2000) or payment systems (Freixas and Parigi, 1998; Freixas et al. 2000), to portfolio diversification and common exposures (Goldstein and Pauzner, 2004; Wagner, 2011), common assets and funding risk (Allen et al. 2012), transmission of fire sales prices through interdependency of banks' portfolios (Allen and Carletti, 2006) or the use of mark-to-market accounting standards (e.g., Allen and Carletti, 2008).

The academic literature on contagion is vast and, for reason of brevity, it is not possible to describe it all here. Rather, we will limit ourselves to explain only a few key mechanisms of contagion in some more details. Interested readers can refer to more comprehensive surveys such as Allen et al. (2009).

In looking for contagious effects via direct linkages, early research by Allen and Gale (2000b) studies how the banking system responds to liquidity shocks when banks exchange interbank deposits. The first important result is that the connections created by swapping deposits allows banks to insure each other against idiosyncratic liquidity shocks but, at the same time, they expose the system to contagion as soon as some frictions such as a small aggregate liquidity shock emerge. The second important result is that the resiliency of the system depends on the network structure of the interbank deposits. In particular, incomplete networks, that is networks where all banks are connected but each bank exchanges deposits only with a group of other banks, turn out to be more prone to contagion than complete structures. The intuition is that better connected networks are more resilient since the proportion of the losses in one bank's portfolio is transferred to more banks through interbank agreements. Similar results concerning the resiliency of more complete networks are present also in Freixas, Parigi and Rochet (2000) and more recently in Acemoglu et al. (2015), where the resiliency of different networks is analyzed also as a function of the size of shocks.

A related question within the literature analyzing banks' direct exposures as sources of contagion is the extent to which contagion can be due to coordination problems among depositors when they receive private information about banks' future fundamentals (Dasgupta, 2004) or to the complementarities among investors' decisions to undertake the same investment projects (Leitner, 2005).

Another related question concerns the issue of network formation, that is how banks choose to connect when they anticipate contagion risk. Based on the intuition as in Allen and Gale (2000b) that better connected networks are more resilient to contagion, Babus (2014) predicts that banks form links with each other up to a certain connectivity threshold above which contagion does not occur. In other words, banks choose the network that prevents the risk of contagion, but, given that forming links is costly, they do not wish to go beyond such a connectivity threshold.

Another channel of contagion based on direct linkages among banks is financial innovation and/or financial markets. The idea is that financial products like for example credit risk transfer allow banks to insure each other against certain risks but at the same time, when certain conditions realize, they may expose banks to failures and contagion. For example, credit risk transfers are beneficial as a way to insure different intermediaries or different sectors that are subject to independently distributed liquidity shocks. However, when some intermediaries are forced to sell the assets for example for idiosyncratic liquidity reasons and there is price volatility and fire sales in some states of the world, then the presence of credit risk transfers can be detrimental as they can generate contagion across intermediaries or sectors (Allen and Carletti, 2006). Similar results on the benefits but also the risks of financial innovations are obtained by Parlour and Winton (2008) and Shin (2009), among others.

The second approach to modeling contagion focuses on indirect balance-sheet linkages. One possible contagion mechanism works through portfolio readjustments (Lagunoff and Schreft, 2001; de Vries, 2005; Cifuentes, Ferrucci, and Shin, 2005). The basic idea is that the return of a bank's portfolio depends on the portfolio allocations of other banks. This implies that the decision of some banks to readjust their portfolios in

response to the realization of some shocks produces negative externalities in that it reduces the returns of other banks' portfolios. This may induce other banks to abandon the investments as well either gradually as losses propagate through the system or more rapidly in an attempt to avoid contagion of losses in the future.

Portfolio readjustments can also generate contagion if they happen at the level of investors holding claims on different banks. Such mechanisms have been analyzed by Kodres and Pritsker (2002), Goldstein and Pauzner (2004) and others. In Goldstein and Pauzner (2004), for example, investors hold deposits in two different banks. The realization of a crisis in one bank reduces their wealth, and so makes them more risk averse (under the common assumption of a decreasing absolute risk aversion utility function). Then, they are more likely to run in the other bank, generating the contagion between the two banks.

Besides the theoretical investigations, there has been a substantial interest in looking for evidence of contagion. Most studies focus on contagion from direct linkages among banks. Typically, they estimate bilateral credit relationships for different banking systems and then test the stability of the system, mostly focusing on the interbank market, by simulating the breakdown of a single bank. Studies in this category include Upper and Worms (2004) on the German banking system, Cocco, Gomes, and Martins (2009) on Portugal, Furfine (2003) on the US, Boss, Elsinger, Thurner, and Summer (2004) on Austria, and Degryse and Nguyen (2007) on Belgium. These papers find that the banking systems demonstrate high resilience, even to large shocks. For instance, simulations of the worst case scenarios for German system show the failure of a single bank could lead to the breakdown of up to 15% of the banking sector based on assets. Since these results depend heavily on how the linkages between banks are estimated and they abstract from any type of behavioral feedback (Upper 2006), it is likely that they provide downward bias estimator of contagious outcomes.

Other studies like Mistrulli (2011) or Iyer and Peydró-Alcalde (2011) base their analyses on actual data. For example, the former analyzes the possibility of contagion within the Italian interbank market using banks' actual bilateral exposures, while the latter finds that following the failure of a large Indian bank, banks with higher interbank exposure to the failed bank experience higher deposit withdrawals.

Turning to the empirical investigation of contagion through indirect connections between financial institutions, Adrian and Brunnermeier (2011) propose a new measure for systemic risk, the so-called covar, that is conditional on an institution (or the whole financial sector) being under distress. As example of this type of contagion is found in Jorion and Zhang (2009), who find evidence of credit contagion via counterparty effects. The discussion in this and the previous sub-section underline that a proper risk analysis in finance has to look beyond the stability of individual institutions towards systemic risk. While so far we have discussed primarily the cross-sectional dimension of systemic risk, we now turn to the time-series dimensions of this phenomenon.

#### ***2.4 Bad incentives, bubbles and crises***

Banking crises often follow collapses in asset prices after what appears to have been a 'bubble'. This is in contrast to standard neoclassical theory and the efficient markets hypothesis which precludes the existence

of bubbles. The global crisis that started in 2007 provides a stark example. In numerous countries, including the US, Ireland, UK and Spain, real estate prices rose substantially up to 2007 and the financial crisis was triggered precisely when they collapsed.

Asset price bubbles can arise for many reasons. One important factor is the ease of credit, that is the amount of liquidity provided by the central bank as money or credit. This may induce “speculative manias” as argued already by Kindleberger (1978) and lead to optimism and increased prices. Numerous crises can be read as being induced, or at least facilitated, by excessive credit availability. For example, the recent crisis can be seen as being induced by the substantial credit availability deriving from apparently loose monetary policies of central banks particularly the U.S. Federal Reserve and the presence of global imbalances resulting from the Asian crisis of the end of 2000s. This fueled into asset price and real estate bubbles in many countries. When the bubbles burst, asset prices declined rapidly below fundamental values causing problems to financial market, financial institutions and finally the real economy.

Numerous other crises show a similar pattern of events. As documented, among others, by Kaminsky and Reinhart (1999) and Reinhart and Rogoff (2011), a common precursor to most of crises is financial liberalization and significant credit expansion. These are followed by an average rise in the price of stocks of about 40 percent per year above that occurring in normal times. The prices of real estate and other assets also increase significantly. At some point the bubble bursts and the stock and real estate markets collapse. Given banks and other intermediaries tend to be overexposed to the equity and real estate markets, typically a banking crisis starts about one year after the bubble burst. This is often accompanied by an exchange rate crisis as governments choose between lowering interest rates to ease the banking crisis or raising interest rates to defend the currency. Finally, a significant fall in output occurs and the recession lasts for an average of about a year and a half.

There are a number of theories that can explain how bubbles can arise (see, e.g., Tirole (1982, 1985), Allen and Gorton (1993), Allen, Morris and Postlewaite (1993), Abreu and Brunnermeier (2003), Scheinkman and Xiong (2003), Brunnermeier and Nagel (2004), Hong, Scheinkman and Xiong (2008), and Brunnermeier (2001) for an overview). Here we focus on theories that are explicitly related to financial crises, where bubbles can occur because of agency problems, financial accelerator theories and amplification effects on the role of collateral.

One mechanism for the creation of bubbles in the presence of agency problems is analyzed in Allen and Gale (2000c). The idea is that many investors in real estate and stock markets obtain their investment funds from external sources but the ultimate providers of funds are unable to observe the characteristics of the investment. This leads to a classic asset-substitution problem, which increases the return to investment in risky assets and causes investors to bid up prices above their fundamental values. A crucial determinant of asset prices is thus the amount of credit provided by the financial system. Financial liberalization, by expanding the volume of credit and creating uncertainty about the future path of credit expansion, can interact with the agency

problem and lead to a bubble in asset prices. When the bubble bursts, either because returns are low or because the central bank tightens credit, there is a financial crisis.

There has been a substantial literature attempting to understand how shocks, and in particular negative shocks, are amplified through the system and generate negative bubbles. Some theories rely on the so-called financial accelerator (Bernanke and Gertler, 1989; Bernanke, Gertler and Gilchrist (1996). The idea is that negative shocks to borrowers' wealth are amplified because of the presence of asymmetric information and of an agency problem between borrowers and lenders. In a similar spirit but focusing on the role of collateral, Kiyotaki and Moore (1997) suggest that a shock that lower asset prices can lead to a crisis. The reason is that by lowering the value of collateral, lower asset prices imply less borrowing and thus further reduction in asset prices and borrowing capacity, and so on in a downward spiral. Geanakoplos (1997, 2003, 2009) and Fostel and Geanakoplos (2008) push the analyses further by investigating the effect of asset prices on collateral value and borrowing capacity in more general equilibrium settings.

