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Contents lists available at ScienceDirect

Journal of Financial Stability

journal homepage: www.elsevier.com/locate/jfstabil

Reflections on the crisis and on its lessons for regulatory reform and for central bank policies[☆]

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ARTICLE INFO

Article history:

Received 2 August 2009

Received in revised form 10 March 2010

Accepted 26 March 2010

Available online 4 April 2010

JEL classification:

G2

E5

G1

Keywords:

Regulation

Supervision

Institutions

Externalities

Bubbles

ABSTRACT

This paper discusses the problems exposed by the global financial crisis in the areas of financial regulation and supervision and possible solutions. It describes and evaluates current proposals regarding the role of the central bank as a systemic regulator, the pros and the cons of locating financial supervision in the central bank, and the conflicts and synergies that such an arrangement entails. Once a crisis erupts, central bank liquidity injections constitute a first line of defense. But in the longer term these injections create a trade-off between price and financial stability, and may compromise central bank independence.

Problems exposed by the crisis include the growth of a poorly regulated shadow financial system, short-termism in executive compensation packages and consequent adverse incentive effects, the too-big-to-fail problem, procyclicality in the behavior of financial institutions, conflicts of interest in the rating agencies industry and the trade-off between the scope of intermediation through securitization and transparency in the valuation of assets. The paper also discusses international dimensions including international cooperation in regulatory reform and the scope for limiting exchange rate variability. The conclusion points out inherent difficulties in distinguishing ex ante between a fundamentals based expansion and a “bubble.”

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When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing.¹

1. Introduction

The global financial crisis (GFC) has exposed numerous problems of moral hazard and of asymmetric information in financial intermediation. In good times such problems are not as salient because various excesses – such as exaggerated commissions, large compensation packages, biased financial advice and outright fraud – are overshadowed by the generally good performance of the economy. When everybody is making money and credit is plentiful the general public, as well as politicians, are not inclined to be inquisitive and various excesses are more likely to be glossed over. Easy access to credit makes it possible to main-

tain such excesses and even outright fraud over long periods of time.²

Many of those problems call for substantial reforms in the regulation and supervision of financial institutions and some reconsideration of the way central bank policies operate. Paradoxically, a benefit of the crisis is that it has exposed the fact that in a world with serious asymmetries of information, vigorous financial innovations and incomplete regulatory frameworks, “self-regulation” does not work. This realization will, no doubt, induce institutional changes designed to reduce the likelihood of systemic crises through reforms of the current regulatory and supervisory systems. Some of this process is already taking place. The crisis also presents new challenges for recent conventional wisdom regarding monetary policy procedures.

Many reasons – such as inadequate regulation of financial institutions, overly expansionary monetary policy and a global savings glut – have been suggested as reasons for the crisis.³ With an eye to potential reforms in the regulation of financial institutions, the paper focuses mainly on inadequate regulation and supervision. It takes the view that suggestions for reforms must start with an

[☆] A previous version was presented as a Keynote lecture at the Finlawmetrics conference on: “After the Big Bang: Reshaping central banking, regulation and supervision”, June 2009, Bocconi University, Milan, Italy.

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¹ Interview with Citigroup CEO in the *Financial Times*, July 9 2007.

² A salient example is the Madoff case.

³ See respectively Roubini (2008), Taylor (2009) and Bernanke (2005).

identification of the factors that contributed to the eruption of the subprime crisis in the US and then to its transformation into a GFC.⁴ The most glaring regulatory failures are the rise of an unregulated shadow banking system, the existence of compensation packages that encourage excessive risk taking behavior, the too-big-to-fail problem, procyclicality in the behavior of financial institutions, and moral hazard problems in the rating agencies sector. Section 2 describes the roles of those factors in the generation of the crisis and suggests detailed regulatory reforms to address the problems that surfaced in each of those areas.

Contrary to the great depression, both fiscal and monetary policies in the US, and to a lesser extent in Europe, have responded swiftly and vigorously to the crisis and are likely to be maintained for some time. It is highly likely that in the absence of those quick and large policy responses the crisis would have been deeper and more sustained. Particularly notable here is the response of the Fed which, unlike fiscal policy that requires a longer legislative process, was very quick and determined. This swift response maintained financial markets afloat in face of the panic that took hold following the bankruptcy of Lehman Brothers. This experience revealed the crucial role of the central banker as a first line of defense in the face of a panic. Section 3 discusses this “old-new” aspect of short run central bank policy and argues that it is likely to lead to a resuscitation of this function in parallel with the (recently) more traditional inflation targeting regime.

Although warranted by the seriousness of the crisis, the short-run response of monetary policy, and subsequently of fiscal policy, created a new state of affairs in which the central bank (CB) holds a large (and more risky) share of debt in the economy and in which the share of public debt in GDP is expected to increase substantially. This is particularly notable in the case of the Fed. When the US ultimately emerges from the crisis, this new state of affairs may create a painful trade-off between price stability and financial stability. However, price and financial stability may also reinforce each other, as was the case during the Savings and Loan Association crisis in the US. Section 4 discusses those issues along with other longer-term lessons for regulatory reform and for the role of the CB within the newly created regulatory environment. The section discusses the pros and cons of delegating responsibility for financial stability and regulation to the CB, and in particular, its potential role as a macroprudential regulator. It also discusses the long-term risks posed by the crisis for CB independence as well as the independence and professionalism of other financial regulators.

The globalization of financial flows and of trade in conjunction with the central role of the US in both of these areas contributed to the quick transformation of the subprime crisis into a GFC. Thus, along with its substantial benefits, globalization also contributed to a quick transmission of the adverse effects of the subprime crisis to the rest of the world. This suggests that although the crisis originated in the US, other countries have to adapt their institutions as well. In the presence of globalization, regulatory reforms should not be confined to the US and should be sufficiently coordinated in order to prevent regulatory arbitrage.⁵ The onset of the crisis dramatically increased volatility on forex markets. In times of global crisis, when much of the world is hit by a common shock, there may be room for beneficial coordination of monetary policies among major central banks in order to offset some of this volatility. Those international dimensions are discussed in Sec-

tion 5. This is followed by concluding thoughts including, inter alia, some conjectures about the relation between the likelihood of bubbles and the effectiveness of regulation and of supervision.

2. Regulatory problems exposed by the subprime crisis in the US and potential remedies

This section reviews the contributions of supervisory forbearance and of regulatory incompleteness to the emergence of the crisis as a starting point for possible remedial measures in those areas.⁶ It centers mainly on the US for two reasons. First, the crisis originated in that country. Second, the swift adoption and spreading of financial innovations in the US, many of which were driven by regulation avoidance, quickly led to an increasing gap between the sophistication of private financial operators and the abilities of financial supervisors to effectively regulate the financial system. This occurred through several channels, such as the emergence of lightly regulated shadow banking institutions, compensation packages that encouraged shorttermism and excessive risk taking, various conflicts of interest related to the operation of rating agencies and of financial research departments within investment banks, and overly sophisticated financial assets whose fundamental values became more and more opaque as the state of the real economy gradually moved from boom to recession.

