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FINANCIAL STABILITY, MONETARY POLICY, BANKING SUPERVISION, AND CENTRAL BANKING

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0 ABSTRACT *The paper gives an overview over issues concerning the role of financial stability concerns for monetary policy and the relation between banking supervision and central banking. Following a brief account of developments in the European Monetary Union since its creation, the systematic treatment contains four parts, first a systematic discussion of how a central bank's operations differ from those of an administrative authority; second, a discussion of how the shift from convertible currencies to paper currencies have affected our understanding of monetary policy and the role of financial stability; third, a discussion of moral hazard in banking and banking supervision as a threat to monetary dominance and to the effective independence of central bank decision making in an environment in which financial stability is an essential precondition for reaching the central bank's macroeconomic objective, e.g. price stability; finally, a discussion of the challenges for institution design and policy, with special attention to developments in the euro area.*

1 FINANCIAL STABILITY AND MONETARY POLICY IN THE EURO AREA: WHERE DO WE COME FROM

Sometime in 1997, when I was on the *conseil d'administration* of the research foundation of the *Banque de France*, I suggested that it might be interesting to promote research on the problems that monetary union would pose for the relation between central banking, which would be supranational, and banking supervision, which would remain national under the home country principle.¹ This proposal was turned down on the grounds that banking supervision and central banking have nothing to do with each other: Central banking and monetary policy are concerned with price stability, banking supervision is concerned with the safety and soundness of banks. Any notion that central banking has to do with financial stability would generate moral hazard. When I pointed to the fact that, in 1990, Mr. Greenspan had found it appropriate to turn monetary policy around in order to avoid a major crisis of

¹ For a detailed account of my concerns, see Hellwig (2007).

US commercial banks, I received the answer that this measure had not harmed price stability.²

On that occasion, and many subsequent ones, I thought that treating the relation between central banking and banking supervision as a non-issue was a way to preempt or defuse any attempts by supranational institutions to challenge the national prerogative in banking. I also thought that this objective could be seen behind the promotion of bank mergers, even mega-mergers, at the national level.³

However, the underlying thinking has been more widespread. The Maastricht Treaty names price stability as the objective of monetary policy and does not say a word about financial stability. In academia, before the crisis, and with some authors even today, there was a view that inflation rates, inflation expectations, and the implied relative intertemporal prices were all that mattered, and no words or modelling efforts were devoted to the role of financial institutions in the monetary system.⁴

For a long time, this thinking was also reflected in the ECB's policy stance, using interest rate policy to deal with price stability concerns and unorthodox measures for dealing with financial stability concerns. If one believes that these issues can really be compartmentalized, this may seem like a clear-cut assignment of different instruments to different policy objectives.

However, one must doubt whether the compartmentalization of issues works as neatly in the real world as in the theory. Whereas inflation fears motivated the ECB to maintain high interest rates well into 2008, and to raise interest rates again in mid-2011, the effect of these interest rates on banks' funding costs may well have contributed to a worsening of the financial crisis, in 2011 as well as 2008.

The crisis of 2011 worked as a catalyst for change. In the summer and fall of that year, worries about the implications of the Greek haircut for bank solvency caused the market funding of European banks to erode. As banks were selling assets to get cash, asset prices declined, imposing further losses on banks, and confidence in the banks eroded even further. The decision of the October summit to allay solvency concerns by imposing stricter equity requirements was initially followed by further deleveraging and further asset price declines. The downward spiral was only stopped when the ECB stepped in with its Long-Term Refinancing Option (LTRO), which provided financial institutions – and markets – with an assurance of reliable and

² On the 1990 crisis, see Bernanke and Lown (1990), Boyd and Gertler (1994).

³ For example, the merger of BNP and Banque Paribas in 2000 was strongly supported by political and regulatory authorities. At the time, the President of the Banque de France suggested that it would be even better if Société Générale were to join in the merger as well. In Germany, in 2004, the Federal Chancellor called for the industry to get their act together and form a "national champion". For a discussion of the risks of such a policy, see Monopolkommission (2004), items 30, 31, and Bundesregierung (2005), items 23 – 25.

⁴ See, for example, Bernanke and Gertler (2001), Svensson (1999), Woodford (2003). For a critique, see White (2007).

cheap bank funding over a substantial period of time. In contrast to the previous compartmentalization of objectives and instruments, the LTRO involved a use of low interest rates for a financial stability objective.

As a means of stopping the crisis of 2011, the LTRO was very successful. Even so, it has been quite controversial. Less controversial perhaps than the Securities Markets Program (SMP) in 2010 and 2011 or the announcement of Outright Monetary Transactions (OMT) in 2012, but the difference has more to do with the legal issues than with the policies themselves. Whereas people who object to the ECB's overall policy stance, or even the ECB's existence, like to attack SMP and OMT on the grounds that they violate the Treaty's prohibition of ECB funding of member state governments, there is no doubt that the LTRO is fully covered by the Treaty. However, I have read many statements from academics, journalists, and even the Deutsche Bundesbank, saying that the dramatic increase in the quantity of high-powered money and the low interest rates that are associated with the LTRO, as well as other policies of the ECB, carry a risk of high future inflation. If this risk has not yet materialized, the reason might be that, as we know from the writings of Milton Friedman, lags in monetary policy are long and variable.⁵

At this point, in May 2014, we are of course worrying about deflation rather than inflation. The objections may therefore seem pointless. They still raise the question of what is the relation of price stability and financial stability. To what extent is there a tradeoff and what conceptual framework should we use to think about such a tradeoff? Is there a need to change the legal norm so as to encompass an objective of financial stability? Or should we take it for granted that the present formulation already encompasses some key elements of financial stability as part of the requirement that the European System of Central Banks (ESCB) should "define and implement monetary policy" (Art. 127 (2) TFEU)?

And then there is the issue of moral hazard. In the discussion that I mentioned in the introductory paragraph, I had emphasized the success of the 1990 turnaround of US monetary policy in preventing a major banking crisis. By lowering short-term interest rates, the Federal Reserve provided commercial banks with the means to rebuild their equity by playing the yield curve, earning record profits one quarter after another for close to four years. However, as they were betting on the Federal Reserve's low-interest rate policy, financial institutions took very risky positions, which is one reason why the slight policy turnaround in 1994, caused substantial turmoil in the US financial system. More generally, we have come to understand that the so-called "Greenspan put", an anticipation that the Federal Reserve would neutralize any adversary developments in the financial sector, contributed to the excessive risk taking of many financial institutions in the years before 2007.

⁵ Bundesbank (2012).

There are substantial reasons to believe that the LTRO benefited not only healthy banks but also banks whose health was doubtful, perhaps even banks that would have been insolvent if they had been forced to uncover their hidden losses. In fact, reliance on ECB support has been most important for those banks that had the weakest equity positions and the greatest difficulties in obtaining market funding. For these banks, borrowing from the ECB at one percent or less and lending to their own governments at four or five percent appears as a wonderful way to avoid default and rebuild equity.⁶

Policies that benefit banks which are actually insolvent violate the principle that solvency problems of banks should be dealt with by governments and central banks should only deal with liquidity problems. In the euro area, a decade ago, the various Memoranda of Understanding (MoU) for how to deal with banks in difficulties provided for a division of tasks according to this principle, with the added provision that liquidity problems of individual institutions should be dealt with by the national central banks, and liquidity problems of the entire system by the ECB.⁷ To the extent that *de facto* insolvent banks benefit from ECB funding, these principles are violated. However, if banking supervision is in the hands of national authorities and these authorities exercise forbearance towards the solvency problems of “their” banks, there is little the ECB can do about it.

The very determination to preserve financial stability as an important element of monetary stability puts the ECB into a position of weakness. Given the knowledge that the ECB will support the system anyway, the pressure on national governments and national supervisors to clean up their banking systems is that much weaker. Some politicians may in fact understand that the very weakness of their banks gives them an indirect access to the printing press. After all, with the LTRO, a large part of the money that banks got from the ECB was lent to the banks’ own governments.⁸

Fear of such moral hazard, on the side of banks and on the side of national governments and national supervisors, seems to have played an important role in the move towards banking union. To be sure, the 2012 decision to create a Single Supervisory Mechanism (SSM) was triggered by the Spanish request for ESM funding to recapitalize Spanish banks and was intended to reduce the moral hazard that ESM involvement might create. However, the ECB supported this move very strongly, presumably because it had wanted to get out of a situation where monetary policy was persistently put under pressure by the weakness of financial institutions, a weakness that national institutions could not or would not resolve. There is a danger of course that, with banking union, the ECB will be drawn ever more deeply into

⁶ According to Acharya and Steffen (2013), the banks that had the weakest equity positions were most active in this “greatest carry trade ever”.

⁷ For a critical discussion of these MoUs, see Hellwig (2007).

⁸ Acharya and Steffen (2013).

responsibility for financial stability and that the straightjacket for monetary policy may become even tighter.