### **3. Financial regulation: typology**

The main goals of financial regulation are to maintain financial stability and consumers' (or depositors') protection. The former includes preventing systemic risk and maintaining the role of financial intermediaries in credit markets. The latter includes the protection of essential needs and wealth of ordinary people. Despite these announced goals, as we will claim again further below, till the 2007 financial crisis the focus of financial regulation has been mostly centered around the concept of microprudential regulation. What this means is that despite systemic risk has always been one of announced goals of financial regulation, the design of the regulatory tools has always been mostly centered on guaranteeing the stability of the *individual* financial institutions rather of the system overall. The reason for that was the belief that guaranteeing the stability of individual institutions would imply systemic stability. However, the 2007 financial crisis has clearly shown that microprudential approach to financial regulation does not suffice in guaranteeing financial stability because of what some scholars have defined "fallacy of composition" (Brunnermeier et al., 2011), that is the impossibility of making the system as a whole safe by making sure that individual banks are safe. The reasons are multiple. First, as explained in the previous section, there are risks such as those due to the interconnections among banks which go beyond the preservation of individual stability. Second, going one step further, it may happen that in trying to make themselves safer, banks can behave in a way that collectively undermines the system. Asset sales and fire sale prices are an example of this. Banks start selling assets when they need to deal with idiosyncratic shocks. But doing so, they disregard the effect that their sale will have on asset prices and thus on the stability of the other institutions. Similarly for diversification. Banks choose their diversification strategies taking account of their own individual risk sharing and hedging motives, disregarding the effects of increasingly more correlated portfolios on systemic risk. These are just two forms of the more general and well-known problem of individual agents not being able to internalize externalities.

With this in mind, we now review the main regulatory tools. Our focus is on capital requirements, as they have been the core of financial regulation, also in the aftermath of the financial crisis. To complement this, we will discuss, albeit briefly, liquidity requirements and safety nets, that is central bank liquidity provision and deposit insurance in the broader form of government guarantees and bailouts. In reviewing the academic literature below, we maintain the view that banking regulation should be structured so to solve the market failures in the financial system, which we described in the previous section. This means, for example, that capital regulation should be designed to minimize the risk of banks' failures and contagion, while liquidity requirements should be set so to reduce the risk of panics and forced asset sales with consequent fire sales on financial markets.

### ***3.1 Capital regulation***

In general, capital solves various roles. First, it absorbs unanticipated losses and thus reduces the risk of insolvency and contagion. The idea is capital ratios represent a cushion to absorb losses, thus reducing the likelihood of failure. Second, capital protects uninsured depositors and hence maintains confidence in the financial system. Third, capital protects bondholders and creditors in the event of insolvency and liquidation. It protects deposit insurance and taxpayers. Finally, it provides incentives to bank managers and shareholders.

Despite these numerous roles, the academic literature has mostly focused on capital as a way to reduce the problem of limited liability and excessive risk taking due to high leverage and the (implicit or explicit) support of financial institutions through widespread deposit insurance and bailouts. The main idea behind capital regulation is then that larger capital ratios reduce bank risk taking. The intuition is simple: With more stake at risk, bankers should have fewer incentives to take on risk.

The effects of capital on banks' risk taking have been discussed in the literature since the 1970s. Earlier papers (e.g., Kareken and Wallace, 1978; Kahane, 1977, but also, more recently, Boot and Boot and Greenbaum, 1993, and Hellman, Murdock and Stiglitz, 2000) were quite negative on the benefits of capital requirements showing that they were either ineffective in preventive in risk taking or even counter-productive inducing bankers to choose riskier assets.

Other, more recent works, instead, support a more positive capital for capital, justifying capital regulation as needed to offset moral hazard from deposit insurance. The general idea is that because banks have access to low cost funds guaranteed by the government, they have an incentive to take significant risks. If the risks pay off they receive the upside, while if they do not the losses are born by the government. Capital regulation that ensures shareholders will lose significantly if losses are incurred is needed to offset this incentive for banks to take risks. One way of capturing this is to model the effects of capital on banks' monitoring incentives (Holmstrom and Tirole, 1997). Using this framework, Dell'Ariccia and Marquez (2006) and Allen, Carletti and Marquez (2010) analyze how the relationship between capital and banks' incentives to monitor changes depending on the presence and design of deposit insurance, credit market competition etc. Overall, this literature supports a positive role of capital and thus of capital regulation in ameliorating banks' incentives to monitor borrowers and thus reducing the credit risk of individual banks.

As mentioned above, another rationale for capital regulation is the prevention of contagion and systemic risk. Contagion is the market failure that central banks often use to justify intervention, as, for example, in the case of the arranged takeover of Bear Stearns in March 2008, as it was publicly stressed (Bernanke, 2008). Yet, the theory of capital as a way to reduce systemic risk is still in its infancy, given the focus till recently on the microprudential role of capital regulation. Going forward, it is essential to develop new theories of capital regulation based on preventing contagion and systemic risk. In general, as we argue also further below, there is the need of a deeper analysis of the appropriate design of macroprudential regulation. Attempts in this direction can be found in Acharya (2009) and Rochet (2004), but much more work is needed in this area.

One of the major problems in designing capital regulation is in modeling the costs of equity finance for financial institutions. The literature assumes typically that equity is more costly than other forms of finance (see, for example, Gorton and Winton, 2003). This also justifies the need for capital regulation as in its absence, banks would simply minimize their capital holdings and hold more debt. However, it is not at all clear what this higher cost is due to. One simple answer is that it is privately more costly because in many countries debt interest is tax deductible at the corporate level but dividends are not. One important shortcoming of this explanation though is that it does not explain the difference in capital holdings across industries. Simple evidence shows indeed that non-financial firms hold around 30-40% of their liabilities in the form of capital whereas the financial firms operate with approx. 10% of capital on average in normal times (Flannery and Rangan, 2008).

Given this, another, more plausible, explanation is that debt is implicitly subsidized in the financial industry through government guarantees and bailouts (see also Admati et al., 2010). If this is the case, the removal of the public guarantees and the design of clear resolution schemes would enhance financial stability substantially as it would improve banks' incentives to take risks and induce higher capital holdings. A more recent explanation for the higher cost of equity capital in banks is based on the market segmentation between deposits and capital and the positive role of capital as a way to reduce the bankruptcy costs of deposit taking institutions (Allen et al., 2015).

Another important issue in current capital regulation is that it is based on accounting book values rather than market values. The recent crisis has clearly showed that book values have important shortcomings, in particular as they may prevent to discover insolvency risks at an early stage, thus preventing early intervention at troublesome banks. Theoretically, it is unclear as to whether capital regulation should be based entirely on accounting book values and not at all on market values. A related literature is the one on the use of mark-to-market accounting for financial institutions (e.g., O'Hara, 1993; Allen and Carletti, 2008; Plantin, Sapra, and Shin, 2008, Heaton, Lucas and McDonald, 2010). This literature highlights the trade-off involved. Valuing banks' assets at market prices has the advantage of reflecting the true value of their balance sheets. However, if markets are flawed it may also lead to important inefficiencies in terms of increased price volatility and

contagion, suboptimal real decisions and reduced liquidity creation. Such inefficiencies should be taken into account in investigating the extent to which capital regulation should be based on market capital.

### ***3.2 Liquidity requirements***

Whereas the literature on capital regulation, albeit focused on the microprudential role of capital, is abundant, the one on liquidity requirements has just started. One explanation is perhaps the absence of liquidity requirements as regulatory tool till the recent new Basel III accord.

Although the role of liquidity requirements still need to be investigated in detail, liquidity ratios should aim at reducing the occurrence of panics and the occurrence of fire sales and mispricing of assets. To this end, works on the role of liquidity regulation should focus on analyzing its effects on banks' incentives to take risk/excessive maturity transformation, premature sale of long term assets and asset prices and depositors' incentives to withdrawals.

One way of thinking of these effects is going back to the frameworks described above where banks operate as providers of liquidity insurance and expose themselves to maturity transformation by choosing the appropriate mix of long and short term assets they want to invest in. (Diamond and Dybvig, 1983; Goldstein and Pauszner, 2005; etc.). Introducing liquidity requirements in these frameworks forces banks to increase the investment in the short term asset relative to what they would choose in the absence of regulation, thus inducing a reduction in the maturity transformation they operate. This will also possibly lead them to reduce strategic complementarities and collective moral hazard, thus reducing also the need for public intervention ex post (Fahri and Tirole, 2012). In terms of the premature sale of long term assets and asset prices, the introduction of liquidity requirements should allow banks to better deal with liquidity shocks, thus leading to fewer assets on sale and a lower likelihood of fire sales. This in turn should benefit the banking system as a whole as it would lead to fewer bank failures and thus lower propagation of losses through the system.