2.1. The growth of poorly regulated segments of the financial system

Parts of the US financial system, such as commercial banks, are subject to reasonable levels of regulation and supervision, while other parts such as hedge funds are very lightly regulated, or not regulated at all. The Glass Steagell Act of 1933 separated commercial banking from other financial activities like underwriting, brokerage and securitization that were performed by such institutions as investment banks. As long as the act was in force commercial banks were largely confined to narrow banking. Bowing to pressures from the financial community, the 1999 Gramm–Leach–Bliley Act effectively repealed this separation, widely opening the door for universal banking and the growth of a shadow banking system. This led to regulatory arbitrage that transferred a significant fraction of financial intermediation to non-bank financial institutions such as broker dealers and hedge funds. Commercial banks also participated in this expansion by setting up special investment vehicles (SIV), conduits and other legal entities that allowed them to shift a rising fraction of their business away from tightly regulated activities into unregulated or lightly regulated activities.

The growth of the shadow financial system had the following consequences. First, the fraction of intermediation not subject to capital requirements increased. Second, many institutions in this segment of the market did not have access to the lender of last resort facility, making them potentially subject to runs—not by bank depositors who are insured by the Federal Deposit Insurance Corporation (FDIC), but by the more sophisticated holders of their liabilities. Third, like banks, many institutions in the shadow system had liabilities whose average maturity was shorter than that of their assets. This created a liquidity risk akin to the classic liquidity run analyzed in Diamond and Dybvig (1983). Fourth, some of those institutions, such as hedge funds, engaged in highly leveraged operations. Finally, with light or nonexistent regulation, the

⁴ A companion discussion that focuses on the reasons for the crisis and the regulatory reform in the UK appears in Goodhart (2008).

⁵ The April 2 2009 declaration on strengthening the financial system following the London summit of the G20 is well aware of this requirement. But its translation into specific recommendations is only partial at this stage.

⁶ An early discussion of some of those issues appeared in Roubini (2008).

shadow banking institutions could afford to be opaque and even secretive about their assets and liabilities.

2.1.1. Remedies

The main lesson for regulatory institutions is that the scope of regulation should be extended to *all* financial institutions. Extending regulation and supervision to *all* financial institutions is essential for restoring the shattered credibility and normal functioning of financial institutions in the US and world financial markets as well as for the minimization of regulatory arbitrage. Although the details of the extended regulation may have to be tailored to the different types of financial intermediaries, the general principles – such as maintenance of risks, and particularly of systemic risks, below critical levels and assurance of adequate levels of disclosure and transparency – should be uniform. A practice that facilitated regulatory arbitrage in the US is the fact that, within some limits, financial institutions can choose their regulators. I believe any post-crisis reasonable regulatory system should largely eliminate this option.

Amidst the public policy discussions about the future of the US regulatory system, free-market advocates have been preaching in favor of self-regulation. My feeling is that the crisis has provided substantial evidence in favor of the view that self-regulation cannot be relied upon to prevent future crises in the US financial system. The “taste” for taking risks and producing new financial instruments to generate profits is simply too strong in that country. Self-regulation may have a better chance in Canada whose banks are less innovative and more conservative in their lending policies. This view appears to be supported by the observation that although Canada has a large subprime mortgage market, this market has performed to date much better than its US counterpart.

2.2. Compensation packages that encourage shorttermism and excessive risk taking

The crisis has drawn public attention and anger to the large compensation packages of senior- and mid-level financial executives. In addition to their size, which often appears exaggerated on distributional equity grounds, those packages raise two principal-agent issues and another one regarding their implications for systemic stability. The first principal-agent question is whether the compensation packages are justified in view of the contribution of those executives to the long-run performance of their respective institutions. The other concerns the effect of those packages on the incentives of top managers to make decisions leading to risks/return patterns that are in line with the long-term interests of their shareholders. Those microeconomic questions are discussed in this subsection; the macro type implication of existing compensation packages for systemic stability is discussed in the following subsection.

A typical remuneration package is composed of a fixed payment plus yearly bonuses paid for performance above a threshold level. Above the threshold, the bonus increases with the performance of the institution. As a consequence, financial executives are remunerated in good years but not fined for poor performance in other years. This creates a structure of incentives that encourages short-run profit maximization at the expense of longer-term average returns as well as excessive risk taking. Actions that increase the current year's performance, even if quite costly in terms of longer-run risks and returns, are individually rational since executives get extra pay now and are not fined for subsequent bad performance. Furthermore, this structure of incentives is likely to lead to decisions that increase the variability of profits and the overall risk of the financial institution over time.

This has important consequences for the chosen leverage ratio. The main instrument through which executives control the distribution of risks and returns is leverage. By raising leverage, they raise profits in case of success but also the magnitude of losses in case of failure. The typical compensation package lowers the individual executive's downside risk below that of the financial institutions leading to leverage ratios that are excessive for shareholders. Furthermore, bonuses often take the form of options on the stock of the institution. Since, by design, options are highly leveraged instruments relative to the institution's profits, the overall incentive of financial officers to aim at quick large profits is even higher.⁷ Short-termism was further encouraged by the relatively high turnover of skilled financial individuals in the US and by the built-in short horizons of politicians in democratic countries.⁸

2.2.1. Remedial devices

How should financial regulation be devised to reduce those distortions? The general principle is that executive compensation should be aligned, as much as possible, with the long-term performance of the institution for which they work. In particular, bonuses should be based on average performance over several years. Should regulation of those matters be applied only to top executives or also to mid-level managers? One view is that it should suffice to align the incentive of top managers with those of shareholders, since it would then be in their interest to design packages with similar features for mid-level portfolio managers as well. Since shorttermism at many levels was a basic factor in the creation of the crisis, my own view is that bonuses to all individuals who make risk/return decisions within a financial institution should be based on average performance over several years.

One problem with bonuses that are based on longer-term performance is that some shareholders of banks, such as hedge funds, have been focusing on short-term profits. This focus was most likely nurtured by the fact that managers and traders of such funds were being remunerated on the basis of short-term performance. Consequently, a possible way to deal with this problem is to extend the requirement that bonuses be based on longer-term performance of hedge funds and other institutions that hold large blocks of shares like mutual funds. The wider the circle of financial institutions to which this longer-term principle is applied, the better the chances that shorttermism is moderated without major misalignment of incentives between managers of banks and their institutional shareholders.

2.3. Systemic or macro risks and the too-big-to-fail problem (TBTF)

Even when compensation packages are such that the incentives of shareholders and of managers are perfectly aligned, the latter take excessive risks from a social perspective because they do not internalize the impact of their actions on the likelihood of a systemic crisis. Although, for small financial institutions this negative externality is negligible, it is sizable for large institutions. Managers of large institutions expect therefore that, if they fail, the government will come to the rescue and bail out their institution. As a consequence they choose portfolios that carry risk levels higher than the socially optimal levels, not only because they do not internalize systemic risks, but also because they expect to be bailed out. This is the “too big to fail” problem. The large amounts of funds used by the Fed to keep AIG and Citibank afloat, as well as the finan-

⁷ A fuller analysis appears in Bechuk and Spamann (2010).

⁸ In a recent book, Padoa-Schioppa and Romano (2009) describe the numerous channels through which shorttermism contributed to the creation of the GFC.

cial markets disruptions induced by Lehman Brothers' bankruptcy, dramatically illustrate the dilemma of the Fed and of the US Treasury. Those authorities found themselves between a rock and a hard place. By bailing out large failing institutions they assumed high risks on behalf of taxpayers. But when they did not, they were faced with a severe crisis of confidence in financial markets.