Legal proceedings, before the German Constitutional Court and soon before the European Court of Justice, must also be seen in this context. These proceedings are not just concerned with the question whether OMT violates the prohibition of central bank funding of governments. At a deeper level, they are motivated by the recognition that monetary policy has strong distributive effects, which give rise to worries about governance and moral hazard. In the context of the OMT program, the distributive effects are particularly obvious because the program stipulates selective interventions. However, the issue is more general as we see distributive effects arising also from those cheap central-bank loans under the LTRO. From the perspective of constitutional law in a democracy, governance of decisions that have such distributive effects is a fundamental issue.

In the following, I will give an overview over the different issues that financial-stability concerns raise for monetary policy. I will not be able to settle them, but I hope to provide a comprehensive overview and perhaps a conceptual structure that makes it possible to appreciate what the tradeoffs are. Such a structure is important if one wants to avoid shooting from the hip with partial arguments and recommendations that may end up having unintended, costly, and destructive consequences.

2 REMARKS ON CENTRAL BANKING

I begin with a few remarks on what a central bank actually is and how it differs from other institutions. Political, legal, and academic discussion about the issues sometimes suffers from a lack of attention to institutional and operational detail. To be clear about terminology, even when the central bank is in charge of banking supervision, I use the term “central banking” exclusively for the non-supervisory activities of the institution.

Central Banks Are Banks

In contrast to supervision, central banking is mostly a form of banking rather than a form of administrative authority. Whereas administrative authorities are setting, interpreting and applying statutory rules, most activities of central banks involve transactions on a *quid-pro-quo* basis, such as taking deposits from banks, granting loans to banks, or buying and selling assets in open markets. Conditions for these transactions are set by the central bank but, with one exception, the counterparties participate voluntarily in these transactions and are not forced to do so by *fiat* of the central bank or the government. The exception to this rule is given by minimum reserve requirements that force banks to hold cash or central-bank deposits.

Minimum reserve requirements are a form of administrative rule, but, at this point, they are practically irrelevant in Europe.

The fact that a central bank is a bank has two important consequences: First, no matter how it operates, its operation generates windfalls for its counterparties and possibly further windfalls for the counterparties' counterparties. Second, no matter how the central bank operates, it is subject to risk from its activities.

Windfalls to Counterparties and Moral Hazard from Expectations of Central-Bank Availability Are Unavoidable

Given that transactions are voluntary, any counterparty will usually obtain a surplus from them. A private bank that borrows from the central bank and that invests the money elsewhere is likely to earn a margin. If the bank uses the money for loans, the bank's borrowers may benefit as well. Similarly, an investor who sells a security to the central bank is likely to put the proceeds to a use that he considers better than the security that he sells. If the central bank's intervention causes securities prices to rise, all holders of the securities benefit. If the price increases induce the securities' issuers to expand their supplies of securities, the issuers may also benefit.

Such distributive effects from the central bank's activities arise no matter how the central bank operates. They are not limited to cases where the central bank lends to *de facto* insolvent banks or governments. Nor are they limited to times of crisis.

The question of who will benefit from these distributive effects is therefore unavoidable. As a student, I learnt that open-market interventions involve government bonds, rather than private-issuer shares or bonds because open-market operations involving private-issuer shares or bonds would cause discrimination between issuers and thus distort private markets. Today, the same kind of concern is raised about the effects of selectivity of government bond purchases under OMT.

Selectivity is discriminatory but so is *any* form of open market intervention. The selectivity of OMT is controversial because it collides with the textbook view that open-market operations in private-issuer securities are discriminatory and open-market operations in government bonds are not; moreover, the distributive effects are easy to pinpoint and highly political. However, this textbook view itself is problematic. Even with a single central government, open-market operations in that government's bonds are discriminatory and can be a source of distortions. In the United States, over decades, the use of such open-market operations for the Federal Reserve's interest rate policy enabled the monetization of government debt even without an outright regime of fiscal dominance.

If the central bank avoids open-market operations altogether and relies on lending to banks, one can ask why it is lending to banks and not, for example, to hedge funds,

or one can ask how it selects the banks to which it lends. In the United States, for example, access to the Federal Reserve's discount window has provided commercial banks with a major competitive advantage over investment banks, an advantage that contributed significantly to the pressures on the investment banks, before the crisis and in the crisis.

Moral hazard from central bank intervention and central bank availability, to which I referred in the introduction, is also unavoidable, likely to arise even under the best of circumstances.⁹ If the central bank develops a routine for how to do its business, through open-market purchases or through lending to financial institutions, the private and public counterparties to the central bank's business will form expectations about the future availability of transactions with the central bank and will form their own plans accordingly. They will do the same if they do business with a private partner on a regular basis.¹⁰ The problem of moral hazard from the availability of the central bank must be seen as a problem of degree rather than one of principle.

Therefore the real policy question is *not* how to avoid windfalls to counterparties, selectivity, but how to minimize the distortions from these side-effects of central-bank activity. This question concerns the choice of counterparties, the preconditions that counterparties must satisfy, and the choice of contracts and securities that the central bank engages in. These choices in turn must be seen in relation to the monetary policy problems that the central banks are faced with. For example, the privileged position of banks may be justified by the central role that bank deposits and payments from and to deposits have in the monetary system.¹¹

Risks From Assets Held Are Unavoidable

Turning to the risks of the central bank's activities, such risks have been the basis for criticizing interventions of central banks in the years in the crisis. One example would be the Federal Reserve's buying "toxic" assets, such as mortgage-backed securities or collateralized debt obligations, as a way of freeing financial institutions from the burden of having such dubious assets on their books. Another example would be the ECB and other central banks' loosening of quality standards for the collateral they accept when lending to banks. It is not always possible to distinguish whether a critic is concerned about excessive risk or about excessively low returns because overall prospects depend the prices that central banks pay and the interest rates that they demand, both of which affect expected returns as well as risks. In any case, the

⁹ As discussed by Goodhart (1988), moral hazard on the side of commercial banks has always been a concern for central banks.

¹⁰ In this context, it is worth remembering the systemic effects of the breakdown of wholesale short-term funding markets in September 2008. Many banks had counted on the availability of such funding and were squeezed for liquidity when the implosion of US money market funds in the wake of the Lehman bankruptcy caused these markets to disappear.

¹¹ In the case of selectivity OMT, an important question to ask would be whether the deepening fragmentation of monetary and financial systems that we have seen since 2009 requires monetary policy to be targeted at different subsystems separately.

potential that central banks might end up making substantial losses looms large in the discussion.¹²

However, central banks may end up making substantial losses on *any* assets they hold. This is just as true for the most traditional and conventional of central-bank assets, such as gold or foreign exchange, as well as for the new-fangled assets that figured prominently in the financial crisis. From 1980 to 2001, as the gold price fell from 885 US\$ per ounce to 253 US\$ per ounce, a central bank that held gold would have seen the value of its position cut by more than two thirds. And even if the central bank had held on to the gold until its peak of 1500 US\$, its return since 1980 would have been less than 2 percent per year, nothing like a market compensation for the risks that were involved. Similarly, foreign reserves cause the central bank to make losses if the currency devalues. As the Bundesbank knows from experience, such losses can be particularly large if the reserves have been acquired with a view to avoiding a revaluation but in the end the defense of the old exchange rate was unsuccessful.

The asset portfolios of central banks are typically very different from those of private banks,¹³ but whatever risks the assets involve must be borne by the central bank and its owners just as a private bank and its owners bear the risks of the bank's asset portfolio. Perhaps therefore, the question of what risks are acceptable for a central bank to bear without parliamentary approval, which has figured prominently in the legal dispute about the OMT program, should be seen in parallel with the question of what risks are acceptable for a publicly-owned and state-guaranteed bank to bear without parliamentary approval. An example would be Westdeutsche Landesbank, whose costs to taxpayers on losses since 2005 amount to 18 billion euros, according to the finance minister in charge.¹⁴

Central Bank Debt is Not Really Debt

The central bank does of course differ from other banks because the government¹⁵ has provided it with certain privileges. The central bank has the exclusive right to issue money, and the money that it issues serves as legal tender.¹⁶

¹² See, for example, Bundesverfassungsgericht (2014).

¹³ As discussed by Goodhart (1988), the difference reflects not only the different tasks of the two types of banks but also the realization that, in view of the central bank's funding advantage, there would be serious problems if the central bank was to compete with private banks in their proper domains.

¹⁴ In this context, it is of interest to observe that, in the Land of Nordrhein-Westfalen, the owner of Westdeutsche Landesbank, a parliamentary request for information about the government's involvement in the bank's disastrous investment decision was turned down on the grounds that this information was a "business secret". The German Constitutional Court itself used a similar argument to turn down a request from the parliamentary party Die Linke to obtain information (and parliamentary control) concerning massive real-estate sales by Deutsche Bahn AG, the government-owned railway company.

¹⁵ Unless the distinction is important, I use the term „government“ as referring to both, legislative and executive branches of government.

In a previous era, bank notes were debt instruments that entitled the bearer to receive specified amounts of gold whenever he wishes. Relying on such debt for funding was attractive because, for as long as the notes were in circulation, the issuer could put the funds that he had obtained to some other use. By giving the central bank a monopoly, the government made sure that profits would not be eroded by competition.¹⁷ By making bank notes legal tender, it enhanced the central bank's profitability even more.