What seems to be more unclear is the effect of liquidity requirements on the behavior of banks' depositors and thus on the probability of occurrence of panic and fundamental driven crises. The reason is as follows. On the one hand, as already mentioned, liquidity requirements reduce the premature liquidation (or sale) of the long term assets, thus reducing depositors' incentives to run out of coordination problems and panics. However, by forcing banks to invest more in shorter term assets, which are typically less profitable than longer term assets, liquidity requirements also reduce banks' profitability in the longer run. This in turn may lead depositors and investors more generally to run at the bank out of worries of inadequate resources of the bank in the long run, that is out of fundamental driven reasons. Given these two contrasting effects, the overall implications of liquidity regulation on bank stability is unclear. Much more work is needed in this direction in the upcoming years, also looking at the interaction between capital and liquidity requirements.

### ***3.3 Safety nets: central bank intervention and deposit insurance***

Besides being a rationale for financial regulation, the fears of systemic risk and contagion have also been used as reasons to justify public interventions and widespread support in the financial industry. This

support is provided through what is typically called “safety nets arrangements, namely a lender of last resort facility and deposit insurance, or more generally, government guarantees. Although both the two instruments represent a form of insurance for the banking system, they differ in their task, scope, time of application and contractual arrangement.

The lender of last resort (LOLR) facility is assigned the task of preventing the emergence of systemic crises by supplying liquidity to individual banks in distress. The exact scope and form of central bank intervention are highly controversial in the academic literature. The main controversy centers on the trade-off between the benefits (prevention of contagion) and the costs (distortion of incentives-moral hazard problem) of bailing out distressed banks. According to Bagehot (1873), central banks have a role in lending freely at time of crises in order to avert panics. Loans should be made at a penalty rate and only against good collateral, so to be extended to illiquid but solvent banks. LOLR rules should be well defined and publicly announced. This should discourage banks from using central bank facilities to finance current operations and should prevent an indiscriminate rescue of all institutions. The need of the LOLR is due to the market’s inability to deal with bank liquidity shocks because of the presence of asymmetric information about bank solvency. This causes intermediaries not to be able to transmit credible information on the true asset value during a crisis.

This view has been highly criticized by Goodhart (1987), among others, on the ground that it is virtually impossible, even for the central bank, to distinguish illiquidity from insolvency at the time the LOLR should act. This implies that the Bagehot view of lending only to illiquid institutions is not practicable. Given this, what matters for central bank intervention is not whether the bank is illiquid or insolvent but rather whether its failures would propagate to the system. According to an even more extreme view (Goodfriend and King, 1988), there is no need of LOLR to individual banks. Rather, open market operations are sufficient to address pure liquidity risk on the interbank market.

Which view of LOLR is correct very much depends on the market failure LOLR wants to address. If the goal is to prevent contagion and widespread failures, then individual liquidity assistance to banks in difficulty may be needed, also because solvent banks may be unable to obtain liquidity from the market (Rochet and Vives, 2004). By contrast, if the role of LOLR is only to provide hedging against liquidity risk, then open market operations are sufficient to eliminate price volatility and fix prices so to allows banks to reallocate liquidity from those with low (idiosyncratic) shocks to those with high shocks (Allen, Carletti and Gale, 2009).

Differently from the LOLR; deposit insurance has both the tasks of consumer protection and of prevention of systemic crises. The main justification for the latter role is the model of Diamond and Dybvig (1983), where the introduction of deposit insurance eliminates the bad panic equilibrium, thus leaving the good equilibrium where banks optimal the first best allocation in the economy as the unique equilibrium. In other words, deposit insurance is a way to eliminate depositors’ coordination problems and guarantee financial stability when banks are subject to panic runs only.

Deposit insurance has been among the most common policy tools against financial fragility since the financial crisis leading to the great depression. In the United States, that crisis has led to the understanding that

banks are inherently fragile due to a coordination failure among depositors, and that a way to stabilize them is to provide deposit insurance by the government, such that depositors know that their money is safe even if others rush to demand early withdrawal. This led to the establishment of the Federal Deposit Insurance Corporation, which since then has had significant success in reducing the likelihood of runs. Other countries have also adopted similar policies.

In the basic Diamond and Dybvig (1983) model, deposit insurance achieves perfect outcomes without any downside. In it, the mere fact that the government guarantees the deposits acts to prevent runs, and so the deposit insurance does not even have to be paid in equilibrium. Essentially, the whole effect of the deposit insurance is achieved off the equilibrium path.

However, in reality things are clearly much more complicated than this. First, banking crises occur not only due to panic but sometimes also due to bad fundamentals of the bank as we surveyed before. Hence, if the government designs a system of guarantees it will likely need to pay depositors in some cases when deteriorating fundamentals have led to a crisis. Then, the cost of paying the insurance has to be weighed against the benefit in terms of reduced crisis likelihood. Second, the presence of guarantees is likely to affect banks' choices of investments and liabilities. It is often argued that the bank will end up taking more risk when the government provides deposit insurance, and so this is another cost of providing deposit insurance that has to be considered against the benefit.

Overall, the question of optimal deposit insurance policy is still an open question that deserves more research. Allen, Carletti, Goldstein, and Leonello (2014) provide recent theoretical analysis utilizing the global-games methodology described above. The strength of this methodology is the ability to endogenously pin down the probability of a crisis and how it is affected by the parameters of the model and also by the guarantee scheme and by the resulting bank choices. This enables us to assess the benefits and costs of the guarantees scheme. Allen, Carletti, Goldstein, and Leonello (2014) then provide analysis of the optimal design of a guarantee scheme as well as the optimal size of guarantees under a particular scheme.

#### **4. Regulatory reforms – what has been done?**

European countries have undertaken a large number of regulatory reforms or are in the process of doing so, ranging from higher capital and liquidity requirements for banks and a banking union for the Eurozone to new regulatory frameworks for the insurance and investment fund sectors. We focus on the main regulatory reform programmes and proposals over the past five years and concentrate our discussion on the regulatory reforms in banking. The reforms involving banks range from restrictions on business activities, and organisational structures to new regulatory tools and new supervisory structures. The reforms involving non-bank financial institutions range from the mutual fund and insurance sectors to transaction taxes and OTC markets.

Our focus is on the initiatives affecting the European regulatory framework, although some of these reforms such as the new capital rules, are transpositions at the European levels of more international guidelines and accords.

#### *4.1. Capital and liquidity requirements*

The main regulatory reforms introduced after the 2007 financial crisis are contained in the new Basel III regulatory standards. The new accord introduces a stricter definition of capital, a high quality and quantity of capital, two dynamic capital buffers, a minimum leverage ratio, and two minimum liquidity ratios.

The Basel III accord is implemented in Europe through the Capital Requirement Directive IV (CRD IV), whose objective is to create a level playing field across countries. The package contains a directive and a regulation. Key aspects of the Basel III accord such as the new definition of capital and the liquidity requirements are included in the regulation and will thus be directly applicable in the Member States. Others such as capital buffers, enhanced governance and other rules governing access to deposit-taking activities are included in the directive and will therefore need to be transposed into national laws with the usual discretion left to the national regulators to implement more stringent rules (DFID, 2013).

As in the Basel III standards, the CRD IV leaves the minimum capital requirements unchanged at 8 per cent of risk-weighted assets (to which the capital buffers have to be added) but, as in the international accord, it requires banks to increase Common Equity Tier 1 (CET 1) from the current 2 per cent to 4.5 per cent of risk-weighted assets. The regulation defines CET 1 instruments using 14 criteria similar to those in Basel III and mandates the European Banking Authority to monitor the capital instruments issued by the financial institutions. Banks are also required to maintain a non-risk-based leverage ratio that includes off-balance sheet exposures as a way to contain the risk-based capital requirement as well as the build-up of leverage.

To address the problems related to systemic risk and interconnectedness, the CRD IV introduces also size restrictions in line with the prescriptions of the Basel Committee and the Financial Stability Board. In particular, it prescribes mandatory capital buffers for global systemically important institutions (G-SIIs) and voluntary buffers for other EU or domestic systemically important institutions. G-SIIs will be divided in five sub-categories, depending on their systemic importance. A progressive additional CET 1 capital requirement, ranging from 1 per cent to 2.5 per cent, will be applied to the first four groups, while a buffer of 3.5 per cent will be applied to the highest sub-category. Each Member State will maintain flexibility concerning the stricter requirements to impose

on domestic systemically important institutions (D-SIIs). This means that the supplementary capital requirements larger institutions will be left to the discretion of the reciprocal supervisors, with potential distortions in terms of level playing field.

Further, the CRD IV package contains a capital conservation buffer in the form of additional common equity for 2.5 per cent of risk-weighted assets, as well as of a countercyclical buffer requiring a further range of 0-2.5 per cent of common equity when authorities judge credit growth may lead to an excessive build-up of systemic risk. Banks that do not maintain the conservation buffer will face restrictions on dividend payouts, share buybacks and bonuses.

Member States have some flexibility in relation to the above mentioned capital buffers and also relative to other some macro-prudential tools such as the level of own funds, liquidity and large exposure requirements, the capital conservation buffer, public disclosure requirements, risk weights for targeting asset bubbles in property bubbles, etc. For these tools Member States have the possibility, for up to two years (extendable), to impose stricter macro-prudential requirements for domestic institutions that pose increased risk to financial stability. The Council can however reject, by qualified majority, stricter national measures proposed by a Member State.