2.3.1. Remedial devices

Once a crisis develops it is likely that bailouts of systemically important institutions are preferable to the financial disruptions that would otherwise occur. But the longer-run drawback of such policies is that they encourage systemically important institutions to assume excessive risks. The wide-scale bailouts implemented by both fiscal and monetary authorities during the GFC most likely reinforced such tendencies. It is therefore imperative to devise mechanisms that would offset those tendencies and possibly collect up-front payments from systemically important institutions for the risks they collectively impose on taxpayers.

Those objectives can be achieved through a number of non-mutually-exclusive devices. Direct ways are the ex ante mandatory breakup of financial institutions that are TBTF and the imposition of absolute limits on the amounts of leverage and of risks that an institution can assume through derivatives (CDSs for example), as well as through the imposition of adequate capital requirements. The ex ante breakup of large institutions reduces the need to bail out the institution if it fails and, therefore, also its incentive to assume excessive risks. Ceilings on leverage and minimal capital requirements reduce risk taking by operating directly on the balance sheets of financial institutions. Some combinations of such devices are being considered in recently proposed legislation in both the US and the European Union. There are different views about whether authority over such instruments should be vested with the central bank or with a council of regulators. The pros and the cons of those alternative arrangements are discussed in Section 4.

A more market-oriented device to induce internalization of systemic risks by TBTF institutions is via a tax schedule whose structure is proportional to the systemic risks induced by the decisions of such institutions. Since larger institutions generate higher systemic risks, they should pay relatively higher taxes. In addition, the burden of the tax could be structured so that it is higher during expansions, when financial institutions tend to assume higher risks, and lower during recessions, when financial institutions are naturally more cautious. By collecting a larger share of the tax during expansions, such a schedule would offset at least part of the procyclical risk-taking tendencies of financial operators discussed in the following subsection. The average tax (or insurance premium) could be set at a level that covers, on average, the costs of prospective future bailouts. This method has two advantages. First, it operates through the price system rather than through quantitative restrictions. Second, in the presence of an appropriately chosen tax level, realized bailouts would be covered in the long run from fees on TBTF institutions without burdening taxpayers. On the other hand the appropriate insurance premium level may be hard to determine—at least initially.

2.4. Procyclicality in the behavior of financial institutions and investors

The decisions of financial institutions and of investors tend to be procyclical. During the upper phases of the cycle they accept higher risks in order to increase expected returns; during the down phases the reverse happens (in markets' language—a “flight to safety”). As a consequence, credit and leverage expand during expansions and contract during recessions. This widely observed phenomenon is caused by economic and psychological factors as well as by some

features of existing financial regulation. Among the economic factors are.

1. The countercyclical behavior of the external finance premium (EFP). The EFP is the difference between the cost of external finance and the alternative cost of own funds.⁹ It goes down during booms leading to the expansion of leverage and up during recessions leading to the contraction of credit and leverage. Related to that is the procyclical behavior of collateral also known as the “balance sheet effect.” During expansions the value of collateral goes up, raising the willingness of lenders to extend credit, while during contractions the opposite occurs. This reinforces the procyclicality in leverage. An additional reinforcing factor is the Basel II requirement to mark collateral to market.¹⁰
2. Evaluation of risks by financial institutions tends to be based mainly on developments during the preceding several years. As a consequence, after several years of expansion, statistical measures of risk are likely to be biased downward. With the benefit of hindsight it appears that this was the case during the second half of the subprime crisis. On the other hand, following the downfall of Lehman Brothers the markets' risk evaluations jumped to levels which turned out to be exaggerated (at least with the benefit of hindsight). It appears that dramatic bad news, such as the downfall of Lehman Brothers, induces violent fluctuations in the risk assessments of financial institutions and other market participants. The impact of such news appears to be stronger when it comes following a substantial buildup of leverage. How much of the resulting waves of optimism and pessimism are due to changes in economic fundamentals and how much to human psychology is a widely open question. Some observers like Shiller (2000, 2008) attribute such fluctuations to “irrational exuberance” or “social contagion.” But more traditional economic thinking could argue that these wide gyrations are rational in a world of highly imperfect and asymmetric information. As a matter of fact, frameworks like those of Morris and Shin (2002) and Morris et al. (2005), in which fully rational individuals overreact to public information because they know that everybody else has access to the same information, go a long way toward reconciliation of the two approaches. Nonetheless, it is likely that the reactions of financial decision makers to unfolding events are affected by both economically rational calculations as well as by psychological considerations. An insightful discussion that combines both factors informally appears in White (2008, Section 3).
3. With the benefit of hindsight it became clear that an additional reason for the large risk evaluation mistakes made by financial officers prior to the eruption of the subprime crisis was due to their overreliance on evaluation of micro risks and relative disregard for macroeconomic risks created by systemic effects. As a consequence they underestimated the correlations between adverse states of nature across different segments of financial markets.¹¹ In particular, it is likely that they underestimated the correlations between credit default at the level of a single institution and at the level of the entire economy. This is probably due to their better understanding of micro than of macro risks. Besides contributing further to the procyclical behavior of leverage, this factor may also explain the speed with which the boom turned into bust following dramatically adverse news.

⁹ Due to asymmetric information and moral hazard problems between lenders and borrowers this premium is generally positive. For a quick survey see Bernanke (2007).

¹⁰ A fuller discussion appears in chapter 4 of Brunnermeier et al. (2009).

¹¹ This issue is a main theme of Brunnermeier et al. (2009).

2.4.1. Remedial devices

Although regulation and supervision alone cannot fully offset the cumulative procyclical impact of those factors, they can be devised in ways that reduce them to tolerable levels. Through such devices, appropriately devised regulation of financial institutions can contribute to lowering the likelihood of bubbles and of the largely inevitable busts that follow their bursting. The general objective of regulation of financial institutions should be to create built-in mechanisms that attenuate the impact of procyclical behavior on the likelihood of a crisis.

Several, not mutually exclusive, regulatory devices can be used to achieve this objective. The most obvious is to raise capital requirements during booms and loosen them during recessions. Furthermore, capital requirements need not be the same for all institutions. They should rise with the riskiness of assets held by a financial institution, so that institutions with higher risk profiles are forced to maintain larger levels of capital as a cushion against the higher risks they impose on counterparties. One of the mechanisms proposed to handle the TBTF problem discussed above was to impose insurance levies on systemically important institutions. This mechanism can be refined to simultaneously offset procyclicality by spreading the systemic internalization levies discussed in the preceding subsection over the cycle, so that most of those levies are collected in good times when financial institutions enjoy large profits and robust balance sheets.

Other regulatory reforms could include the mandatory conversions of bonds into stocks in bad times in order to maintain the capital ratio in such times. Recent legislative proposals in the UK and the US would give regulators resolution authority under pre-specified circumstances. Those devices are particularly important in the case of TBTF institutions. In addition, an appropriate systemic regulator should develop and maintain early warning signals for macroeconomic risks, particularly during booms, and publish them.¹² This may be supplemented by imposing upper limits on the levels of credit and of CDSs in large institutions, when those levels appear to move into a dangerous area. Authority for setting the specifics of those mechanisms would be vested with an appropriate macroprudential regulator. The controversial issue concerning the powers of the CB in macro regulation is discussed in Section 4.