Even with a monopoly on note issuance, as long as these notes involve a serious obligation, a central bank faces constraints that are similar to the ones faced by private banks: It must manage its activities and its assets so that it can always fulfil the obligations implied by its debt. If bank notes promised their bearers payments in gold, this meant that the central bank must manage its gold reserves appropriately.¹⁸ Even if bank notes are not convertible into gold, the same kinds of concerns arise if the central bank is committed to maintain a fixed exchange rate with some other currency.

Since the abandonment of the Bretton-Woods system, however, central banks are no longer subject to such concerns. This means that the notes they issue are no longer debt in any meaningful sense of the word. The issue of bank notes does not oblige the central bank to do anything. And the deposit that a private bank might have with the central bank obliges the central bank to give the corresponding amount in notes on demand to the private bank; this is an obligation that the central bank can always fulfil.

Balance sheets of central banks show the central bank's issue of notes and deposits as a liability. However, this is an anachronism, a bookkeeping convention, which hides the fact that the central bank's note issue does not involve any obligation to the acquirers of the notes. If a central bank issues notes or deposits and acquires assets, and if the central bank makes a loss on those assets, there still is no risk that it might default. By the conventional criterion of comparing the value of assets to the value of outstanding debt, a central bank might be deemed to be insolvent but, in contrast to private banks or non-financial firms, this has no practical consequences. The reason

¹⁶ The importance of money being legal tender is stressed by Goodhart (1998). For a critical assessment, see Hayek (1977).

¹⁷ In England before Peel's Bank Act, bank notes were issued by other banks as well as the Bank of England. In other countries, such as the United States or Switzerland, the creation of the central bank replaced a system of competing bank note issuance by private banks.

¹⁸ Goodhart (1988) observes that the conflict between this business need and whatever other objectives central banks were trying to fulfil has been a constant theme in the history of central banking. Eichengreen (1992) explains how the concern for convertibility damaged the ability of central banks to deal with the problem of the Great Depression. He also points out that, with some central banks, this kind of thinking persisted long after the regime change that would have allowed a change of policy stance.

is that the central bank's note issue does not oblige it to do anything and the obligations on deposits can always be fulfilled by issuing notes.

There is an exception that proves the rule. If a central bank borrows foreign currency from another central bank or from private parties, for example in order to support its own banks if they have borrowed in that currency, then there is a genuine risk of default. Under a swap agreement, in 2011, the ECB borrowed dollars from the Federal Reserve in order to support European banks whose dollar funding from money market funds had vanished. If events had taken an even worse turn than they did, at some point, the question might have arisen whether the ECB would be able to repay the Federal Reserve. After all, the ECB cannot create dollars, only euros.

For obligations that are denominated in euros however, there is no risk of default of the central bank. Nor is there necessarily a risk that losses on assets might impose an obligation on taxpayers; such a risk only arises if the central bank is required to have a minimum amount of equity and if equity is calculated in terms of traditional balance sheet conventions, which treat the central bank's note issue as debt even though it imposes no obligation on the central bank.¹⁹

Going beyond legal issues, losses on assets may harm the central bank's credibility and thereby its ability to achieve its policy objectives. If the central bank were to report substantial losses, economic actors might expect it to try to make up for them in some way or other. One way to do so might be to expand its issue of money and invest in assets that earn a positive return. This would be profitable but might also be inflationary. If the central bank wants to maintain the credibility of its anti-inflationary stance, it is therefore well-advised to control the risks that it runs. However, this is a matter of policy rather than the law.

Fiscal Implications of Central Banking Are Unavoidable

Even though the central bank cannot go bankrupt, risks from the central bank's assets can affect taxpayers. Any profits of the central bank that it distributes accrue to its owners. For the owners, any risks in the central bank's investment policy involve a risk to future profit distributions.

As central banks today are owned by governments, this means that profit distributions from central banks go into the governments' budgets.²⁰ If the central bank makes losses on its assets and if, therefore, its profit distribution to the government is reduced, the government must either reduce some expenditures or

¹⁹ The link between potential losses on assets and potential demands on taxpayers is thus much less direct than the German Constitutional Court has surmised. It is also much less direct than in the case of the Landesbanken, which have benefited from explicit unlimited state guarantees and which are subject to a genuine risk of default.

²⁰ As documented in the Appendix to Goodhart (1988), most central banks initially had at least some private shareholders. Some central banks still do so today.

raise taxes (or borrow more, which implies lower expenditures or higher taxes in the future).

Much of the legal discussion about the ECB has focused on the need to keep fiscal policy and monetary policy apart. Do the ECB's policies violate the Treaty because they have implications for government budgets? Unless one goes into details, this discussion is meaningless because monetary policy necessarily has implications for government budgets. This follows directly from the fact that governments have a claim to the profits that the central bank earns and distributes.

Democratic Legitimacy, Fiscal Dominance, and Central Bank Independence

Do the fiscal implications of central banking warrant or even mandate a subordination of central bank policy to the wishes of democratically elected governments? This has been the view of many governments in the past. This view is also implicit in the German Constitutional Court's reference to the need for parliamentary approval of any policies that might carry substantial budgetary risks.

In Germany, of course, the experience with political control over central bank policies has been a reason to make the central bank independent. Twice in the twentieth century, the political authorities have used their influence over central bank behavior to obtain government funding through the printing press. The *seigniorage* from the printing of new money, in addition to whatever returns the central bank might earn, provided them with a way to fund expenditures for armaments and wars by means other than taxes. And twice, the result has been a destruction of the currency and a complete expropriation of the holders of nominal assets.

To be sure, in Germany, the independence of the central bank was imposed from outside, by the Dawes Plan in 1923 and again by the Allies in 1948/1951. However, given the experience of the past, the independence of the Bundesbank has always enjoyed strong support in the population, which was more concerned about inflation than about the question how central bank independence might be compatible with the democratic-legitimacy mandate of the constitution.

In other countries, the view that central bank policy must be subordinated to the political authorities also led to a regime of fiscal dominance whereby the government's funding needs determined the central bank's money creation. Under the Bretton-Woods regime, before 1973, this mechanism was constrained by the need to maintain the exchange rate. After 1973, however, it led to substantial money creation and substantial inflation in many countries. Political authorities everywhere tried to avoid hard choices by using money creation and the "inflation tax" as a way to maintain expenditures that were popular with important clienteles without raising explicit taxes.

The experience of the 1970s and 1980s however showed that fiscal dominance and inflation may harm economic performance, in particular economic growth. The experience of these two decades also showed that central bank independence provides some protection against the harm from fiscal dominance.²¹

From the perspective of economic theory, the issue is simple: The value of *seigniorage* that is obtained by issuing money depends on investors' expectations of inflation, which lowers the real rate of return on this money. The issuer should therefore have an incentive to promise that the value of money will remain stable and will not be diluted by new money creation. However, once the money has been created and "sold", the issuer has an incentive to breach his promise and create yet more money. If the issuer is under the influence of the finance minister, the incentive is likely to be even stronger because, unless the system enters into hyperinflation,²² money creation and the inflation that it induces reduce the real burden of the government's debt, which is denominated in units of money.

Decisions about money creation involve a problem of *time inconsistency*. Because of this problem, decision makers may not want to stick to promises or threats they made previously. If the decision maker is unable to commit his subsequent decisions beforehand, his very sovereignty over subsequent decisions may make him worse off because nobody trusts him. By delegating subsequent decisions to a third party, such as an independent central bank, he loses sovereignty over those decisions, but this very loss of sovereignty may serve as a mechanism of commitment that enables him to benefit from the trust that such commitment induces. The price stability mandate of the Treaty embodies this commitment.

3 FINANCIAL STABILITY AND MONETARY POLICY

From the perspective of history, the Treaty's unique focus on price stability reflects the situation of the early 1990s and the preceding history. One hundred years earlier, this formulation would have been inconceivable. Stability concerns had an important place in the mandates of central banks even then, but they concerned the microeconomics of the note issue, interest rates, or financial stability, rather than the overall macroeconomy. Today's focus on "stability" in terms of the macroeconomy is a product of the twentieth century.

*Stability Mandates Before the Rise of Macroeconomics*²³

²¹ See Grilli et al. (1991), Alesina and Summers (1992).

²² The lag between the collection of taxes and the activities that are being taxed implies that real government revenue is actually reduced if inflation is too high. On this so-called Tanzi effect; see Tanzi (1969)

²³ Most of the discussion in this section is based on the comprehensive historical description and analysis, in Goodhart (1988). Baltensperger (2012) provides details about the origins of central banking in Switzerland.

Central banks have always been political. They have been connected to governments, obtaining public funds as deposits and lending to governments. Moreover, they have worked under government charters and benefited from government-granted privileges such as the monopoly on issuing notes. Sometimes their government gave them explicit stability mandates. The Banque de France, for example, was given the task to stabilize the discount rate.²⁴

Being political, central banks did not behave like private profit-maximizing firms. According to Goodhart (1988), this fact, together with their being close to their governments, contributed to their acquiring a central position in the financial system, including their becoming the banks for other banks. In the course of this development, they came to take on the role of a lender of the last resort, providing the other banks with liquidity at times of stress when market funding mechanisms were breaking down.²⁵ This role came to be enshrined in Bagehot's (1873) famous prescription that central banks should be prepared to lend freely to solvent banks, against good collateral and at penalty rates.