In addition to changes in the capital requirements, the CRD IV package also introduces global liquidity standards. Following again the Basel accords, two ratios are envisaged: a Liquidity Coverage Ratio (LCR) to withstand a stressed funding scenario and a Net Stable Funding Ratio (NSFR) to address liquidity mismatches. The LCR is a measure of an institution's ability to withstand a severe liquidity freeze that lasts at least 30 days. By contrast, the NSFR is designed to reveal risks that arise from significant maturity mismatches between assets and liabilities. Special indications are provided to the methods to be used to calculate these two ratios in terms of how to classify assets and liabilities, maturity mismatches, etc.

Note also that the CRD IV leaves the possibility for European banks to zero risk-weight all sovereign debt issued in domestic currency (Hay, 2013), while it assigns capital requirements depending on the risk of the sovereign for non-euro denominated bonds. This is the same situation as in the US currently, where Basel I, under which the sovereign debt of developed countries enjoys zero-risk weighting, still holds. Discussions are ongoing at the moment as to whether to change the favourable prudential treatment of European sovereign bonds following, in particular, the recent ESRB report (ESRB, 2014).

In summary, the tighter capital requirements aim both for higher quantity and higher quality of capital. However, they also complement the originally purely micro-prudential approach with a macro-prudential approach, both related to the cross-sectional dimension (SIFIs) and to the time-

series dimension (capital buffers) of systemic risk. The new measures of liquidity requirements recognize the close interaction of capital strength and funding ease.

#### ***4.2. Banking union, resolution frameworks, and bail-in instruments***

One major financial reform in Europe concerns the creation of a banking union. This comprises a single supervisory mechanism (SSM), a Single Resolution Mechanism, a Single Rulebook and a harmonized (but, importantly, still decentralized) deposit insurance scheme. The rationales for a banking union are various: 1) break the adverse feedback loop between sovereigns and the financial system; 2) act as a pre-condition for bank recapitalisation through the European Stability Mechanism (ESM); 3) create more distance between banks and regulators, thus preventing forbearance and regulatory capture; 4) improve the effectiveness of supervision through the implementation of a “single rulebook”.

The SSM, which is hosted by the European Central Bank (ECB), started its functioning on November 4, 2014. In brief, the SSM is now the supervisor of all banks operating in the Euro area. It supervises directly the largest 133 banks, accounting for approx. 85% of the assets of the banks operating in the Euro-area, and, indirectly, all the other remaining banks. Banks in other European Member States may voluntarily decide to be supervised by the SSM. Moreover, the SSM should conclude Memorandums of Understanding with national authorities of non-participating Member States to set the general terms of cooperation.

The SSM operates as any other normal supervisor in that it is empowered with the supervisory tasks that can ensure the coherent and effective implementation of the prudential supervision of credit institutions, in particular concerning the application of the single rulebook for financial services. For example, the ECB has the power: to grant and withdraw banks’ licence authorisations, although in compliance with national laws and subject to specific arrangements reflecting the role of national authorities; assess the suitability of the purchase of significant stakes in credit institutions; monitor and enforce compliance with capital regulation rules, limits to the size of exposures to individual counterparties and disclosure requirements on a credit institution’s financial situation; require credit institutions to dispose of sufficient liquid assets to withstand situations of market stress; and limit leverage.

Other measures like additional capital buffers, including a capital conservation buffer, a countercyclical capital buffer and global and other systemic institution buffers and other measures aimed at addressing systemic or macro-prudential risk remain under the control of national authorities. The SSM can request stricter requirements and more stringent measures than the ones

proposed by the national authorities. These rules apply only for the Macroprudential tools for which there is a legal basis, which implies that at the moment all the instruments that are not included in the CRD IV package such as loan-to-value ratios, i.e. the ratio of a loan to the value of an asset purchased, remain with the national authorities, without the ECB having any possibility to intervene. This can turn out to be an important shortcoming which we will discuss later in more detail.

The SSM retains powers to ensure that credit institutions have proper internal governance arrangements, and if necessary, impose specific additional own funds, liquidity and disclosure requirements to guarantee adequate internal capital. Moreover, the SSM has the tasks and the power to intervene at an early stage in troubled credit institutions in order to preserve financial stability. This should, however, not include resolution powers. Other tasks like consumer protection or supervision of payments services remain with national authorities.

Specific governance structures have been put in place to maintain full separation and avoid conflicts of interest between the exercise of monetary policy and supervisory tasks within the ECB. In particular, the SSM's Supervisory Board plans and carries out the SSM's supervisory tasks and proposes draft decisions for adoption by the ECB's Governing Council. Decisions are deemed adopted if the Governing Council does not object within a defined period of time that may not exceed ten working days. The Governing Council may adopt or object to draft decisions but cannot change them. A Mediation Panel to resolve differences of views expressed by the NCAs concerned regarding an objection by the Governing Council to a draft decision of the Supervisory Board has been created.

The second pillar of the banking union concerns the Single Resolution Mechanism (SRM). The objective is to manage resolution efficiently with minimal costs to taxpayers and the real economy. As for the SSM, the SRM applies to all banks in the Euro Area and other Member States that opt to participate. Within the SRM, the Single Resolution Board (SRB) and of the Single Resolution Fund (SRF) are established. The former, which started to operate on 1 January 2015 but will be fully operational from January 2016, is the European resolution authority for the Banking Union. It works in close cooperation with the national resolution authorities of participating Member States in order to ensure an orderly resolution of failing banks according to the rules contained in the Bank Recovery and Resolution Directive (BRRD). These include harmonized rules concerning acquisitions by the private sector, creation of a bridge bank, separation of clean and toxic assets and bail-in creditors.<sup>3</sup>

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<sup>3</sup> There has been an intense debate on the coordination between the provisions concerning bail-in in the BRRD directive and those contained in the new state aid regulation. On this matter, see Kerle (2014) and Micossi, Bruzzone and Cassella (2014).

The SRB is in charge of the SRF, a pool of money constituted from contributions from all banks in the participating Member States. The SRF has a target level of €55 billion (approx. 1% of all banks' assets of participating Member States) but has the possibility to borrow from the markets if decided by the Board. It will reach the target level over 8 years.

The resolution process is quite complicated and includes various institutions. The decision to resolve a bank will in most cases start with the ECB notifying that a bank is failing to the Board, the Commission, and the relevant national resolution authorities. The Board will then adopt a resolution scheme including the relevant resolution tools and any use of the Fund. Before the Board adopts its decision, the Commission has to assess its compliance with State aid rules and can endorse or object to the resolution scheme. In case of disagreement between the Commission and the SRB, the Council will also be called to intervene. The approved resolution scheme will then be implemented by the national resolution authorities, in accordance with national law including relevant provisions transposing the Bank Recovery and Resolution Directive.

#### *4.3. Activity restrictions*

Another important set of reforms or proposal for reforms include activity, size and bonuses restrictions. For sake of brevity, we describe them very briefly here and refer to Allen, Beck and Carletti (2014) for a more detailed discussion.

The proposals on activity restrictions in Europe are contained in two reports, the Vickers report in the UK and the Liikanen report in Europe. Both the Vickers proposal and the Liikanen proposal aim at making the banking groups safer and less connected to trading activities so as to reduce the burden on taxpayers. However, the two approaches present significant differences. The Vickers approach suggests ring-fencing essential banking activities that may need government support in the event of a crisis. In contrast, the Liikanen approach suggests isolating in a separate subsidiary those activities that will not receive government support in the event of a crisis but that will rather be bailed-in. Moreover, the two proposals differ in terms of what activities have to be separated/ring-fenced. For example, deposits from and loans to large corporations have to be given permission not to be ring-fenced according to the Vickers approach while they do not have to be separated according to the Liikanen approach. Also, trading activities need to be separated under the Liikanen approach only if they amount to a significant share of a bank's business, while they are never permitted within the ring-fence in the Vickers approach.<sup>4</sup>

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<sup>4</sup> Table 1 compares in more detail the Vickers and the Liikanen reports, also with the Volcker rule in the US.

To date, no structural reforms have been formally introduced in Europe. Following the Liikanen report, in January 2014 the Commission has put forth a proposal for a regulation on structural reforms but this has not yet been approved. Some individual countries, on the hand, have been moving ahead with their national approaches, including the UK.

## **5. The traditional financial system in Europe – where do European financial systems stand six years after the Global Financial Crisis**

While not synchronized or similarly pronounced across all European countries, large parts of the European Union and the Eurozone went through a credit bubble in the first decade of the 21<sup>st</sup> century, followed by a bust in the wake of the Global Financial Crisis. Unlike the U.S., most European countries have been very slowly in recognizing losses incurred during the crisis and forcing or supporting banks in their recapitalization. The sluggish credit recovery over the past years has been the backdrop on which the ECB has moved towards quantitative easing, though much later than other leading economies, including the U.S, UK and even Japan, a delay partly explained by political considerations.

There is an ongoing debate to which extent the current credit crisis reflects supply or demand side constraints. Giovannini et al. (2015) report that there is no evidence for a shortage of long-term finance in Europe, though there is large cross-country variation. Also, recent increases in long-term funding have been more on the debt side, in the form of bank lending and corporate bonds. On the other hand, initial public offerings (IPO) have declined in recent years, while secondary public offerings (SPO) have increased. The recent crises have resulted in both supply constraints as well as demand reduction in the bank lending market. In spite of recapitalization by governments and through private markets and investors, Europe's banking system continues in a rather weak position, at least compared to the U.S. banking system.