2.5. Regulation of rating agencies

The subprime crisis exposed an important conflict of interest between the public interest on one hand and securitizers (like investment and mortgage banks) and rating agencies on the other. Securitizers have an interest in embellishing the prospects of the financial assets that they repackage. Since rating agencies were paid by securitizers, they obviously had an interest in partially catering to those incentives of their clients within limits determined by the requirement that this did not visibly affect their ex ante credibility. The problem was compounded by the fact that regulators were using some of these ratings to determine the risk levels assumed by the regulated financial institutions. Interestingly, a similar conflict of interest – that involved manipulation of information through collusion between the research and marketing departments of investment banks at the expense of the general public – emerged already in the mid-nineties and was finally settled in 2003. Following lengthy investigations and litigation by the SEC and the NY Attorney-General, ten of the US top investment firms have settled enforcement actions involving conflict of inter-

est between research and investment banking.¹³ The fact that such conflicts of interest continued in another guise for several years after the settlement demonstrates that those measures did not suffice and further supports the view that self-regulation is unlikely to be effective in the US.

2.5.1. Remedial actions

It is clear that rating agencies should not be allowed to be remunerated by any institution that has a stake in the assets that are being rated. It is less obvious how the problem should be handled; different economists may have different views about this question, depending on their a priori views regarding the ability of rating agencies to self-regulate. My own view is that some public involvement in this matter is inescapable. Rating agencies should be monitored by appropriate public bodies and tightly regulated to detect conflicts of interests early on. They should be licensed by the regulatory authority and the latter should have the authority to revoke their license in case of unethical behavior. In addition, serious consideration should be given to the creation of independent public rating agencies parallel to the private ones. These rating agencies should have some authority to demand information from financial institutions and corporations. Their compensation should be totally divorced from the conclusions of their research, but may be tied to the ex post accuracy of their predictions. If appropriately devised, such agencies may set a standard for the private rating agencies.

2.6. Securitization and the trade-off between transparency and efficient intermediation

Securitization of mortgages was initially introduced in the US by the National Mortgage Association (Fannie Mae) already in 1981 by issuing Mortgage Backed Securities (MBS) backed by the “full credit” of the US government. Soon after, securitized products for prime loans without the backing of government emerged in the private US sector.¹⁴ The main advantage of securitization is that it widens the scope for financial intermediation between final borrowers and final lenders. By repackaging mortgages (or other types of loans) it produces financial assets designed to better fit the risk/return preferences of different classes of lenders, thereby increasing the volume of intermediation and, presumably, its allocative efficiency.

However, by disconnecting the direct link between the mortgage originator and the final holder of the MBS, it makes the monitoring of the borrower and the evaluation of the fundamental value of the securitized asset difficult and opaque. This problem becomes more acute when market circumstances change. It is further compounded when there are several layers of securitization. The recent inability of highly sophisticated financial institutions to price the MBSs they owned clearly demonstrates that excessive, and poorly regulated, securitization also carries a cost. This cost, which is related to opaqueness about the value of securitized assets, was largely responsible for the drying out of the interbank market following the demise of Lehman Brothers. The upshot is that securitization creates a trade-off between larger volumes of intermediation on the one hand, and monitoring plus transparency

¹³ The settlement required payment of US\$ 487.5 million by the investment banks to fund independent research and investor education. Some of the investment banks involved were Bear Stearns, Goldman Sachs, Lehman Brothers, J.P. Morgan Securities, Merrill Lynch, Morgan Stanley and Citigroup. Further details appear in *EC NewsDesk* (2003).

¹⁴ The European asset securitization market developed later during the nineties. Further details appear in *Mizen* (2008).

¹² *Borio and Drehmann* (2009) show that excessive increases in the credit-to-GDP ratio and in real estate prices perform reasonably well as advance indicators of a bubble that might burst.

with respect to the fundamental value of securitized assets, on the other.

2.6.1. Remedial measures

An extreme solution to the consequent problems of monitoring and opaqueness is to forbid securitization altogether. This amounts to “throwing out the baby together with the bathwater.” I believe an “optimal” solution should maintain the option to securitize and to assure adequate levels of monitoring and of transparency through appropriate regulation. How this general principle is to be translated into specific details is a difficult open question that requires further research and thinking. One possibility is to require that the originators of MBSs and other securitized instruments retain a substantial fraction of the equity tranche of those assets. This would leave the incentive to monitor final borrowers with the institution that has a comparative advantage in achieving this task. In addition, excessive levels of securitization should be limited by regulators. It is likely that beyond a certain level, the monitoring and transparency losses outweigh the benefits in terms of the volume of intermediation.

Another dimension through which regulation may improve the trade-off between transparency and the scope of intermediation is by enhancing transparency regarding the valuation of securitized assets. This may be achieved by measures such as requiring securitizers to better inform the public about how to value securitized assets and possibly maintain an active secondary market for securitized assets.

3. The CB as a first line of defense against an impending financial crisis

Although the subprime crisis was largely triggered by the 2006 reversal in the trend of prices in the US housing sector, it is essentially a crisis of the financial system. Due to factors discussed in the previous section, the flow of credit within the arteries of the financial system dried up. This was particularly dramatic after the downfall of Lehman Brothers in September 2008. Opaqueness about the value of assets in counterparty institutions made valuation of their assets highly uncertain. Banks and other financial institutions became reluctant to lend to each other, even for short periods of time. Well oiled and liquid financial markets like the interbank market and the subprime mortgage market dried up, and banks became reluctant to lend to the real economy. Highly leveraged institutions such as hedge funds were forced to engage in “fire sales,” further decreasing the value of assets, increasing uncertainty about their valuation and reducing their liquidity. These adverse effects quickly spread to derivatives like the huge CDS market further reinforcing the impact of the crisis on the financial system and on the supply of credit to the real sector of the economy.

The central bank (CB) constitutes the first (ex post) line of defense against such swift adverse developments and is naturally – and rightly so – expected to step in and react quickly. As a matter of fact, the Fed was originally created in order to offset the adverse effects of periodic financial panics and to reduce their impact on the variability of interest rates and on liquidity.¹⁵ However, those necessary immediate reactions also create new challenges for the central bank, when the economy returns to normal. This section focuses on lessons from the crisis and from the Fed’s response to date for CB policy during the crisis for the short and intermediate runs, while the impacts of the crisis are still substantial. Lessons for

longer term reforms designed to reduce the ex ante likelihood of a crisis are discussed in the subsequent section.

3.1. The central bank as a “fire fighter”

The GFC demonstrated that the presence of persistent regulatory problems induces serious credibility problems about the solvency and liquidity of financial institutions, and may eventually lead to the drying up of financial intermediation, to a severe contraction of credit to the private sector and, eventually, to a recession. Such structural problems can be handled only in the longer run, leaving an important open question about the role of the CB in the short run. In this run the CB is akin to a fire fighter. It first has to put out the fire and let society worry about future prevention after the fire has been put out. In the context of the financial system the “fire” is the drying up of financial intermediation. In its role as lender of last resort the CB should, under such circumstances, step in and use its policy instruments to maintain adequate liquidity by assuming a greater share of financial intermediation in the economy. A by-product of such policy is that it may restore some of the shattered credibility of the private financial system.

This lesson was learnt the hard way after the great depression (Friedman and Schwartz, 1963). Since September 2008 the Fed has supplied huge amounts of short-term liquidity and some longer-term funds to the economy, demonstrating that it has internalized this distant lesson.¹⁶ This policy prevented the level of financial intermediation from dropping at very fast rates in spite of deleveraging by the private financial sector. A substantial part of intermediation by the private sector was replaced by intermediation through the central bank, and the interbank market (which dried up due to opaqueness about the credit worthiness of private financial institutions) was replaced by intermediation through the Fed. The fact that banks with excess funds abstained from lending to other financial institutions but were willing to do so through the intermediation of the Fed made it possible to maintain reasonable levels of credit flows. The ECB responded in qualitatively similar ways. It is now apparent (December 2009) that those policies averted a substantially worse financial crisis and restored a measure of confidence to global financial markets.