As businesses, however, central banks could not just pursue whatever political mandates they had but needed to take heed of the constraints that markets imposed on them. If the notes you issue are a kind of debt that you must honor, political mandates may not be compatible with the need to avoid default.

From a business perspective, a lender-of-the-last-resort role can actually be good policy. Having the banks that benefit from this role as customers enlarges the funding base. Intervening to maintain financial stability in a time of crisis may help the central bank to avoid losses on its own asset portfolio, as well as provide support for other financial institutions.²⁶ Moreover, if the conditions are as strict as the Bagehot rule suggests, the intervention itself can be profitable.

Such a congruence of the central bank's business interests and stabilization concerns cannot always be expected however. In the past, there were recurrent tensions between political desires for stability and the need to maintain convertibility.²⁷ An example is the famous interest rate mechanism under the gold standard. High interest rates might be problematic for the finance minister, for financial institutions, or for the overall economy, but it might seem necessary to a central bank that is concerned about its gold reserves. This attitude played an

²⁴ Goodhart (1988), 118.

²⁵ Goodhart (1988) argues that purely private solutions to the problem of liquidity provision at times of stress had been hampered by the competitive interests of the participating private banks.

²⁶ Policy discussions about the risks of central bank interventions for the central bank's balance sheet typically neglect the fact that abstention from intervention can also be very risky.

²⁷ Goodhart (1988).

important role in the interwar period and contributed greatly to the depression of the 1930s.²⁸

The Impact of Macroeconomics

The Great Depression of the 1930s had a profound effect on our thinking about the role of central banks. The question whether central banks could have done anything to prevent or to mitigate the disaster arose even as the depression was going on. Subsequently, the question of what is the role of monetary policy became a key concern in the newly developing field of macroeconomics. In this context, the focus was no longer on the behavior central bank as a business in the center of the financial system, but on the role of monetary policy in macroeconomic stabilization.

Such a shift of focus was possible because convertibility of the currency into gold was no longer an issue, and, for the United States at least, where much of the discussion took place, maintenance of the exchange rate under the Bretton-Woods system was not a concern because the dollar was the major reserve currency; maintenance of the exchange rate was an obligation for other countries. Indeed, when Mundell (1962) showed that the obligation to maintain a fixed exchange rate imposed constraints on the central bank that harmed or even eliminated its ability to contribute to macroeconomic stabilization, this finding was seen as an argument against fixed exchange rates and contributed to the momentum of the movement towards flexible exchange rates that culminated in the 1973 abandonment of the Bretton Woods system.

In the second half of the twentieth century, the major debates about monetary policy have all focused on macroeconomics. Is monetary policy or fiscal policy better suited to stabilize or even to permanently increase aggregate demand? Can an inflationary monetary policy be used to permanently reduce unemployment? To what extent is monetary policy influenced by fiscal policy and by the need to monetize government debt, if the central bank wants to prevent “excessive” increases in interest rates? These are the debates of the sixties, seventies and eighties, reflecting the different experiences of the times.²⁹ They are concerned with aggregate economic activity and growth, unemployment, and inflation as ultimate policy objectives but pay little attention to the details of what central banks actually do and how what they do affects those ultimate objectives.

Legal norms like the Humphrey-Hawkins Bill in the United States, with its reference to maximum employment, stable prices and moderate interest rates, reflect this thinking. So does the exclusive focus on price stability in the Bundesbank Law and

²⁸ Eichengreen (1992)

²⁹ The debate on monetary versus fiscal policy may have contributed to the mistaken notion that monetary policy does not have fiscal implications. Concerns about the government budget constraint seem to have been more of a side issue; see, for example, Tobin (1963), Blinder and Solow (1973), Sargent and Wallace (1981).

the Maastricht Treaty; the focus is different but the ultimate policy objective of central bank policy is formulated in abstract terms that are far removed from the microeconomics of what the central bank does.

This is also true of the debates about intermediate targets of monetary policy, interest rates, monetary aggregates, or inflation rates. In these debates as well, the microeconomics of what a central bank does, do not play much of a role nor does the financial sector. Debates about transmission mechanisms get a bit closer but even these debates rarely provide us with a comprehensive picture. Characteristically, the dynamic stochastic general-equilibrium models that nowadays serve for quantitative analysis typically do not have much of a banking sector.³⁰

What is “Money”?

In the macroeconomic debates about monetary policy, there always is a question as to what we should think of as “money” and “monetary policy”. This question played a prominent role in the early debates about the role of monetary policy in the Great Depression. According to one view, which by now is regarded as obsolete, monetary policy in the Great Depression was expansionary but powerless. This view would be based, for example, on the observation that, in the United States, from 1929 to 1933, an increase in the monetary base, i.e. the amount of central-bank money, by some 15 percent could not prevent a decline in nominal income by 53 percent and in real income by 36 percent. Against this view, Friedman and Schwartz (1963) observed that, even as central-bank money rose by 15 percent, what they called the “money stock”, the sum of deposits and currency held by the non-bank sector in the economy, fell by 33 percent. They inferred that monetary policy actually was contractionary and that the monetary contraction was responsible for the economic decline.

As an analytical concept, the concept of the “money stock” is problematic because it mixes elements of central-bank policy, bank behavior, and behavior of non-banks without providing a proper analysis of the different actors interact or how the demand and supply of the different components are determined.³¹ However, this concept provided Friedman and Schwartz with a simple rhetorical device that allowed them to refer to monetary policy as being contractionary when in fact the monetary base was

³⁰ Even those that do fail to take account of the fact that asset markets and bank funding markets operate on another time scale than goods markets and labor markets. Whereas asset markets and bank funding markets operate in real time, goods markets and labor markets, which concern macroeconomic flows rather than stocks, are more usefully analyzed with a periodization of a quarter or a year. On the difficulties of integrating different types of markets in one model and of accommodating the different roles of money in this model, see Hellwig (1993).

³¹ For example, should we think of non-banks as treating currency and deposits as complements or as substitutes? The definition of the money stock M_1 involves the sum of the two, which suggests that they should be seen as substitutes. However, the currency-deposit ratio is treated as a parameter, which suggests that they should be seen as complements!

expanding, albeit not enough to compensate for the effects of banks' and non-banks' increased desires to hold central bank money.

The semantic issue is very much alive today. In the years since 2007, central-banks have very much increased their money issues, but most of these increases just counteracted the contractionary effects that arose from within the economy. For example, in the euro area, the monetary base rose by approximately 100 percent from 2008 to 2013, but monetary aggregates rose by much less, M_3 for example, by about 10 percent, i.e., 2 percent per year, in line with the ECB's inflation target. Observers who focus on the monetary base are convinced that these policies were highly inflationary; observers who focus on M_3 assert the opposite.

Behind the discussion, or lack of discussion, about the semantics of the word "money", there are some important substantive issues. If the ultimate objectives of monetary policy are formulated in terms of variables relating to the overall macroeconomy, which variables provides with reliable indicators of conditions in the monetary system? And to what extent should the assessment of these indicators take account of changes in the financial sector?

The empirical evidence seems fairly clear: Whereas in normal times the monetary base, i.e., the amount of central bank money in the economy is a reliable indicator of monetary developments, this need not be the case in times of change or of turmoil in the financial sector. The historical account of the Great Depression in Friedman and Schwartz (1963) provides one example, the recent experience another. In the euro area, for example, cumulative inflation in the period 2008 – 2013 has been about 10 percent, roughly in line with growth in M_3 – and with the ECB's inflation target.³² On other occasions, when institutional changes that enabled banks to economize on their reserves of central-bank money have caused wider monetary aggregates to grow more quickly than the monetary base, inducing inflation at a higher rate than one might have predicted from the growth of the monetary base.³³

To be sure, such unreliability of indicators due to structural change must be a concern with *any* monetary aggregate. For example, in the 1970s in the United States, behavioral changes leading to private households and firms substituting demand deposits by shares in money market funds or in interest-bearing accounts implied that standard monetary aggregates were under-predicting inflation. However, this just means that monetary policy must be attuned to the overall development of the monetary and financial system, and should not be mechanically tied to any one indicator.

³² At this point, the Bundesbank (2013) which has been warning of inflation, suggests that the jury is still out because lags are long and variable, without however explaining why the monetary base would be more appropriate as an indicator of monetary policy than one of the wider monetary aggregates.

³³ An example is given by the experience of Switzerland in 1988 and 1989 when the introduction of electronic interbank clearing and a change in liquidity requirements enabled banks to significantly reduce their reserves of central-bank money.

The common denominator of these observations is that in any assessment of the likely effect of monetary policy on its ultimate macroeconomic targets the central bank must be aware of changes in the financial sector. A central bank that takes its ultimate policy targets seriously must take this into account. The focus on macroeconomic variables as ultimate objectives of central bank policy is a luxury that was made possible by the elimination of convertibility and by the introduction of flexible exchange rates, but this focus is problematic if it makes us forget about the microeconomics of central banking and the transmission mechanism.