### **Bank vs. markets? A new financial structure debate**

Beyond concerns about the recovery of different components of the financial system across Europe, the current discussion on the Capital Market Union has again raised the discussion on the financial structure in Europe, not only within the Eurozone. While previous research has shown the irrelevance (on average) for economic growth of the degree to which a financial system is bank- or market-based, more recent research has shown that the relative strong reliance on Europe on bank intermediation (both in absolute and relative terms) might explain the underperformance in growth

and the stronger impact of the recent crisis (e.g. Langfield and Pagano, 2015). This comes in addition to the observation that certain segments of the financial system that are critical for the financing of young and small enterprises are underdeveloped in most European countries, including the private equity industry, venture capital and angel financing. These findings also serve as motivation for a stronger focus on building sources of equity finance/capital markets in Europe, including the Capital Market Union initiative.

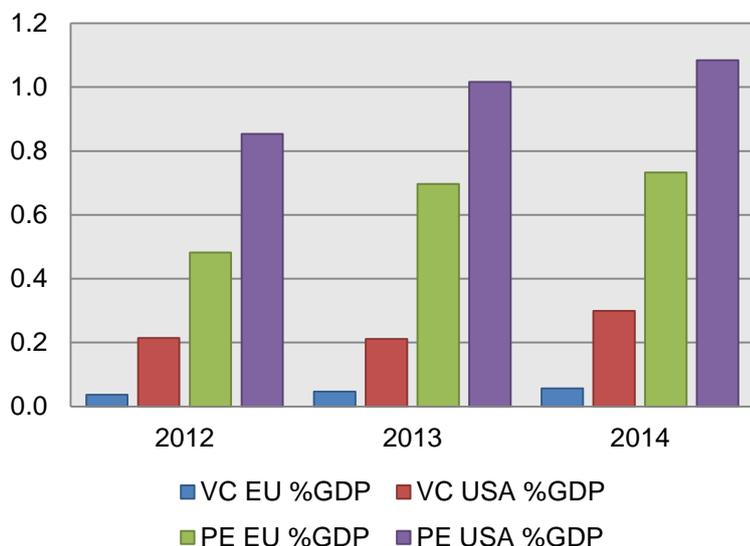
The contrast between markets and banks, however, might be a wrong one. Most of finance today is intermediated, even if it goes through public markets, such as public debt and equity markets. Institutional investors, including insurance companies, pension and mutual funds pay a critical role, which is also reflected, e.g., in the prominent role of institutional investors in the ownership structure of publicly listed firms. On the other hand, there might be indications that there are not sufficient sources of equity finance in the economy.

Financial intermediaries and markets also have other complementarities. Securitization is an important connection between intermediaries and markets in the cross-section. IPOs of companies financed by venture capitalists are an important connection over time, between financial intermediaries and public markets.

The question, therefore, seems not necessarily in the contrast of two specific segments, but rather in having a diversified if not complete financial system. And it is in this context that the focus should be on specific segments of the financial system that play less of a role in Europe than other developed regions of the world, including private equity funds, venture capital funds, and corporate bond markets (Figure 1).

In this context, new players are emerging, including non-intermediated forms of bringing savers and entrepreneurs together, such as peer-to-peer lending and crowd-funding platforms. These platforms work with many borrowers and lenders, with an only limited role for the platform provider, building on other social media models. Rather than on private information acquisition, these new models of financial intermediation often rely on Big Data, collected on potential borrowers based on social media. As we will discuss below, the emergence of new players is an important dimension of financial innovation and contributes to the process of financial deepening. However, these new players will eventually pose the question of the regulatory perimeter.

**Figure 1: The Size of Venture Capital and Private Equity Industries in the US and European Union**



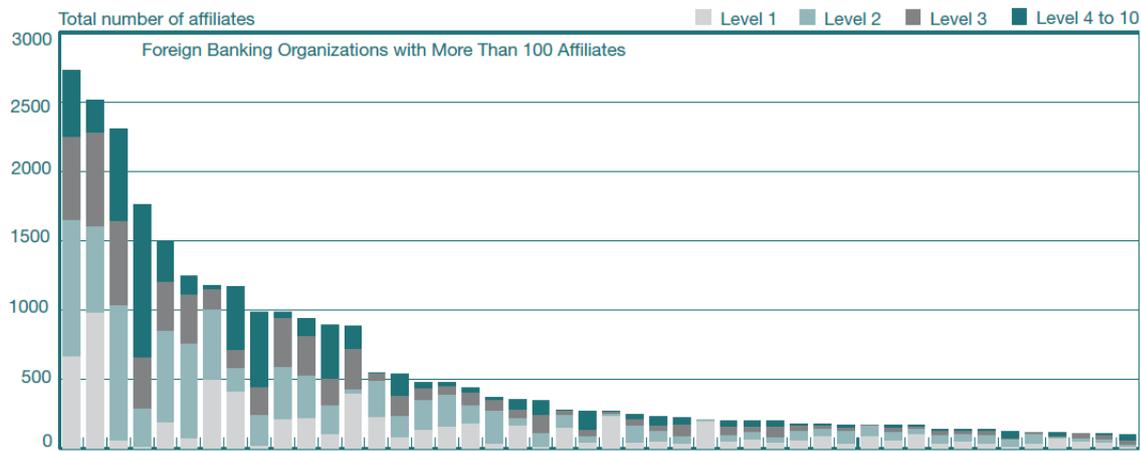
Source: Figures for private equity are taken from the Zephyr Global Private Equity Annual Reports 2013-2014 published by BvD. Venture capita data are from Dow Jones VentureSource Report 2014. GDP data are from OECD

### Complexity and globalization

One striking phenomenon over the past decades has been a clear trend towards more complex financial institutions, which results in serious challenges for regulators. Specifically, Cetorelli and Goldberg (2014) report that while in 1990 only one U.S. bank holding company had more than 1,000 subsidiaries, in 2012 at least half a dozen had. Using data both for U.S. banks and non-U.S. banks with branches in the U.S., they show that many of the leading banks have hundreds if not thousands of subsidiaries, making it very hard for supervisors to properly monitor them (Figure 2). Complexity can take on different forms, reflected not just in the number of subsidiaries, but also in the expansion across different financial activities, including investment banking, insurance, mutual funds, and even non-financial activities (Figure 3). In addition, banks have organized their increasing variety of activities often in multi-tiered ownership relations, with up to ten levels of ownership links. Cetorelli and Goldberg also show that while the number of affiliates and the share of non-bank activity are positively correlated with the size of the parent bank, measures of business and geographic complexity are not. Complexity is thus a bank characteristic, which is not completely correlated

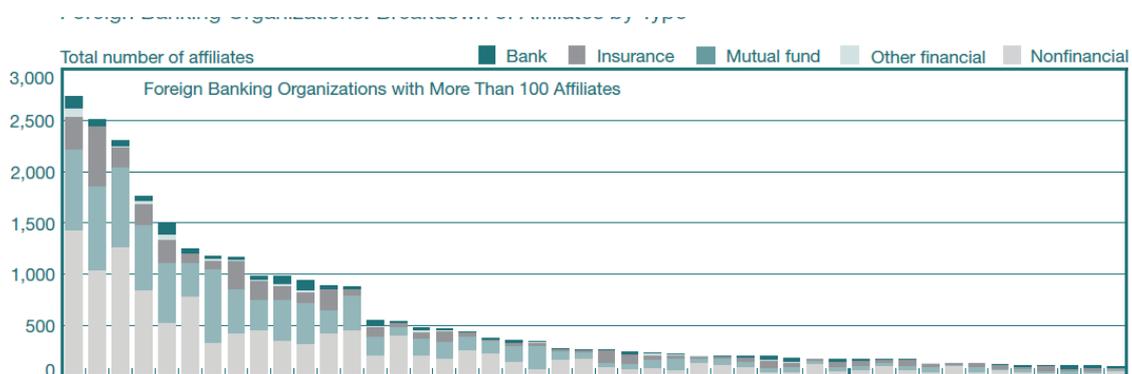
with size; in addition to the challenge of too-big-to-fail, there is thus the challenge of too-complex-to-resolve.

**Figure 2: Number of subsidiaries for largest foreign banks in the US**



Source: Cetorelli and Goldberg (2014)

**Figure 3: Number of subsidiaries across different financial segments for largest foreign banks in the US**



Source: Cetorelli and Goldberg (2014)

Not just financial institutions, but also the regulatory framework has become more and more complex over the past decade, with the Basel II capital regime being a watershed. Hakenes and Schnabel (2014) use a theoretical model to show that it is in banks' interest to push complex regulation, in what they refer to as regulatory capture by sophistication. Specifically, in a world where regulators are less well paid than bankers and with a variation in skills across regulators, regulators might be swayed to rubber-stamp banks' risk models in order to not have to admit that they do not understand these risk models. This allows banks to hold less capital than required. This trend towards

sophistication and the resultant capture has been exacerbated by the Basel II regulatory framework, which allowed the use of banks' internal risk model to compute risk weights for different asset classes. However, this phenomenon becomes more critical if the regulator has discretionary power, such as under pillar II of Basel II. It is important to note that this type of regulatory capture by sophistication is somewhat different from the regulatory capture due to conflict of interest, social connection (rotating door), political interference or lobbying activity by banks.

Related with the trend towards complexity is the increasing globalization of banks, with the leading global banks being active across a large number of regions and countries. In addition, over the past decade there has been a trend towards regional banks, i.e. Latin American and African banks reaching out across their respective regions. This poses additional challenges for supervisors in terms of cooperation across borders. While this topic is somewhat outside the current survey, it is important to be flagged.