4. Longer term reform: the role of central banks in regulation and supervision of financial institutions

Following the crisis there is broad consensus that financial regulation should be reinforced and supervision tightened. An important element of this consensus is that, in addition to existing micro regulatory authorities, a macro regulatory authority that would monitor systemic risks and possess policy instruments able to deal with such risks should be set up. However, views differ on the scope of reform and on the allocation of regulatory authority across different regulatory institutions. In particular there are disagreements about the allocation of responsibility for financial stability and of the closely related systemic regulation function to the CB or to one or several other regulatory institutions. Existing practices vary widely across countries. In the US the Fed regulates most of the banking system including banking holding companies

¹⁵ See Meltzer (2003).

¹⁶ By contrast, during the first three years of the great depression, monetary policy was passive and became expansionary only after Roosevelt was elected in 1933 (further details appear in Cukierman, 2009). No doubt, one factor that contributed to the swift and vigorous reaction of monetary policy during the current crisis is the fact that the Fed’s chairman devoted much of his early academic career to studying the consequences of monetary passivity during the great depression (Bernanke, 1983).

while the Federal Deposit Insurance Corporation (FDIC) implements deposit insurance and handles the resolution of insolvent banks.¹⁷ The Securities and Exchange Commission (SEC) regulates securities markets and the Commodity Futures Trading Commission (CFTC) handles futures markets. But many other derivative markets like the Credit Default Swap (CDS) market, that expanded by leaps and bounds prior to the crisis, are not regulated at all. Clearly, the structure of US financial regulation is fragmented and incomplete. Regulatory coverage and supervision in Europe are generally tighter. But the structure of regulation varies substantially across countries within Europe. Thus, since 1997, authority for regulation and supervision of banks in the UK is vested with the Financial Sector Authority (FSA) and the Bank of England has no regulatory or supervisory authority. By contrast, in Germany regulation and supervision are shared between the Bundesbank and the German Federal Banking Supervisory Office (GFBSO).¹⁸

4.1. Regulatory reform proposals and the role of the CB

In view of its broad macroeconomic focus and expertise, the CB is a natural candidate for monitoring systemic risks and for evaluating the economy-wide risks induced by the behavior of large financial institutions. However, this does not necessarily mean that the CB should be the *only* institution in charge of those functions. This is where the consensus ends.

4.1.1. The US

In June of 2009 the US Treasury produced a comprehensive plan for regulatory reform that includes the Fed as systemic risk regulator and supervisor of TBTF institutions, the creation of a “Council of Regulators,” the regulation of all financial derivatives for the first time in US history, a new resolution mechanism for failing institutions and the creation of a consumer protection agency. The central role of the Fed in regulating and potentially breaking up systemically important institutions and in setting leverage limits and liquidity rules was further upheld in October 2009 in a House Draft Law provision. But in November 2009 Senator Chris Dodd, Chair of the Senate Banking Committee, proposed alternative legislation that would create a Financial Institutions Regulatory Administration (FIRA) as the single national regulator. This council of regulators would include the Treasury, the Fed, the FDIC, a consumer agency (to be created), the SEC and the CFTC. The main difference between these two draft law provisions is that the house draft basically delegates the authority for systemic regulation and supervision to the Fed, whereas the Senate proposal assigns it to a council of regulators in which the Fed is only one of several institutions. The Senate proposal’s revealed reluctance to vest systemic regulatory authority mainly with the Fed derives from its perception that this institution was partly responsible for the outbreak of the financial crisis.¹⁹

4.1.2. The European Union

Although the existing European regulatory structure provides better coverage of European financial institutions, it is more fragmented than that of the US. Consequently a first order of business of the Larosiere Committee appointed to recommend regulatory

and supervisory reforms in Europe was to find ways to harmonize those functions across the EU while maintaining the involvement of national regulators. In February 2009 the committee came up with recommendations summarized in the Larosiere Report (2009). In September 2009 the European Commission (EC) in Brussels endorsed those recommendations with the intention of having them eventually ratified by the 27 EU member countries.

The report recommends the establishment of a new body called the European Systemic Risk Council (ESRC) that would be responsible for systemic macro-prudential issues. The ESRC will be chaired by the European Central Bank (ECB) president and logistically supported by the ECB. In parallel, three pan-European supervisory agencies will be created to enforce a common rule-book for banks, insurance companies and security markets across the EU. These agencies’ formal titles are the European Banking Authority (EBA), the European Insurance Authority (EIA) and the European Securities Authority (ESA). The ESRC will be composed of all the members of the general council of the ECB, the chairs of the EBA, the EIA and the ESA, as well as one representative of the EC. These bodies will have more powers and resources than the existing EU committees that they are supposed to replace. They will draw common rules in a wide range of financial services areas that would then have to be enforced by national regulators.²⁰ The three authorities would also be able to rule in the event of a dispute with or between member states—although there would be an appeal process, ultimately to European Council level, where the final decision would be by qualified majority voting. Finally, the principle of “fiscal responsibility” would be formally recognized in the legislation, meaning that the new supervisory structure should not intrude on states’ finances.

4.1.3. Comparison of US and EU reform proposals

The proposed US and EU regulatory legislations are similar in that they both create a top council of regulators (the FIRA in the US and the ESRC in the EC). But the European model clearly assigns a major role in macro-prudential regulation to the ECB, while this role is envisaged for the Fed only in the House Draft Law Provision. Another difference is that the EU formula creates three new pan-European regulatory agencies for banking, insurance and securities activities. Since US wide regulatory institutions in those areas already exist, no additional regulatory organs are planned.²¹ Hitherto unregulated segments of the US financial system would come under the responsibility umbrella of existing US regulatory agencies. Last but not least, European regulatory reform proposals recognize that, to the extent that maintenance of financial stability requires fiscal decisions, those are left to the discretion of the 27 national governments.

4.2. Should the CB be responsible for financial stability and should it regulate financial institutions? Pros and cons

Central banks were originally created mainly in order to maintain financial stability and to prevent liquidity crises by acting as lenders of last resort (LLR), and later through regulation and supervision. Following the experience of the great depression and the inflationary experiences of the twentieth century, they were also assigned the additional dual objective of adequate employment and price stability. During the last two decades these two objectives were embedded into explicit or implicit inflation targeting

¹⁷ The Fed regulates banks that are members of the Federal Reserve System. The remaining banks are regulated by state regulators and by the Office of the Comptroller of the Currency (OCC).

¹⁸ Further details about German regulation appear in Fischer and Pfeil (2003). Masciandaro et al. (2008) provide a wider cross-country comparison of regulatory institutions.

¹⁹ Senator Dodd expressed this view at the Banking Committee hearings for the nomination of Ben Bernanke as the Fed’s chairman for a second four-year term.

²⁰ Under the proposed legislation, their rules would still have to be endorsed by the European Commission before coming into effect, but this could become a largely “rubber-stamping” exercise.

²¹ An exception is the planned consumer regulatory agency that would protect the interest of consumers in matters such as credit card and ATM fees.