Back to Financial Stability as a Concern of Monetary Policy

At this point, we come back to the financial stability issues that originally did have a prominent place in central banking and were somewhat shoved aside by the rise of macroeconomics, to some extent because they were moot in the decades between the 1930s and the 1970s when there were no financial crises. When Friedman and Schwartz (1963) talk about monetary contraction due to changes in the reserve-holding behavior of banks and in the currency-holding behavior of non-banks, they are really referring to the banking crises during the Great Depression, to their impact on the “money stock” and on the real economy. The behavior changes that Friedman and Schwartz (1963) document can certainly be attributed to banks’ taking precautions against runs and to non-banks’ becoming more suspicious of bank deposits. The latter presumably was a result of non-banks’ seeing many banks go into default, the former a result of banks’ seeing other banks being run upon by anxious depositors.

One may wonder whether the impact on the “money stock” that is discussed in Friedman and Schwartz (1963) properly identifies the transmission mechanism. Bernanke’s (1983) interpretation that bank defaults and closures destroyed the information capital that banks had accumulated in dealing with their loan customers is also plausible. However, the distinction is less important than the common conclusion that bank failures had a strong negative impact on the monetary and financial system in the Great Depression.

The experience of 2007 – 2009 confirms this view. It shows that, despite the more macroeconomic orientation of monetary policy, financial stability concerns remain very relevant for central banking.

Do We Need a Financial Stability Mandate?

Given that financial-stability concerns are often not mentioned in the legal mandates of central banks, we must ask whether they should be mentioned. In practice, in recent years, many interventions supporting financial stability have been undertaken without such a mandate, usually on the grounds these interventions were called for

by the given macroeconomic mandates, for example the maximum employment mandate in the United States or the price stability mandate in the euro area (with the presumption that “price stability” requires a prevention of deflation as well as inflation). A special financial stability mandate might therefore seem unnecessary, and might be seen to contribute to moral hazard from the availability of central-bank support. However, while this approach has worked in practice, it has also contributed to political controversy about central bank policies, especially since the semantics of the terms “money” and “monetary policy” are ambiguous.

Moreover, there is also another side to the question. If central-bank actions supporting financial stability are justified with a view to the central bank’s macroeconomic mandate, actions that endanger financial stability might also be justified with a view to the central bank’s macroeconomic mandate. A central bank that sees its macroeconomic mandate endangered because private banks are very cautious might be tempted to ask the private banks to take more risks. For example, if, at the onset of a recession, private banks are becoming cautious in their lending, a central bank that wants to smooth the recession might put pressure on the private banks to be less cautious.³⁴ If lending in a recession is actually risky, such behavior can contribute to subsequent financial instability, moreover an instability involving problems of bank solvency, not just their liquidity. Similarly, if the central bank has a sense that the private banks’ desire to hold reserves of central-bank money impedes their lending to non-financial firms and indirectly harms the central bank’s macroeconomic mandate, pressures to change this behavior may entail risks for future financial stability, either from the additional lending or from the fact that sources of liquidity other than deposits with the central bank are less reliable.

Regardless of whether the central bank’s macroeconomic mandate is formulated in terms of price stability or in other terms, subsuming financial stability under this mandate is problematic because in some situations the two mandates can be in conflict. An explicit financial stability mandate would lay the conflict open and force the central bank to account for how its policies relate to the two dimensions of stability.

What about Bagehot’s Rule?

We have now come full circle from Bagehot’s analysis of the lender of the last resort to a more macroeconomic focus on price stability, inflation, and in some countries employment, and back to a concern for financial stability, the latter because its importance has been amply experienced and because, without financial stability, there is no hope for macroeconomic stability. What about Bagehot’s rule then? Lend freely to solvent banks, against good collateral and at penalty rates.

³⁴ Episodes of this sort have been reported about the Federal Reserve under Alan Greenspan; see, e.g. Woodward (2000).

Bagehot's rule combines three concerns: First, the central bank should invest prudently in order to avoid risks and losses from its assets as much as possible. Second, the central bank should minimize moral hazard from banks' expectations that they will be bailed out. Third, the central bank should not prevent the closure of insolvent banks.

All three concerns raise the question why the benefits from central bank intervention are not mentioned. All central bank activities involve risks and potential losses, and all activities give rise to moral hazard on the side of actual or potential counterparties. The prescription to lend freely in a liquidity crisis is motivated by the desire to limit the crisis and is presumably justified by the benefits from doing so. Why then do we not see a tradeoff between costs and benefits in the rule?

Putting the question differently: Could it be that, in some crises, it might be appropriate to depart from the rule and to lend even to banks whose solvency is in doubt, even against poor collateral and at low rates? This is of course what central banks have done in the recent crisis.

An example from history may illustrate the point.³⁵ The German banking crisis of 1931 began with a run on Danat Bank, which was greatly exposed to the fallout from the bankruptcy of a large textile company. The Reichsbank continued to lend to them through its discount facility even though it must have been clear that Danat Bank was insolvent and even though the collateral no longer satisfied the Reichsbank's usual criteria. At some point, the Reichsbank had to stop doing so because it hit the limit set by the requirement that 40 percent of its money issue must be covered by gold and foreign exchange. At that point, there was a universal run, and the banks had to be closed. The consequences of the crisis for the overall economy were terrible. Over the six months that followed, the economic depression became much worse.

In this episode, developments after the crisis suggest that it would have been better if the Reichsbank had been able to continue its support of banks. Does that assessment include Danat Bank? Or should the Reichsbank have stopped its support for Danat Bank as soon as the bank's solvency was in doubt? One might argue that, if the Reichsbank had not supported Danat Bank, it would have not have hit the 40 percent limit for the coverage ratio and the peak of the crisis would have been avoided. But that argument merely diverts attention away from the substantive question whether a financial stability mandate, in particular on that is justified by macroeconomic concerns might not justify a departure from Bagehot's rule.

If we base our reasoning on the ultimate macroeconomic objectives, the answer seems clear: If the danger of a crisis is very large, then even a support of banks

³⁵ For accounts of the episode, see Born (1967), Schnabel (2004, 2010). Schnabel emphasizes the moral hazard involved in the large banks' reliance on the Reichsbank's discount facility, which was based on a long tradition of preferential treatment for these banks.

whose solvency is in doubt may be warranted because, in terms of the ultimate objectives, the costs of a default might be too large. Concerns about risks and losses from the central bank's intervention, as well as concerns about moral hazard from the central bank's availability, are very important, but these concerns must be present in *all* central bank decisions and must be treated as a part of the tradeoffs that the central bank is facing.³⁶ As one is taking account of the tradeoffs, the actual decisions will depend on assessments of costs and benefits *in the given situation*, and, if the situation is serious enough, concerns for damage prevention may justifiably outweigh the concerns about moral hazard and credibility.

For the concern that central bank support should not prevent the closure of insolvent banks, the argument is less clear-cut. By preventing the closure of an insolvent bank, the central bank may avert an immediate crisis, but it leaves an important problem unsolved. Banks that are insolvent or that are on the verge of insolvency create problems for the health of the industry and for the overall economy. If they behave defensively, trying to cover up losses on their assets, they are likely to engage in poor lending strategies, wasting resources and harming economic growth.³⁷ If there is excess capacity in the industry, the preservation of insolvent banks keeps the problem alive and may force all banks to pursue excessively risky strategies in order to survive in an intensely competitive environment.³⁸ In either case, a support from the central bank that allows the solvency problems of banks to persist bears significant risks for the longer run, for financial stability and for the ultimate macroeconomic objectives of monetary policy.³⁹

4. MORAL HAZARD AND PRUDENTIAL SUPERVISION

Moral hazard and other forms of malfunctioning in the financial sector should in principle be contained by prudential regulation and supervision. *Ex ante*, prudential supervision should help contain the buildup of risks. *Ex post*, when risks have materialized, the supervisors should help contain the damage. In particular, they should make sure that solvency problems are promptly dealt with.

The Problem of Hidden Insolvencies

³⁶ In this context, it is worth noting that concerns about risks and losses on assets are less of a concern in a paper money regime with flexible exchange rates than in a regime in which the central bank's notes are genuine debt and the central bank itself can be in danger of defaulting.

³⁷ This effect figures prominently in the Japanese crisis of the past two decades. See Hoshi and Kashyap (2004, 2010). Caprio and Klingebiel (1996, 1997) show that quite generally, delays in the resolution of banking problems can be very costly and very damaging.

³⁸ An example of this effect can be found in covered-bond finance after the 2005 change in legal rules in Germany, which facilitates entry. In subsequent years, competition in this segment of the industry was so intense that participants could only survive by engage in extreme maturity transformation for the funding of the excess coverage. Banks like Dexia and Hypo Real Estate, which did not have much of a deposit base, had to do this through wholesale markets and were therefore extremely vulnerable to problems in these markets.

³⁹ For a comprehensive treatment, see ASC (2012).