## **6. Financial innovation – regulatory arbitrage, creation of fragility or contribution to financial deepening?**

Financial innovation is a very broad concept, but can be generally defined as new financial products and services, new financial intermediaries or markets, and new delivery channels.<sup>5</sup> Examples abound, ranging from the introduction of the ATM/cash machine in the 1970s and mobile phone based financial services in the 2000s, over the introduction of money market funds as alternative to bank deposits, the emergence of venture capital fund to structured financial products. The above mentioned intermediation platforms of peer-to-peer lending and crowdfunding also fall under the category of financial innovation. Goetz and Rouwenhorst (2005) identify 19 major financial innovations, grouped into innovations that (i) facilitate the transfer of value through time (e.g. savings accounts), (ii) enhance the ability to contract on future values (e.g. venture capitalists) and (iii) increase the negotiability of contracts (e.g. securitization).

The traditional *innovation-growth view* posits that financial innovations help reduce agency costs, facilitate risk sharing, complete the market, and ultimately improve allocative efficiency and economic growth, thus focusing on the bright side of financial innovation. Laeven, Levine and Michalopoulos (2015) quote several historical examples where financial innovation has been critical

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<sup>5</sup> One can also refer to this as production, process and organizational innovation.

in allowing major technological innovation to be adopted on a broad scale. For example, specialized investment banks emerged to facilitate the construction of vast railroad networks in the 19<sup>th</sup> and 20<sup>th</sup> centuries across North America and Europe, screening and monitoring borrowers on behalf of disperse and distant investors. In the second half of the 20<sup>th</sup> century, venture capital funds arose to finance IT start-ups, characterized by limited if any tangible assets that could be used as collateral and thus requiring patient investment capital and close screening and monitoring as well as technical advice. And in recent decades, financial innovation has supported bio technology. Lerner and Tufano (2011) undertake a counterfactual exercise, a “counterfactual historiography”, comparing real development with hypothetical development in world without (i) venture capital and private equity, (ii) mutual funds and exchange-traded funds and (iii) securitization. Their analysis points to overall positive effects of these innovation that would not necessarily have been achieved with alternative arrangements. There is also empirical evidence for the importance of both financial deepening for innovation (Amore et al., 2013; Chava et al., 2013) as well as of financial innovation for economic growth (Laeven et al., 2015). Beck et al. (2012) show that countries with higher innovative activity in the banking system experience faster growth in industries with higher needs for external finance and higher growth opportunities.

The *innovation-fragility view*, on the other hand, focuses on the “dark” side and has identified financial innovations as the root cause of the recent Global Financial Crisis, by leading to an unprecedented credit expansion that helped feed the boom and subsequent bust in housing prices (Brunnermeier, 2009), by engineering securities perceived to be safe but exposed to neglected risks (Gennaioli, Shleifer and Vishny, 2012), and by helping banks and investment banks design structured products to exploit investors’ misunderstandings of financial markets (Henderson and Pearson, 2011). Several authors have pointed to distortions introduced by financial innovations, such as securitization and new derivative securities, and how they have contributed to aggressive risk taking, reduction in lending standards and thus fragility (e.g., Keys et al., 2010; Dell’Ariccia, Igan and Laeven, 2008; Rajan, 2006

Financial innovation has been often used for purposes of regulatory arbitrage or to get around regulatory restrictions. For example, Euro-accounts were established in reaction to Regulation Q, which prohibited payment of interest on sight accounts in the U.S. Another example is the use of Special Purpose Vehicles (SPV), investment trusts to which bank off-loaded loan portfolios, in return for securities issued by the SPV and often rated AAA. In total, banks set up conduits to securitize assets worth \$ 1.3 trillion, insuring the securitized assets with explicit guarantees (Acharya, Schnabl and Suarez, 2011). The objective of such securitization operation was to save capital, as guarantees

were structured in a way to reduce regulatory capital requirements. Acharya, Schnabl and Suarez (2011) show that the losses on these conduits had to be taken back on banks' balance sheets during the crisis as consequence of wholesale runs.

Taking a broader view, Freixas, Laeven and Peydro (2015) argue that financial innovation is one of the key drivers of systemic risk. Financial innovation allowing for better risk management and sharing might reduce idiosyncratic risk, i.e. the risk of individual financial institutions considered on a stand-alone basis, while at the same time increase systemic risk as larger part of the financial system are exposed to the same systematic or aggregate risk and/or increasing the appetite and capacity to take on risk. This is confirmed by Wagner (2010) who shows theoretically that as banks become more similar due to diversification of risks, systemic risk increases.

The use of financial innovation on the bank-level has provided somewhat contradictory results. On the one side, Norden, Silva Buston and Wagner (2014) show that the use of credit derivatives reduced corporate loan spreads in the U.S., suggesting that banks passed on benefits of risk management benefits. The benefits were even stronger during the recent crisis, when banks with higher holdings of such derivative positions cut lending by less. On the other hand, Nijskens and Wagner (2011) show that even before the crisis the share price beta of banks trading credit default swaps (CDS) or issuing collateralized loan obligations (CLOs) increased suggesting higher risk from the use of these risk management tools. This effect is driven by higher correlation with the market while volatility actually decreases, suggesting that while these risk management tools serve to reduce idiosyncratic bank risk they actually increase systemic risk.

Financial innovation might also affect the incentives of financial intermediaries. Wagner (2007 a, b) shows that financial innovation that reduces asymmetric information can actually increase risk-taking due to agency problems between bank owners and managers, or because of lower costs of fragility. Keys et al. (2011), for example, show how reduced incentives to screen borrowers in the U.S. due to the possibility of being able to securitizing loans contributed to higher loan losses.

In summary, both theory and empirical work has shown that financial innovation can bring benefits but also increased risks both by the design of products but also through changing incentives. While financial innovation is thus critical for the development of the financial system, it also poses significant challenges for regulators. Regulatory frameworks are designed in light of existing products and providers. They are mostly rule-based (and intermediary-based), e.g. for liquidity requirements only specific clearly defined assets are considered. Rule-based regulatory regimes have the clear advantage of providing certainty, and reduce room for supervisory overreach. They also guarantee a certain independence for supervisors, given the limited degree of freedom for

interpretation. On the other hand, rule-based regulatory systems are less adequate in reacting to new products and markets as existing rules do not refer to them. A principle-based regime is more flexible in this context, but might be more open to arbitrage possibilities.

While regulation might give rise to certain financial innovations, regulators in turn will try to catch up with innovation, a process that Kane (1977) refers to regulatory dialectic. Compared to the financial sector, regulators are at a disadvantage, as regulation (especially rule-based regulation) refers to specific institutions, products and markets. Risk-based supervision would imply regulating and supervising all financial intermediaries that offer the same products under the same regime. For example, all institutions offering deposit services should be subject to the same prudential regulation. We will discuss this issue in more detail in the next section.

## **7. Regulatory perimeter: Fragility in Banks vs. Markets**

Much of the traditional regulation intended to improve the stability of the financial system is concentrated in the traditional banking sector. This is based on historical experience, according to which panics and runs were very pervasive in the banking sector and such failures tend to spread across banks. Indeed, banks make themselves quite fragile with the way they structure their assets and liabilities. They invest in long-term illiquid assets and finance themselves with demand deposits, allowing people to come and demand their money back at any point in time. This causes banks to be exposed to the risk of panic among depositors whereby they all demand liquidity at the same time and the bank fails. Moreover, due to banks' interconnections, such failures are likely to spread to other banks.

The history of the banking sector in the US prior to the establishment of the Federal Deposit Insurance Corporation (FDIC) and the Federal Reserve System is indeed plagued with many such occurrences. The same is true for other countries, which are largely following and learning from the US experience. Thus, financial stability regulation has focused to a large extent on stabilizing the banking system. First, the FDIC provides deposit insurance, which guarantees deposits up to a certain amount. This has proven quite powerful as a tool to tame panics, as depositors know that they do not have to rush to the bank at the first sign of weakness, since their deposits are guaranteed and not threatened by the withdrawal of others. Second, vast regulation on the amounts of capital, liquidity, and other choices made by banks have been introduced to make banks safer and reduce the risk-taking motive that might have been strengthened by the introduction of insurance. Many such regulations are coordinated by the Basel committee.

To a large extent, other financial entities operating in financial markets, such as mutual funds, hedge funds, money-market funds, etc. have been left unattended by financial-stability regulation. The idea was that they are different than banks, as they do not have the peculiar structure of demand deposit contracts and they do not have the system of vast connections among institutions, and so they do not put the system at a risk. A common theme is that prices should be allowed to fluctuate, people should be allowed to take risk, and institutions should be allowed to fail as long as there is no severe externality that they do not internalize which might threaten the system. This line of thinking, however, has proven to be incomplete.

Over the years, other financial institutions have started taking on bank-like features. Perhaps the most striking example is the Long Term Capital Management (LTCM) hedge fund which failed in 1998. LTCM exposed itself to huge leverage in an attempt to enhance returns to shareholders. Doing that, it also generated large risks, and indeed collapsed in 1998. Hence, the thinking that deposit-type risk does not exist in such institutions was shown incorrect. Moreover, after the fact, people have realized that LTCM was also at the heart of a system of vast connections to other institutions, and so its failure put the system at the risk of systemic failure. Indeed, it took quite a bit of effort from the side of US regulators to have all counterparties agree to a resolution that stabilized the system. The failure of Lehmann Brothers in 2008, although different in many respects, carried some similar lessons.