(IT) frameworks in which the maintenance of financial stability, although implicitly present, took a back seat. The GFC propelled the financial stability objective and the LLR function back into the front seat, raising a fundamental question about whether regulatory and supervisory responsibilities should be located within the CB or in separate institutions.

This subsection considers the trade-offs and synergies between price and financial stability when the responsibility for achieving the second objective is placed with the CB. In this case the objective function of the standard IT framework should be expanded to include three objectives and (excluding initially possible additional instruments) only one instrument, to which I refer as the stance of monetary policy.²² The presence of only one instrument and several objectives may create trade-offs between the various objectives. Following the extraordinary expansionary policies that major central banks have deployed in response to the GFC, a current concern is that excessive focus on financial stability may interfere with the objective of long-run price stability. This concern is particularly strong in the case of the Fed, whose monetary policy stance has been particularly expansionary and is expected to remain in such a state for some time.

4.2.1. Price and financial stability: complements or substitutes?

At a more general level, price and financial stability are not always competing objectives. Whether they compete or complement each other depends on the origin of shocks that affect the economy. This point is illustrated by means of two episodes from the recent history of the financial sector in the US. The first draws on the experience of the current crisis and the second on the Savings and Loans Associations (S&L) crisis during the seventies and the eighties of the previous century. The current crisis originated in the bursting of a real estate financial bubble against a backdrop of price stability. In conjunction with opaque financial instruments, this led to panic within the financial sector and to a stoppage of credit flows. To restore confidence and the flow of credit, monetary policy responded by flooding the financial system with liquidity. If not removed when the economy rebounds, this liquidity will be inflationary in the longer run, thus creating a trade-off between financial and price stability.

The S&L crisis was due to disintermediation in the S&L segment of the financial system. At a deeper level this was caused by the fact that the assets of a typical firm in this sector had longer maturities than its liabilities in conjunction with the acceleration of inflation. Together with the then-prevailing structure of deposit and loan contracts, inflation led to a faster rise in interest rates on deposits than on loans and to bankruptcies in the S&L sector. Thus, in contrast to the current crisis, inflation was an important contributing factor to the S&L crisis. When finally restored under Volcker, price stability also removed this kind of financial instability. Clearly, during the S&L crisis there were strong synergies between price and financial stability.

The broader conclusion from those two episodes is that, depending on the existing structure of financial contracts and on aggregate developments, price and financial stability may either compete or complement each other. Obviously, when they reinforce each other there is no harm in putting the financial stability objective under the CB responsibility. The harder problem arises when those two objectives compete with each other. In such cases CB concern about financial stability may interfere to some extent with price

stability and even create an inflation bias during times of financial stress.²³ On the other hand, periods of financial stress which necessitate large liquidity injections are not frequent events. Furthermore, during the last twenty years most CBs demonstrated their ability to overcome the well known, employment motivated, Kydland–Prescott (1977), Barro–Gordon (1983) inflation bias. There is therefore reason to believe that they are also capable of overcoming the financial stability motivated inflation bias.

4.2.2. The CB as a macroprudential regulator and supervisor

The CB appears to be the natural institution for monitoring systemic risks and for determining which institutions in the economy induce such risks for the entire economy. Modern central banks possess a broad macroeconomic outlook supported by professional research departments characterized by a broad aggregate outlook on the economy. Due to the complexity of financial markets, it is probably unrealistic to concentrate the regulation and supervision of the entire financial sector under the umbrella of a single institution, and a single regulatory formula may not fit all countries. I believe nonetheless that any future regulatory reform should at least fulfill the following criteria: First, the entire financial system should be regulated and supervised and the limits of responsibility across regulators delineated in ways that eliminate regulatory “holes.” Second, a constant flow of two-way information between regulators should be assured. Third, in any sensible regulatory structure the CB is likely to occupy a central position as a macroprudential regulator, particularly of TBTF institutions.

Devices for reigning in the systemic risks induced by the behavior of TBTF institutions have been discussed in Section 2.3. They include, inter alia, the breakup of such institutions and appropriate up-front taxation of their activities commensurate with the systemic risks that they impose on the economy. Here again the CB appears to be the most suitable institution to evaluate those externalities. It therefore appears efficient that the CB, perhaps with the cooperation of other suitable regulators and a representative of the Treasury, be in charge of setting those additional instruments. It is important to observe that since the regulation of TBTF institutions comes with additional new instruments, its location within the CB does not conflict with the price stability objective.²⁴ Last but not least, the macroprudential regulator should closely monitor the evolution of financial innovations and evaluate their potential implications for systemic stability in real time. With the benefit of hindsight it is clear that, had there been an institution with a clear mandate to perform such a function, the buildup of the subprime crisis would have been detected earlier. Thus, Barth et al. (2009) note that over the period between 2003 and 2006 there was a rapid increase in the proportion of increasingly complex nontraditional mortgages which allowed and encouraged borrowers to postpone the amortization of mortgage debt. They claim that clear-sighted monitoring of information such as this by regulators should have set off the credit extension alarm bell sooner. In the future this kind of information should be reported to the systemic regulator sooner rather than later. Since many financial innovations are likely to be of microeconomic nature, this episode suggests that even when it is the main macroprudential regulator, the CB should cooperate and exchange information with other more specialized regulators.

²² The stance may be more or less expansionary. Although a given stance can be achieved by various combinations of interest rates and of quantitative easing policies, what matters is the degree of monetary stimulus to the economy and to the financial system which I consider as only one instrument.

²³ A formal analysis and demonstration of this point appears in chapter 7 of Cukierman (1992).

²⁴ At the positive level, Klomp and de Haan (2009) present empirical evidence which supports the view that the instrument independence of the central bank is associated with lower levels of financial instability. Masciandaro (2009) proposes a theory that separates circumstances under which politicians tend to vest regulatory authority with the central bank from circumstances under which they prefer to delegate it to one or several other institutions.

4.3. Other long-term implications for central bank policy and independence

Once a crisis sets in, the immediate policy responses described in Section 3 appear to be inevitable or at least a lesser evil. But they create longer-term challenges for monetary policy and the standing of the CB within the public sector. These challenges arise because, when the crisis starts to subside, there is a huge amount of liquidity in the economy and the CB finds itself holding a substantial fraction of private and public debt. This creates two potential problems. One is to identify the shifts in the relative risks of inflation and of financial instability in real time, in order to decide when to start to remove liquidity from the economy and by how much. The objective here should be to maintain monetary policy as near as possible to an optimal trade-off between those two risks.²⁵ Success in achieving this goal depends mainly on the forecasting ability of the monetary authority. Qualitatively, this problem is no different from a similar problem during normal times. However, in the aftermath of a crisis, the public's mood is more volatile and uncertainty about the optimal response, therefore, substantial. This implies that the CB should devote more resources to monitoring the economy and possibly rely on additional indicators for evaluation of the state of the economy and for its mood, particularly within the financial community. This problem may be exacerbated if inflationary pressures develop before a sufficient level of stability has been restored to the financial system.