However, to deal with solvency problems, one must first identify them. This may be difficult because, unlike default, insolvency is a theoretical concept which is difficult to verify in practice. By a standard criterion, a firm is insolvent if the value of its assets is less than the value of its liabilities. If this criterion is met, we infer that, at some point, the firm will not be able to pay its debts, and we conclude that the situation should be remedied right away. Early intervention would avoid further damage that might arise because borrowers facing a prospect of bankruptcy have highly distorted incentives.⁴⁰

But comparing the values of assets and liabilities is anything but clear-cut. What is the value of assets when there are no market prices? For example, what is the value of an assembly line in an automobile factory? As a going concern? In liquidation? And what is the value of a loan in a bank's books? Even if market prices are available, should we take them seriously? Or should we say that these valuations are depressed by panic and fire sales?⁴¹ If Lloyds Bank found it appropriate to sell a portfolio of shipping loans at a 50 percent discount, should we require that all banks apply such a discount to their shipping loans?⁴² Or should we accept the view that the shipping crisis will soon be over and, if these loans are held to maturity, losses will be much smaller?⁴³

In the absence of market prices, valuations require forecasts, and these forecasts involve an element of discretion. Incumbent managers and owners tend to use this discretion to their advantage, claiming that "appropriate" asset values are high, and the firm has no solvency problems. By this procedure, they may keep the firm going until it actually defaults because it no longer has the cash to meet its commitments.

In the case of a bank, default may come quite early because the bank's short-term funding may disappear if creditors are afraid that the bank might be in trouble. The bank's managers may then assert that the bank has only a liquidity problem and appeal for emergency liquidity assistance to overcome this problem, which it claims is just temporary. The central bank must then ask itself how justified such the appeal is. For this purpose, it needs an assessment of what the bank's assets actually are. This is where the supervisors come in.

Forbearance and Procrastination

⁴⁰ For a detailed account of problems from hidden insolvencies, see Admati and Hellwig (2013), Chapter 3.

⁴¹ This was a key issue in the discussions about fair-value accounting in 2008(2009). See IMF (2008).

⁴² Reported by Handelsblatt, April 20, 2013.

⁴³ This was the view of the Hamburg government in 2013, when it asked the legislature to approve an increase in the government's second-loss guarantee for HSH Nordbank from 7 billion to 10 billion euro. For a critique, see Hellwig (2013)

If the bank in question is small and if there is a prospect that the problems can be eliminated without further repercussions, the supervisors are likely to deal with the matter very promptly. A typical example would be a regional bank of moderate size that can be sold to a larger bank, which is happy to use the occasion to expand its deposit base.

The matter is different if the bank in question is important in size, systemic relevance or political influence, and if the supervisor sees no way of dealing with the problem without generating major turmoil. In this case, the supervisor may well join the bank's managers in assessing its assets, e.g., nonperforming loans as being more valuable than they really are. Closing one's eyes to the fact that the creditworthiness of loan customers and collateral values are questionable may be a convenient way to avoid disagreeable and costly interventions. From the perspective of the central bank, which is expected to act as a lender of the last resort, this is a second layer of moral hazard, now at the level of supervisory activity.

There are several reasons for this moral hazard. First, intervention is always costly. If a bank is in serious trouble, dealing with the matter by a recapitalization requires money, and a resolution may bring turmoil to the economy. Moreover, governments and supervisors must deal with public scandal as people ask why the problems have been allowed to arise and why they have not been dealt with before. Kicking the can down the road and hoping for the best may therefore seem like an attractive alternative.

If the banks in question are extremely large or if there are very many of them, the problem may also be too big to handle because the public funds needed to avert the negative fallout from the crisis may exceed the government's fiscal capacity. Thus, when the Swedish government intervened very promptly to clean up the banking system in 1992, it lacked the fiscal capacity to also smooth the recession (which however was short, thanks to the cleanup of the banking sector and to the trade effects of currency devaluation). Limited fiscal capacity has also played a major role in the handling of banking problems in some countries in the euro area since 2010.

Second, banks are political. This is especially true of public banks like the German Landesbanken, whose lending policies are often tailored to the interests of the regional governments that own them. More generally, many political authorities (and their voters) think of banks as institutions that should serve to fund their policies, promoting the government's industrial policy or simply funding the government itself.⁴⁴ In some cases, governments' industrial policies have been focused on the banks themselves, using financial institutions that attract funds from the rest of the world and invest funds in the rest of the world as a tool for creating highly-paying jobs

⁴⁴ For a more detailed discussion, see Chapter 12 in Admati and Hellwig (2013).

very quickly.⁴⁵ With such a policy stance, governments are not likely to engage in active interventions that would force the banks to lay open their losses and either recapitalize or retrench their activities. And the supervisors are likely to be pressured into taking a passive stance towards these banks.

Light-Touch Regulation and Supervision Ex ante

These concerns about supervision are not limited to forbearance *ex post*. Similar concerns arise with respect to supervisory behavior *ex ante*, at a time when the risks are building up. According to a well-known saying, it requires courage to take away the punch bowl while the party is going on. This saying applies to supervision as well as the monetary policy that may have fuelled the buildup.

As a matter of principle, supervisory intervention that puts a brake on new business developments may seem contrary to the principles of a market economy, which require that private-sector institutions be allowed to innovate, which is inherently risky. In some countries, this concern has a legal dimension. If new practices have not been explicitly prohibited, the supervisor may not have the legal authority to do anything about them.⁴⁶

Even if supervisors do have the requisite legal authority, their governments may prevent them from using it. In the years before the financial crisis, “light-touch regulation” was a major selling point by which some countries built up their financial industries. This light-touch regulation contributed significantly to the risky practices that banks in those countries pursued – and also contributed significantly to the problems these countries have experienced in 2008 and subsequently. Even in countries that did not pursue this kind of industrial policy, political concerns for politically important banks seem to have affected supervisory behavior in the years before the crisis, with significant consequences for the extent of damage in the crisis.

Systemic Risk and Macroprudential Supervision

At a deeper level, in the past, supervisory perception of problems *ex ante* has been hampered by the focus on individual institutions that traditional supervision has. Such

⁴⁵ This has been the experience of Iceland, Ireland, and Cyprus. More traditional financial centers, such as the United Kingdom or Switzerland have also seen economic growth fuelled by promoting the financial sector as an export industry but their dependence on this sector has been somewhat less pronounced.

⁴⁶ For example, the German supervisor has claimed that he lacked the legal authority to prohibit the regulated banks’ providing large guarantees of liquidity guarantees to their off-balance-sheet special purpose vehicles that enabled them to hold vast amounts of asset-backed securities and CDOs without equity; by the letter of the law, such guarantees did not come under existing large-exposure rules because their maturities were less than a year; never mind that the assets that needed to be funded had longer maturities.

a focus is natural because regulation and supervision are the activities of an administrative authority, imposing certain requirements on individual financial institutions and monitoring these institutions. However, as one is looking at risks in individual institutions, one may not see the forest for all the trees. Specifically, one may miss the fact that similar exposures at different institutions are creating a risk of a systemic crisis due to a macro shock that affects all institutions simultaneously. One may also overlook the systemic risks that arise from correlations between counterparty credit risks and underlying risks in a complex and highly interconnected system of risk management through derivatives and other hedges. For example, financial institutions and their supervisors seem to have overlooked the fact that, if the credit risks from ABS CDOs were hedged by credit default swaps and if the insurers who provided the hedges had lots of such positions, the underlying credit risks might merely be transformed into the counterparty risk that the insurers might not be able to pay. Needless to say, these counterparty credit risks were highly correlated with the underlying risks.

We may hope that this blind spot will disappear with the further development of macroprudential supervision.⁴⁷ However, macroprudential supervision requires quite a different perspective. Even if one takes that perspective, one may find it difficult to see new systemic risks that are developing as the financial sector is trying out new strategies. Whereas in the 1970s and 1980s, it might have been enough to observe the parallel exposures of different institutions to conventional macro shocks, from interest rates, exchange rates or the macroeconomy, in the 2000s, much of the macro risk was hidden in a complex network of contracts, where individual institutions and their supervisors overlooked the role of correlations discussed in the preceding paragraph. And everybody overlooked the systemic risks from fire sales and asset price declines imposing losses on all banks that were holding the same kinds of assets.

The very distinction between microprudential and macroprudential supervision is a problem. This distinction may be unavoidable because, as mentioned, on the ground, supervision concerns the individual institution, the micro-level. However, if different institutions are subjected to the same regulatory rules and supervisory practices, these rules and practices have a macroprudential and macroeconomic dimension. The distinction between microprudential and macroprudential supervision should not lead us to overlook this macroprudential dimension of microprudential supervision. This is a challenge that, as yet, we have not fully come to terms with. The challenge is made more difficult by the fact that, as different institutions are involved in microprudential and macroprudential supervision, the discussion about semantics is also a discussion about turf.

⁴⁷ Interestingly, the countercyclical provision of the Bank of Spain, which has become the paradigm for macroprudential regulation seems to have been introduced initially for reasons of monetary policy, i.e., fight inflation when entry into the currency union caused interest rates to fall dramatically, rather than prudential concerns.