More generally, the fact that banks have been so heavily regulated has limited their ability to provide credit and liquidity and led to the emergence of other institutions that had many features similar to banks, but were not treated like banks or regulated like banks. The common name for such institutions is “shadow banking”, for which the definition is somewhat unclear. It probably covers everything that is not a traditional bank. Indeed, one of the key lessons from the last crisis is that shadow banking has to be looked at and that the regulation of the financial system has to take an integrative approach and consider the potential fragility of banks alongside shadow banks and not just banks in isolation. The idea is that if you regulate only banks, other institutions will emerge to replace them and take over their functions, and so it is important to prevent such a regulatory arbitrage and regulate the system with a holistic view.

A case in point is the money-market mutual funds. These are funds that invest in bonds, treasuries, and other such assets and have a liability structure that is very similar to banks. Specifically, they promise investors the right to withdraw a fixed amount. This is known as a fixed net asset value (NAV), whereby the net asset value promised to investors upon withdrawal is fixed. Due to this feature, investors have been treating their claims in money-market funds as very safe and

used them like money for different transactions. This entity emerged to a large extent as a response to regulation in the banking system: the limitations on the returns that banks can offer led investors to demand this kind of vehicle that will offer a bank-like claim with a higher return. Regulation did not treat money-market funds like banks and so they were free to do many of the things banks could not do.

Over the years, money market funds did not experience many problems and the perception that they are safe was validated in reality. But, during the years leading to the crisis, they started investing in riskier securities, exposing themselves to the mismatch between very liquid liabilities and less liquid assets, just like banks. This whole structure led to a crisis in the fall of 2008 when, following the collapse of Lehmann Brothers, one money market fund could not honor its liabilities to investors (this is known as ‘breaking the buck’). This almost unprecedented event has led to massive runs in the industry across other money market funds. (For empirical evidence, see Schmidt, Timmerman, and Wermers (2014) and for a discussion on regulatory implications Rosengreen (2014)).

The events in the money-market funds led regulators in the US and other countries to realize that regulation should not target just entities called banks, but more broadly other entities that look like banks or offer services like banks. One of the conclusions has been that the fixed-NAV structure is not sustainable and money market funds are thus moving into a structure of floating-NAV which resembles the one used in other mutual funds. According to this structure, investors are not promised a fixed amount when they withdraw, but rather the market value of their underlying assets as of the day of redemption. This will surely decrease the extent to which money market funds look like banks and the extent to which they should be regulated like banks.

However, the shift to a model of floating NAV does not prevent runs and panics. Recall that runs are generated by the presence of a first mover advantage. Investors want to demand their money when they think others will do so if the liability structure is such that the redemption by some investors reduces the value to those who do not redeem. This is certainly the case with fixed deposits or money market funds that have fixed NAV: Investors withdrawing early get the fixed amount and this reduces whatever is left to pay to the remaining investors. But, Chen, Goldstein, and Jiang (2010) have provided empirical evidence that such first-mover advantage exists also in floating-NAV funds.

The idea is that when investors take their money out of a mutual fund, they get the last updated market value of the underlying assets. However, following large redemptions, the fund will have to take actions and adjust the portfolio in the following days and this will hurt the value that remaining investors can get. The problem is particularly severe in funds that hold illiquid assets. These are the

funds that provide the liquidity transformation (in the spirit of banks) and for them the costs of portfolio adjustments following redemptions will be more pronounced. Indeed, Chen, Goldstein, and Jiang (2010) have shown that there is a very different pattern in funds holding illiquid assets relative to those holding liquid assets. The former exhibit much stronger sensitivity of outflow to negative performance indicating that investors are more likely to take their money out fearing the redemptions by others.

This force has shifted attention recently to bond funds. These are funds that invest in corporate, government, and other types of bonds. They have grown tremendously in the US over the last few years. This is again likely to be a response to the tightened regulation of banks. As banks find it more difficult to lend, firms are issuing more bonds to address their financing needs, and mutual funds are holding these bonds. The problem with bonds is that they are much more illiquid than equity, and so the liquidity mismatch for funds that hold bonds is more severe. Goldstein, Jiang, and Ng (2015) show in a recent paper that bond funds indeed exhibit different flow-performance sensitivity that leads to more outflows upon bad performance and consistent with the fact that they lead to greater first-mover advantage and fragility. They also show that this is amplified in times of aggregate illiquidity.

If indeed bond funds create the trigger for panic, this can put pressure on the financial system and the real economy in times of crisis. Vast evidence from the empirical literature on financial markets has shown that outflows from mutual funds create persistent price pressure (e.g., Coval and Stafford (2007) Manconi, Massa and Yasuda (2012), and Ellul, Jotikasthira and Lundblad (2012)) and that these price impacts can have real effects on firms' activities (e.g., Edmans, Goldstein and Jiang (2012) and Hau and Lai (2013)). Recently, Gilchrist and Zakrajcek (2012) show an effect of market-driven credit spread on real economic outcomes.

In summary, financial regulation should view the system as a whole and consider the fact that regulating parts of the system will likely shift activity to other parts and put them at the risk of fragility. An integrative approach, which is now attempted by the Financial Stability Oversight council (FSOC) in the US, is welcome and more of this approach should be implemented worldwide. Fragility should be measured based on the activity that is being pursued and not based on the entity pursuing it.

## 7. Looking beyond the feedback loop – creating arbitrage-safe regulatory frameworks

Our analysis suggests some high-level conclusions for an incentive-compatible regulatory framework that ensures a thriving financial system that supports the real economy, while at the same time minimizing the risk and the repercussions of bank fragility. We first point to some very general policy lessons, with examples, before providing some concrete recommendations in the case of European financial systems.

**1. Complexity vs. simplicity:** We need the right balance of (i) regulatory tools fine-tuned to the risk decisions of financial intermediaries and market participants and (ii) simple tools that cannot be easily circumvented. Both are meant to force banks to internalize the externalities from their possible failure, but having both types of tools reflects the trade-off between the goal of perfect risk pricing and the cost of market players searching for arbitrage options. Just to give two examples, one related to capital buffers and the other to activities of banks. Risk-weighted capital-asset ratios try to force banks to hold capital buffers appropriate for their level of risk-taking, while the leverage ratio is a back-stop that prevents banks from excessively reducing capital through outsmarting the risk weight system. Similarly, forcing banks to hold additional capital or impose higher risk-weights for specific activities that expose the bank to higher risks and/or are not considered central to financial service provision is a pricing-based tool, whereas outright prohibition of certain activities (e.g. trading on own account) is a simpler tool to achieve the same. While a pricing-based tool might be better to balance social benefits and costs, complete prohibition might be better in case of uncertainty about (the distribution of) costs and benefits.

What does this imply for Europe? While the CRR and CRD IV translated the Basel III agreement into European rules, the lessons from the recent crises have only partly been incorporated. On the one hand, government bonds still attract a zero risk weight, thus not reflecting the riskiness of sovereign credit even in many European countries. Maybe more worrisome (and maybe more relevant), there are no concentration limits on government bond holdings by banks, unlike for other asset classes. To our understanding, this issue is currently being discussed among supervisors. On the other hand, the leverage ratio has been set rather low at 3%, while other jurisdictions aim for higher ratios (4 or 5%). Critically, in the recent Comprehensive Assessment, the participating banks were not subjected to and evaluated under stress tests with the leverage ratio as benchmark, but rather only with risk-weighted capital-asset ratios as benchmark. This might also explain why market-based assessment of capital shortfalls provide different bank rankings and calculations of total shortfall than

accounting-based calculations such as done under the Comprehensive Assessment (Acharya and Steffen, 2015).

**2. Complement micro- with macro-prudential regulation.** As argued above, stability of individual financial institutions does not imply systemic stability, so that a focus on systemic risk and thus regulatory tools focusing on the whole financial system are important to complement micro-prudential tools focusing on individual financial institutions. This has to happen both on the time-series dimension, having disposable tools to reduce fluctuations and volatility in the credit cycle, and in the cross-section, having disposable tools to address the interconnectedness of financial institutions. Recent reforms have partly addressed these two dimensions, with counter-cyclical capital buffers and additional capital buffers for systemically financial institutions (SIFIs). Most of the toolbox, however, is focused on the supply side rather than on the user side, which might be an important additional area of policy focus, as tools to smoothen the credit cycle on the user side (especially in boom periods) have less space to be evaded if complemented with the necessary financial conduct regulatory framework. Specifically, loan-to-value caps for individual loans can be more easily circumvented than loan-value caps for borrowers.

This discussion is especially relevant for the European Union and even more so for the newly established banking union. While the SSM can use macro-prudential tool covered under the CRR and CRD IV, it cannot use other macro-prudential tools, which will remain exclusively under national authority (Sapir, 2014). Given that not only micro- but also macro-prudential decisions have externalities beyond national borders, this seems an important gap in the regulatory framework constructed under the banking union. The ESRB, which does not have any formal powers beyond issuing warnings and recommendations, cannot completely fill this gap. Finally, the CRD IV foresees some flexibility in relation to some macro-prudential powers. In particular, member states have the possibility, for up to two years (extendable), to impose stricter macro-prudential requirements for domestic institutions that pose increased risk to financial stability. The requirements concern the level of own funds, liquidity and large exposure requirements, the capital conservation buffer, public disclosure requirements, risk weights for targeting asset bubbles in property bubbles, etc. The Council can however reject, by qualified majority, stricter national measures proposed by a member state. A more effective macro-prudential framework would pool the responsibility of all macro-prudential tools, even if in a two-level structure. Different options can be considered, such as (i) leaving primary

decision power on the national level, with ECB and/or SSM having the right to impose stricter rules or (ii) the SSM being the primary and only decision taker with input from national authorities.