The second problem concerns the ability of the CB to maintain its independence. As the crisis subsides, it is likely that the substantial increase in public debt required to finance the ongoing US fiscal packages will raise the temptation for government to partly alleviate the debt burden by means of inflation. This will raise, at least implicitly, pressures on the CB to be more lenient on inflation. In addition, the balance sheet of the CB will, very likely, show substantial accumulated losses due to various ongoing rescue packages. If substantial, such accumulated losses are likely to make it more politically difficult for the CB to implement anti-inflationary policies. The experience of CBs that have accumulated large capital losses which led to negative CB capital shows that in such cases, CB independence is often compromised, making it more difficult to take a determined stance against inflation when the state of the economy requires it. Such institutional problems should be addressed sooner rather than later. In particular the political establishment (for example Congress in the US) should be made aware of the importance of recapitalization of the CB, if needed, when the economy returns to normal. With a view to the long run, it would be desirable to implement such recapitalization by means of legislation. But if that turns out not to be politically feasible, a long-term recapitalization agreement between the CB and the Treasury would be a second best. Further discussions of these and related issues appear in Stella (2005) and Cukierman (in press).

4.4. Independence, professionalism and remuneration of regulatory authorities

Since their decisions have non-negligible distributional consequences, regulators are natural candidates for pressures from the financial sector (regulatory capture) as well as from politicians. It is therefore important that, like central banks, all regulators be given an adequate level of legal independence. In view of the potency of pressures and of potential temptations from the private sector, additional safeguards are desirable. Individuals with authority

within the regulatory establishment should be paid well, prohibited from moving to the financial community for some time after serving as regulators and have long enough terms of office. Finally they should be highly qualified professionals in their respective areas with substantial prior experience in the regulated sector. All things being equal, the appointment of individuals who are approaching final retirement age could provide greater assurance that they will not be lured by the temptations offered by the private financial sector.

Effective regulation depends to a great extent on the quality of regulators and on their motivation to do a good job. It bears repeating in this context that attracting suitable individuals requires a level of remuneration that does not deviate too much from income levels in the private financial sector. When the income discrepancy is overly large, able individuals are lured away from the regulatory sector into the sector that is being regulated. Maintaining the income differential between these two sectors below an appropriate threshold can be achieved in two ways. The obvious direct way is to raise the remuneration of regulators. A more roundabout way is to impose limits on remunerations within private financial institutions. Since such limits are currently being considered for institutions that benefited from Federal bailouts, it is worth remembering that such limits also provide the added benefit of attracting able personnel into regulation at more reasonable costs.

5. International dimensions

This section briefly discusses additional international issues regarding regulatory reform and the future conduct of monetary policy. It is based on the presumption that globalization of financial markets is here to stay.

5.1. International aspects of regulatory reform

Due to globalization, the reach of markets transcends that of nation states. Consequently, regulatory reform in one country leads to the creation of tax havens, regulatory arbitrage across borders and a race to the bottom in regulation. A world-wide unified regulatory system would, therefore, be a first best. The main practical impediment to such a solution is that nation states are unlikely to abrogate the privilege to regulate financial activity in their respective jurisdictions. Also, experience shows that a national budget is the most likely source to finance a bailout when the need arises. This yields support to the view that national governments should also retain the ultimate responsibility for setting up their regulatory systems. In addition, due to idiosyncrasies in national financial systems, the optimal modalities of regulation are likely to differ across countries. For all those reasons, cross-border minimization of regulatory arbitrage will have to be achieved by international cooperation rather than by full unification of regulation.

One option is to coordinate the national systems by setting good practice guidelines for regulation and supervision, preventing regulatory competition and – in extreme cases such as tax havens and non-cooperative jurisdictions – having the authority to enforce sanctions. Here central banks and international bodies like the Financial Stability Forum (FSF) and the recently established Financial Stability Board (FSB) can play a useful role. The G20 meeting in April 2009 has engaged on this route (G20, 2009). Although the G20 declaration on strengthening the global financial system opens the way for many useful cooperative initiatives, their ultimate test will be in their worldwide implementation. In addition, the declaration ignores some areas in which future international cooperation may be needed under extreme circumstances. For example, the declaration is silent about the thorny issue of how the costs of rescuing

²⁵ This has been recently dubbed as the "exit strategy."

a worldwide systemically important financial institution of a small country will be allocated across countries, if and when such a course of action is required. It is interesting to note in this context that, as of November 2008, the assets of the two largest Swiss banks (UBS and Credit Suisse) amounted to roughly four and two-and-a-half times Swiss GDP.

Obviously to the extent that they are partly responsible for regulation and supervision, those considerations apply *inter alia* to central banks.

5.1.1. Implications for the European Community and the Euro Area

An important particular case of the previous issue concerns the future of financial regulation in the European Union (EU) and/or the Euro area. Unlike the US that comprises one monetary authority and one fiscal authority, the Euro area (and *a fortiori* the EU) is composed of many national fiscal authorities. If and when a systemically important European financial institution needs to be bailed out, this fragmentation of bailout authority is likely to set in motion dangerous processes for the stability of the European financial system. The absence of one fiscal body may lead to protracted negotiations between the different fiscal authorities about sharing the bailout costs. In the absence of prior agreement about a sharing rule, such negotiations are likely to take time raising concerns about the liquidity and solvency of the entire system within the financial community.²⁶ This may clog financial markets and trigger a financial panic.

Within the Euro area, the ECB can act as a first line of defense (as it did during the current crisis). However, for systemically important financial institutions whose activities are well diversified over the Euro area this may not suffice. In case longer-term bailouts are considered, national governments may object to bailouts conducted by the ECB on the grounds that this involves fiscal decisions and that such decisions should be made by the democratically elected national governments. *Buiter (2009)* points out that the “single passport” policy of the EU allows financial services operators legally established in one member state to provide their services in other member states without further authorization requirements. Since this facilitates cross-border financial operations, the need to bail out a large European financial institution with operations all over the community is likely to arise sooner than later.

Clearly, resolution of such potential problems should be coordinated in advance among member countries rather than *ex post* under the menace of a financial panic. Clear and well publicized principles for sharing the burden of bailouts – if and when they become necessary – are essential. One important by-product of such agreements is that they reduce the likelihood of a financial crisis and the associated drying-up of credit. On the regulatory front a first best would be a unified European system, preferably well coordinated with regulators outside Europe. In the absence of such a system, national regulatory systems should operate under a similar set of conventions and have relatively tighter regulatory and supervisory systems in order to partially compensate for the fragmentation in the fiscal area. A not-mutually exclusive measure would be the establishment of a European bailout tax that would be collected from systemically important European financial institutions by a European-wide organization whose proceeds would be used in case of a bailout. Open questions remain, such as by whom and how should a bailout decision be made?

²⁶ The recent adoption of the recommendations of the *Larosiere Report (2009)* by the EU implies that in case of bailouts, fiscal responsibilities remain decentralized.

5.2. Should central banks dampen exchange rate volatility under extreme circumstances?

As the crisis developed and gathered momentum, volatility on exchange-rate markets increased dramatically, as can be seen from *Fig. 1*. Thus, between February and April 2008 the Euro/US\$ rate climbed from a range of 1.45 to around 1.60. It stayed in this range till the beginning of July when it started a deep descent, culminating at a bottom of around 1.25 at the beginning of November 2008. In December of that year it managed to hit the 1.45 mark again and subsequently briefly revisited the 1.25 range at the end of February 2009. During the last week of May 2009 it was back in the 1.40 range. Some of those fluctuations were caused by unsynchronized changes in the monetary policies of the Fed and of the ECB, and others by frequent shifts between flight to safety and risk appetite. While it may be argued that the first class of factors represent “fundamental” adjustments, it is more difficult to defend this position with respect to the frequent shifts between risk appetite and flight to safety. It is noteworthy that some of those large fluctuations occurred in the vicinity of major financial news, like the rescue of Bear-Stern in March 2008, the downfall of Lehmann Brothers in September of that year, the announcement of the Public-Private Partnership Investment Program (PPIP) for buying toxic assets from banks’ balance sheets in March 2009, and the increase in yields on ten-year US Treasury bills in May 2009.