The Danger for Monetary Dominance

The weakness of financial institutions puts the central bank on the spot. If the central bank takes its monetary policy mandate seriously and if it takes account of the role of financial institutions in the monetary system, it has hardly any alternative to a policy of neutralizing the effects of adverse financial developments, which often means providing support to financial institutions or financial markets. In this situation, the independence of the central bank is undermined, not because of any explicit challenge but because a central bank that takes its mandate seriously finds itself in a straightjacket.

Monetary dominance, a regime in which the other actors take the central bank's policy as given and adapt their behaviors accordingly, is then replaced by what I would like to call *financial dominance*.⁴⁸ By this I mean that central banks take the situation of the financial system as given and adapt their policies accordingly. Sometimes, financial dominance involves a form of hidden fiscal dominance, a situation where the weakness of private banks is due to their having and being pressured into funding their governments and where central-bank support provides these governments with indirect access to the printing press.

In practice, the distinction between financial dominance and hidden fiscal dominance is often moot because the problems in the financial sector and in government finances are linked. In the euro area in recent years, we had both, banking crises that caused sovereign debt crises and sovereign debt crises that caused banking crises. In some countries old-fashioned sovereign debt crises that had been caused by the failures of political systems to set priorities so as to make ends meet spilled over into the financial sector because sovereign default imposes large losses on creditors and sovereigns had used their powers to induce "their" banks into funding them. In other countries, equally old-fashioned banking crises that had been caused by boom-and-bust developments in real-estate markets caused sovereign-debt crises when the fallout from the banking problems exceeded their fiscal capacities.

Under the Memoranda of Understanding (MoU) for how to deal with banks in difficulties that were concluded in the early 2000s, solvency problems of banks in the euro area were to be handled by national governments, liquidity problems of individual institutions by the national central banks, and liquidity problems of the entire system by the ECB.⁴⁹ In a situation where both government finance and the banking system are in trouble, this assignment of responsibilities prevents a cleanup in the financial sector. At the national level, the incentives for forbearance and procrastination that I discussed earlier are then particularly strong. If at the same time national governments and supervisors appreciate that those weak banks' access to

⁴⁸ The term was suggested to me by Hans-Helmut Kotz.

⁴⁹ For a critical discussion, see Hellwig (2007).

central-bank funding enlarges their own funding capacity, there is little that the central bank can do about it.

5 CHALLENGES FOR INSTITUTION DESIGN AND POLICY

Must Supervision Be In the Domain of Central Banks

Institutional arrangements for the relation between central banking and bank supervision have been a subject of debate forever. Goodhart (1988) argues that supervisory functions of the central bank arose naturally from the central bank's role in stabilizing the financial system and, if necessary, acting as a lender of the last resort. The potential for moral hazard on the side of private banks that was thereby induced was recognized early on, and supervision was introduced as a means of containing this moral hazard. However, Goodhart also notes that, in some countries, central banking and supervision have been kept separate from the beginning.

Over time, attitudes to this issue have gone back and forth. The United Kingdom separated central banking and financial supervision in the 1990s and joined them again very recently. In Germany, in 2001 when Bafin was created, the government initially proposed to take all supervisory activities away from the Bundesbank; in 2009, the incoming government proposed to put all supervisory activities into the Bundesbank, but the Bundesbank itself demurred when it realized that this task might threaten its independence. Since the crisis, there has been a trend to putting financial supervision into the central banks though there is no evidence that the scope and effects of the financial crisis were any different in countries where banking supervision was with the central bank and in countries where banking supervision was in the hands of a separate authority.

In the euro area, originally, the fact that central banking is supranational and banking supervision national implied that the two were separate as a matter of course. As we are now moving to a banking union, the ECB will be in charge of the Single Supervisory Mechanism (SSM). As far as I can tell, this is not the result of conscious deliberation, but a consequence of the fact that the Euro Area Summit in June 2012 wanted to avoid a Treaty change, which would have delayed the whole procedure. The SSM was created under the auspices of Art. 127 (6) TFEU. Under this article, the ECB can be given specific tasks in banking supervision by a Council Regulation.

Even though the outcome has been determined, it is worth discussing its merits. The following considerations seem relevant: First, given the importance of financial institutions in the monetary system, the central bank must have the best possible information as to what the state of the financial system actually is. This is an argument for having the two activities in one institution or possibly for having the actual inspections done by both institutions jointly, as is the case with Bafin and the Bundesbank.

Second, to protect the substance of central bank independence, it is important to reduce the scope for moral hazard to erode that independence. As discussed in the preceding section, such moral hazard comes not only from the financial institutions themselves but sometimes also from political authorities. This is an argument for making financial supervisors independent of political authorities, as is done in Art. 19 of Council Regulation (EU) No. 1024/2013, which creates the SSM. If one fears that a separate supervisory authority might also develop its own agenda, it is also an argument for having supervision directly in the central bank.

However, the substance of central bank independence may also be threatened if the central bank is in charge of supervision and is held responsible for any problems that might arise in the financial sector. In this case, the central bank itself might delay the resolution of banking problems, hoping that the problems might disappear on their own if enough time is allowed to pass by. The 1990 turnaround in US monetary policy provides an example, moreover one where a policy of delay and support to the system was successful. However, as mentioned above, delay is not always the best strategy and one must fear that some of the incentive distortions that bias such decisions will affect central bankers as well as separate supervisors. Indeed, the distortions can be larger, if the central banker puts more weight on the immediate macroeconomic and monetary situation and discounts the costs to future financial stability.

These concerns are particularly relevant if the central bank is tempted to use its power over financial institutions to make these institutions take actions that may seem desirable from the central bank's own macroeconomic perspective but are problematic for the institutions' safety. Above, I discussed this problem in the context of what is the relation between the central bank's macroeconomic mandate and financial stability. Even if the central has a financial stability mandate, there is a problem as to how it manages the tradeoff when the two mandates are in conflict. This problem is particularly pronounced if the pressure that the central bank can put on market participants derives not only from its own market power but also from its powers as the administrative authority in charge of supervision.

This brings me back to a point I made in the very beginning. Central banking is a form of banking, not an administrative activity. Supervision is an administrative activity. Putting the two under the same roof raises questions about culture as well as procedure. Administrative activity involves the imposition of statutory authority on individuals and institutions under given legal norms, presumably subject to judicial review.⁵⁰ By contrast, central-bank policies are implemented by market transactions where counterparties are in principle free to decide whether they wish to participate

⁵⁰ Council Regulation (EU) No. 1024/2013 does not seem to say anything on the subject of judicial review of administrative decisions. This may be a problem, especially since much of the supervisory activity takes place under national law implementing the European Directives.

or not. These are two very different modes of procedure. If integration of the two activities is all too complete, it might happen that, by threats or by promises, administrative practices become part of the “exchanges” of the central bank with its counterparties in the financial sector. As shown by the experience of the United States with the “Greenspan put”, such “exchanges” bear the risk of corrupting the governance of both, supervision and monetary policy.

To avoid these risks from having central banking and supervision under the same roof, it is important to develop institutional arrangements and procedures that maintain the requisite separation of administrative activities from central banking activities while making sure that the central-banking side of the institution gets all the information it needs about the state of the financial system. In particular, relations between the supervisor and individual institutions must be immunized against any influence that is based on how well the institution is playing along with the central bank’s monetary policy objectives.

The regulation creating the SSM provides for some such separation. However, the experience with “Chinese Walls” in other institutions suggests that this may be a major challenge. Chinese Walls are not effective just because they are in the rules but because the institution is willing to live by those rules. This is ultimately a problem for the institution’s leadership.

The Elephant in the Room: Resolution

Whereas some of the concerns about moral hazard in supervision that I raised above are related to politics, in particular, national politics, the issue of how to deal with banks in difficulties poses a serious problem and a threat to central-bank independence no matter how supervision is organized. The most careful and most professional supervisor is helpless if there is no practical way of dealing with problem banks.⁵¹ The Lehman experience has made us all very sensitive about this issue. We learnt that “Too Big To Fail” is not a myth: Letting a bank fail can indeed have catastrophic consequences, and can be much costlier than a bailout.

Since the Lehman crisis, authorities worldwide have been torn back and forth between two concerns, on the one hand, the desire to avoid a repetition of the post-Lehman panic, on the other hand, the desire to develop procedures for dealing with problem banks that would avoid the kind of tsunami that we saw in September 2008. In the European Union, Banking Recovery and Resolution Directive (BRRD) and the Single Resolution Mechanism (SRM) are part of this program.

However, I am not convinced that the changes in resolution procedures that we have had are really apt to make resolution viable. Many of the reforms that have been instituted, such as the Dodd-Frank Act in the US or the German Bank Restructuring

⁵¹ ASC (2012), Sapir et al. (2012).

Act of 2010, are likely to prove impractical if we get into another crisis. The BRRD and SRM are hardly better.

I have three main concerns. First, for banks with systemically important operations in different countries, multiple-entry resolution with different procedures in each country where there are legally independent subsidiaries destroys the viability of operating procedures that presume integration. In the case of Lehman Brothers, with integrated cash management, the UK authorities found that there was no cash in the London subsidiary because all cash had gone to New York at the previous close of business. As a result there was no way to even temporarily maintain systemically important functions (market making) in London. I am told that integrate IT systems may pose even more serious problems.