**3. Focus on resolution:** given the externalities from bank failure, it is critical to have frameworks in place to resolve financial intermediaries in a way that minimizes disruptions for the rest of the financial system and the real economy, while allocating losses according to creditor ranking. An incentive-compatible resolution framework has therefore not only important effects ex-post, i.e. in the case of failure, but also important ex-ante incentive effects for risk-decision takers. Knowing what happens in case of distress can provide the necessary incentives during normal times, i.e. risk decision takers will adjust their decision if they know that returns in case of distress will reflect the creditor ranking. To put it bluntly: Knowing that you will lose your shirt in case of failure can reduce incentives to take aggressive risks. Providing feasible options for resolution of banks that minimizes the externalities for the rest of financial system and the real economy also reduces the gap for financial safety net managers between ex-ante optimal and ex-post optimal reactions to bank distress. One important component of incentive-compatible resolution frameworks are living wills for large banks that often have the status of too-big or too-complex-to-fail. These living wills spell out what would happen in the case of failure – which parts of the bank will be wound down, which will be maintained at any price as they constitute a public utility and which parts might be sold off. The critical advantage of such tailored living wills is not just to prepare regulators for the worst-case-scenario, but can also be used by regulators to force certain restructuring of financial institutions to make them “resolvable”.

This challenge is especially important in the light of the incomplete banking union for the Eurozone. On the one hand, there has been substantial progress in strengthening (often non-existing) resolution frameworks on both national and European levels. Many countries have introduced bank resolution framework that take into account the special characteristics of banks and the need for swift resolution, while maintaining the creditor ranking. The BRRD has introduced bail-in rules for debtholders that aim to minimize the risk that taxpayers will have to be liable for bank losses. On the supranational level, the Eurozone has made enormous progress in moving towards a supra-national financial safety net, establishing both the single supervisory and the single resolution mechanisms. On the other hand, however, the banking union, as it currently stands is not complete. The SRM seems to be a rather complicated coordination mechanism, which involves several players. In addition, the fact that the UK is outside the SRM will critically hamper its effectiveness, given the importance of London as international financial center and many European banks having substantial parts of their operation in London.

Critically, a proper funding mechanism, including a public back-stop is missing. The target size of the single resolution fund of €55bn would not cover any major bank failure, which leaves the problem of too-big-to-fail unresolved in Europe. Even in the presence of much more rigorous bail-in rules introduced under the BRDD, interim funding might be necessary as large banks are unlikely to be resolved over a weekend. Finally and even more important than the limited self-funding, there is no public back-stop funding mechanism in place, which reduces the effectiveness of the resolution framework. Ultimately, this leaves again the failure of any large financial institution outside the formal financial safety net and subject to political ad-hoc weekend negotiations. Even in a world with high confidence in the competence, independence and integrity of the supervisory institution and process, the shortcomings of these other two pillars will affect the SSM. How credible can a supervisor be in threatening to close a bank if there is no water-tight resolution process in place?

**4. Dynamic approach to regulation.** As the financial system develops and financial innovation creates new products and new providers, regulation and supervision have to adjust. This concerns primarily and foremost the regulatory and supervisory perimeter. This would imply functional rather than institutional regulation (“if it looks like frog and it quacks like a frog...”). This would also imply that the regulatory perimeter has to be adjusted over time and that the focus of prudential regulation (both micro- and macro-prudential) might have to shift over time as new sources of systemic risks arise. One (negative) example was the sudden realization of the systemic importance of AIG in the CDS market (and therefore in the global financial system) in autumn 2008, not having been supervised thoroughly by prudential supervisors.

The question of the regulatory perimeter will arise for the SSM as much as for other bank regulators and thus the challenge of potentially expanding regulation and supervision towards non-bank segments of the financial system closely inter-connected with banks. It remains to be seen how easy it will be for the SSM legally and politically to redefine its regulatory perimeter if it identifies new sources of systemic risk, be they linked to the banking system or completely outside the banking system.

## **8. Looking forward: What do we know, what do we not know yet and what should we know**

The years since the crisis have seen an enormous increase in theoretical and empirical explorations in both (idiosyncratic and systemic) risk measurement and micro- and macro-prudential regulation. The overhaul of the regulatory frameworks across the globe was not only the result of lessons learned from the recent crises but was also accompanied by extensive academic work. We have become

better at measuring risk and designing regulatory tools to reduce build-up of systemic risk and manage it more effectively. Having said this, much of the discussion has been dominated by the last crisis – as always: regulatory reforms after a crisis are designed to prevent the last but not the next crisis. We have thus become better in analysing the known unknowns; this, however, leaves us with the unknown unknowns, including financial innovation leading to new business models and new structures in the financial system and thus new and future sources of financial fragility. As the financial system develops, research and analysis (both academic and within central banks and regulatory authorities) has to adopt to the dynamic nature of the financial system.

The four policy lessons discussed above, however, imply some important venues of further research.

**1. Complexity vs. simplicity:** several studies have addressed the issue of usefulness of risk-weighted capital-asset ratios vs. leverage ratios in predicting bank-level fragility (e.g., Haldane, 2012; Demirguc-Kunt, Detragiache and Merrouche, 2013). One important caveat, however, has been the Goodhart critique – as a specific metric (such as the leverage ratio) becomes a policy tools, it might become less effective. Comparing different measures of capital strength across banks and across countries with different capital framework and regulatory frameworks with market-based measures of fragility (where available) and possibly internal supervisory measures of fragility might provide insights into the relevance and adequacy of different capital requirements. Using market-based measures of tail risk will be important input into the analysis, as actual failures will most likely continue to be rare. As much as more sophisticated measures of systemic risk contributions of individual banks and covariance between different banks are necessary, the development of simple rule-based measures of systemic risk will be important, especially in less transparent environment where few banks are publicly listed and issue publicly traded securities so that little market-based information can be used. Fine-tuning stress test tools based on detailed supervisory information will be even more important in these environments.

**2. Complement micro- with macro-prudential regulation:** there have been few studies so far on the effectiveness of macro-prudential regulation, both on the extensive (which tools) and intensive (how much) margin (though see for example, Vandenbussche et al., 2015 and Claessens et al., 2014). Similar to the assessment of the risk-taking channel of monetary policy on bank fragility, however, loan-level data are necessary to gauge the effectiveness of macro-prudential tools on banks' risk-taking and fragility. Jimenez et al. (2014) is one of the few papers taking up this challenge; using the

Spanish credit registry data they assess both the introduction of dynamic provisioning in Spain in the early 2000s and the relaxation during the crisis in 2008. Their conclusion is that the tool was effective though not sufficient to prevent either credit boom or the credit collapse. The use of credit registry data across different countries (and therefore different financial structures, different macro-prudential tools and different economic structures) will be critical in getting a better assessment of what works best in macro-prudential regulation.

**3. Focus on resolution:** As countries adopt bank resolution frameworks, an assessment of different structures and designs (both in terms of tools and institutions) will be feasible in terms of impact on banks' risk taking, risk profile and fragility. Establishing causality will be difficult, but a combination of market data (where available) and supervisory data will be one route forward.

**4. Dynamic approach to regulation:** one important area for future research will be to explore different sources of systemic risk across the financial system, including in the shadow financial system. Recent work by Kojen and Yogo (2014) has shown significant additional risks in the life insurance sector stemming from life insurers moving liabilities off their balance sheets through unrated shadow reinsurers in less regulated jurisdictions.

TO BE COMPLETED!

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**Table 1: Comparing the Structural Reform Proposals**

	<b>Liikanen group report</b>	<b>UK Vickers report</b>	<b>US Volcker rule</b>
Holding company with banking and trading subsidiaries	Permitted	Permitted	Not permitted
Deposit-taking institution dealing as principal in securities and derivatives 1/	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Not permitted
Deposit-taking institution investing in hedge funds and private equity	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Not permitted
Deposit-taking institution providing market making services	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Permitted
Deposit-taking institution's non-trading exposures to other financial intermediaries	Unrestricted	Restricted	Unrestricted
Higher loss absorbency rule 2/	Yes, via leverage ratio for trading business that exceeds size threshold	Yes, as add-on to the conservation buffer for UK ring-fenced bank	For SIBs with substantial US footprint
Size threshold for application	Yes; applies to all banks with trading books larger than EUR 100bn, or trading assets more than 15-25 per cent of balance-sheet	Yes; applies to all banks and building societies with deposits greater than EUR 25bn	No
Enacted into law	No	Scheduled for completion by 2015	Yes
Implementing regulations finalised?	No	No	No
Notes:			
1/ US federal government and agency securities, debt and securities issued by US state and municipal governments and government-sponsored enterprises, and derivatives of these securities are exempt from proprietary trading restrictions of the Volcker rule.			
2/ The Dodd-Frank Act subjects US banks with assets in excess of USD 50bn to more stringent prudential requirements. Similar requirements have been proposed, under the recent Intermediate Holding Company proposal, for non-US banks with more than USD 50bn in global assets that have a systemically important presence in the US.			

Source: Table 1 on p. 15 of Viñals et al. (2013)