5.2.1. Direct intervention

It appears that as the crisis intensified so did volatility on foreign-exchange markets. This raises a difficult old question about whether central banks should try to dampen some of this volatility by direct intervention in the market. Although the answer may be positive for small open economies like Chile, Switzerland and Israel, it is less clear for key currencies like the US\$ and the Euro.²⁷ Due to the large volume of trade in such currencies, direct intervention is likely to be ineffective unless the respective central banks agree to cooperate via swap arrangements. As a matter of fact, such arrangements were implemented during the last quarter of 2008 between the Fed and the ECB when the Fed provided dollars to the ECB in order to satisfy a large temporary demand for US\$ in the Euro area.

Should such swap arrangements be utilized during periods of large exchange rate fluctuations due to excessive uncertainty in international capital markets? The answer probably depends on whether the two central banks involved are reasonably confident that sizable exchange rate fluctuations are temporary. If so, intervention is indicated. Otherwise the question remains open.

5.2.2. Synchronization of monetary policy decisions between key currencies

For key currencies like the Euro/US\$ rate, a good part of the volatility during the last three years was due to asynchronization in interest rate (and quantitative easing) decisions between the Fed and the ECB. With the benefit of hindsight it appears that the policies of those two institutions turned out to be strongly correlated, on average, during the last year. But since those decisions were not synchronized on a weekly or even monthly basis, asynchronization of policy actions contributed to high volatility. Some of this volatil-

²⁷ Israel recently implemented a preannounced program of direct intervention designed to moderate the impact of capital inflows on the exchange rate of the shekel. Between early July 2008 and fall 2009 the Bank of Israel has been buying US\$ 100 million per business day on average. Investigation of the economic consequences of sterilized intervention in a small open economy within a DSGE framework appears in *Benes et al. (2009)*.



Fig. 1. The euro/dollar exchange rate, June 2004–March 2010.

ity might have been avoided if the two central banks had put some effort into tighter synchronization of their policy decisions.

Most likely, such an objective is not practical for the agenda of national monetary authorities if economic developments in their respective economic areas are expected to be persistently different. But in years like 2008 and 2009, during which the US and the Euro area were hit by large common shocks to the financial and the real sectors of the economy, it was individually rational for the monetary policies of the two blocks to generally move in the same direction. Under such circumstances an attempt to increase synchronization of policy actions is likely to be beneficial for the following reason: When monetary policy decisions are asynchronized, the forex market overreacts to new information about policy decisions and this raises short-run volatility in the forex market. Morris and Shin (2002) have shown that traders tend to rationally overweight public information relative to the social optimum, implying that this volatility reduces welfare. The public information in this case concerns the highly advertised monetary policy decisions of the two central banks.²⁸

6. Concluding thoughts and open questions

In view of the large costs imposed by various aspects of incomplete regulation that led to the financial crisis, the task of appropriately reforming this system is of paramount importance. The discussion in this paper is based on the premise that globalization is desirable and that it is here to stay. Financial globalization broadens the scope of intermediation, thereby increasing the efficiency of flows between savers and investors. But the same efficient channels quickly transmit the adverse impacts of a crisis across countries. It is therefore important that regulatory and supervisory reform be sufficiently coordinated across countries. The remainder of this closing section is devoted to some conjectures triggered by the evolution of the crisis and open questions.

²⁸ Hence, when the policies of the two CBs move on average in the same direction, synchronization of policy decisions reduces suboptimal short-run volatility.

Can appropriately devised regulation and supervision reduce the probability of a crisis, and if so through which channels? This paper suggests that the answer is yes, and points to several channels. First, by assuring adequate transparency about the valuation of assets, regulation can alleviate mutual suspicions among financial institutions, contribute to the uninhibited flow of funds between them and reduce uncertainty and volatility. In particular, it is quite likely that in the presence of adequate transparency about financial assets, the interbank market would not have dried up as it did during the last quarter of 2008. Second, direct and efficient regulation of all financial institutions and rating agencies would have reduced the leverage buildup and the subsequent bust induced by the unwinding of this leverage. Third, built-in countercyclical measures of the type discussed in Section 2.4 also operate in the same direction through their moderating effect on booms and busts.

The crisis vividly demonstrated the need for a systemic regulator that would produce and disseminate information about macroeconomic risks and regulate TBTF financial institutions. An important issue, currently debated by legislators in the US, concerns the role of the CB as a potential systemic regulator. Although there is room for different institutional regulatory arrangements, I believe it is clear that in any of those the role of the CB as a systemic regulator is central. Section 4 discusses and evaluates current proposals for regulatory reform and the role of the CB and discusses the relation between price and financial stability when the CB plays an important role in assuring the stability of the financial system. It is argued that, depending on the nature of shocks to the financial system, those two objectives may be either complements or substitutes. In the first case there is no harm in charging the CB with financial stability; in the second there is a trade-off between price and financial stability. In such cases additional regulatory instruments should be developed to maintain financial stability in order to leave interest-rate policy free to focus on the price stability objective.

Financial crises usually occur following expansionary periods nurtured by overly optimistic expectations that induce financial institutions and the general public to assume higher risks. When this overoptimism is sufficiently controverted by reality, expectations become overly pessimistic and the boom turns into bust. In the jargon of economists, the first phase is identified as a “bubble”

and the second as the “bursting of the bubble.” A widely accepted tenet of economic theory is that a bubble may develop through the interaction between self-fulfilling expectations and economic developments, when the possible range of paths for those expectations is larger than one. In the presence of opaqueness and a shadow banking system, there are potentially many such self-fulfilling paths, since there are less constraints regarding expectations about feasible outcomes. By imposing tighter constraints on behavior and assuring adequate transparency, regulation is likely to reduce the scope for “wild” self-fulfilling expectations and with it the likelihood of booms and busts associated with bubbles. As a by-product it also reduces the probability of errors on the part of financial institutions, policymakers and the general public. By reducing the magnitude of the positive interaction between expectations and cyclically oriented behavior, built-in countercyclical regulation of financial institutions can also contribute to the reduction of “wild” self-fulfilling expectations.

It would be highly desirable to have a procedure for identifying bubbles *ex ante*. Unfortunately, economists do not possess a clear-cut recipe for distinguishing between a bubble and a healthy expansion based on fundamentals for both conceptual and practical reasons. The conceptual difficulty originates in the observation that (as far as theory is concerned) all expansions are driven by self-fulfilling expectations blurring the distinction between what is a bubble and what is not. One possibility would be to rank self-fulfilling paths as being “more bubbly” if the amplitudes of cycles created through their booms and busts is larger. Even if we accept such a notion, theoretically based indicators for more bubbly paths do not currently exist.²⁹ However, as we have seen above, it is still possible to make statements about the relation between the institutional framework, such as regulation, and the likelihood of a bubble. It is also possible, based on the experience of past crises, to draw inferences about circumstances that increase the likelihood of bubbles.

Acknowledgement

I benefited from useful suggestions of an anonymous referee and of the editor.

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²⁹ But there are some empirically based early warning indicators (Borio and Drehmann, 2009).