Second, the BRRD and SRM, pay hardly any attention to the need to maintain funding. Any maintenance of systemically important operations requires funding. Market funding, however, is likely to vanish unless creditors are given guarantees that they will not be harmed. In ordinary insolvency law, the problem is solved by giving new creditors priority over pre-insolvency creditors. However, this only works if (i) freezing the old creditors has no dramatic systemic effects and (ii) the need for new funding is small enough for the new funding to be relatively safe if it is given priority. In the case of banks, with enormous amounts of funding from wholesale short-term creditors such as money market funds and with enormous derivatives positions, neither condition is satisfied. As the experience of the Reserve Primary Fund and other money market funds after the Lehman bankruptcy has shown, systemic effects from a freeze of short-term claims can be disastrous, with a run on money market funds forcing these funds to withdraw their own funding of banks and making all participants scramble for cash.

The various resolution and restructuring funds that are being instituted are insufficient to deal with the funding problem. Maintenance of funding requires guarantees on the order of hundreds of billions of euros. These amounts are much larger than the amounts considered for the various European funds. In the United States, the problem is solved by providing the authority with access to loans from the Treasury. In the European context, however, the fiscal backstops that are in place or under consideration are too weak to provide investors with the assurance they will require.

Third, whereas the numbers involved in solvency problems are likely to be much smaller than funding needs, I still have doubts about the scale of the backstops that are in place or under consideration. I also have doubts whether bail-ins will be as effective as is presumed in the new legislation. In the S&L crisis of the 1980s in the United States, the industry was in such difficulties that it could not bear the costs of the crisis; the Federal Savings and Loans Insurance Corporation (FSLIC) became

insolvent and was merged with the FDIC. Out of \$153 billion of losses, in the end, the industry paid \$29 billion and taxpayers \$124 billion.⁵²

This example may be seen as atypical in that most S&L funding in the United States had come from deposits, which were federally insured. Thus there was little room for clawbacks or bail-ins of creditors. One may therefore hope that ultimate losses in bank resolution will be smaller if more creditors are bailed in, i.e., if more creditors are forced to participate in losses as they would have to do if the bank entered a bankruptcy or insolvency procedure. On this point, however, I am not very hopeful, despite the fact that the new legislation contains a “bail-in tool”. The Lehman crisis and the post-Lehman bailouts have created a strong lobby against any creditor liability. Forcing creditors to bear losses, we are told, entails a danger of systemic risks from domino effects, as those creditors themselves may be too weak to absorb those losses, or as the realization that creditor liability must be taken seriously hurts funding conditions of other banks.

Given these concerns about resolution, I fear that the problem of forbearance and procrastination in dealing with banks in difficulties will not be resolved by the SSM and the integration of supervision into the ECB. If such decisions are within the purview of the central bank, they will not be subject to the same distortions as they have been so far. However, they will be subject to different distortions. The reasons may be different, but the temptation to kick the can down the road will be there as long as we do not have a resolution procedure that we can trust.

Of the problems I mentioned, the multiple-entry problem will only be solved if we have an international accord in favor of single entry. However, this would presume an agreement on how to share losses that gives the participating countries sufficient confidence that their interests will not unduly suffer in the procedure. Unfortunately, such an agreement seems far away.

The funding problem can easily be handled by the central bank itself if it has the assurance that any losses will be covered by a fiscal backstop. In the medium run, I believe that banking union will require some Europeanization of fiscal responsibility for banks. This would somewhat defuse the issue of loss sharing in dealing with banks with systemically important operations in different countries, making single-entry resolution more palatable.⁵³ It would also protect the ECB if it were to provide support for funding in resolution.

Most importantly, a Europeanization of fiscal responsibility is necessary for the protection of monetary policy. As long as the assignment of fiscal responsibilities prevents a cleanup of the financial system, the independence of the central bank's monetary policy is undermined by the weakness of the financial sector.

⁵² See Curry and Shibut (2000).

⁵³ Without the US and the UK, this would only be a small step, but one that is nevertheless worthwhile.

Fiscal Responsibility and Independence

In many countries, traditionally, banking supervision has been in the domain of the finance minister. In the euro area, this is now changed because, under the SSM, all supervisory authorities are independent. This independence may give rise to legal controversy in the future.

The previous arrangement could be justified on the grounds that, if banks that are too big, too systemic or otherwise too important to fail, ultimately, the risks of poor banking supervision are borne by the taxpayer, and therefore the finance minister should be in charge. However, if we look at the actual record of how banking supervision was carried out under the authority of finance ministers, a good case to be made for independence. As I discussed above, governments have all too often seen their banks as a source of funds rather than a source of risks, using them as both tools and objects of costly industrial policies without much concern for the potential costs to taxpayers. Moreover, in the monetary union, national political sovereignty over financial supervision induces serious distortions if national politicians expect the costs of their actions to be at least partly borne by the central bank.

As a matter of constitutional law, however, the new arrangement, with independence of supervisory authorities, may be questionable. To be sure, there may not be much of a problem if we take the view that never again will taxpayers be called upon to bail out a failing bank. However, as I discussed above, I do not share this view. Even if I leave the funding problem aside, if solvency problems are large enough and if these problems affect the entire industry, a choice will have to be taken between a bailout with taxpayer money or an intervention that may entail substantial risks for the financial system and the overall economy. One might try to avoid the problem by keeping the affected banks going without doing anything, relying on central-bank funding and hoping for a better future, but then the ugly choices may merely be delayed. Once the ugly choice between a recapitalization at the taxpayers' expense and a systemic crisis has to be taken, the question of how independence of supervisory authorities squares with the risks to taxpayers will be on the agenda again. I consider it all the more important that the assignment of fiscal responsibilities and fiscal capacities be speedily reformed and that this be done in a way that actually works rather than one that is merely proclaimed to work.

6 REFERENCES

Acharya, V.V., and Steffen, S. (2013), "The greatest carry trade ever? Understanding European bank risk", Working paper, New York University and European School of Management and Technology.

Admati, A.R., and Hellwig, M.F. (2013), *The bankers' new clothes: What's wrong with banking and what to do about it*, Princeton University Press, Princeton, N.J.

Alesina, A., and Summers, L. J. (1992), "Central bank independence and macroeconomic performance: Some comparative evidence" *Journal of Money, Credit and Banking* 25 (2), 151 – 162.

ASC (2012), "Forbearance, resolution, and deposit insurance", Report No. 1 of the Advisory Scientific Committee of the European Systemic Risk Board.

Baltensperge, E. (2012), *Der Schweizer Franken: Eine Erfolgsgeschichte*, Verlag Neue Zürcher Zeitung, Zürich.

Bernanke, B.S. (1983), "Nonmonetary effects of the financial crisis in propagation of the Great Depression", *American Economic Review* 73 (3), 257 – 276.

Bernanke, B.S., and Lown, C.S. (1991), "The Credit Crunch", *Brookings Papers on Economic Activity* 22 (2), 205 – 248.

Bernanke, B.S., and Gertler, M. (2001), "Should Central Banks Respond to Movements in Asset Prices?", *American Economic Review* 91 (2), *Papers and Proceedings*, 253-257.

Born, K.-E (1967)., *Die deutsche Bankenkrise*, Piper Verlag.

Boyd, J.H., and Gertler, M. (1994), „The role of large banks in the recent U.S. banking crisis”, *Federal Reserve Bank of Minneapolis Quarterly Review* 18 (1), 2 – 22.

Blinder, A.S., and Solow, R.M. (1973), "Does fiscal policy matter?" *Journal of Public Economics* 2 (4), 319-337

Bundesregierung (2005), *Stellungnahme der Bundesregierung zum Fünfzehnten Hauptgutachten der Monopolkommission 2002/2003*, Bundestagsdrucksache 15/5819. (Response to the 15th Biennial Report of the Monopolies Commission).

Bundesverfassungsgericht (2011), Entscheidung vom 22. November 2011, 2 BvE 3/08.

Bundesverfassungsgericht (2014), Beschluss vom 14. Januar, 2014, 2 BvR 2728/13 u.a., (Decision to ask the European Court of Justice for an assessment of the compatibility of the ECB's OMT program with the Treaty) http://www.bverfg.de/entscheidungen/rs20140114_2bvr272813.html

Caprio, G., and Klingebiel, D. (1996), "Bank insolvencies: Cross-country experiences", Policy Research Working Paper 1620, World Bank, Washington, D.C.

Caprio, G., and Klingebiel, D. (1997), „Bank insolvency: Bad luck, bad policy, or bad banking?", Paper written for the Annual World Bank Conference on Development Economics, April 25 – 26, 1996.

Deutsche Bundesbank (2012), „Stellungnahme gegenüber dem Bundesverfassungsgericht zu den Verfahren mit den Az. 2 BvR 2728/13“, (Statement to the German Constitutional Court in the Proceedings concerning the ECB's OMT program).

Eichengreen, B.J. (1992), *Golden fetters*, Oxford University Press, Oxford, U.K.

Goodhart, C.A.G.(1988), *The evolution of central banks*, MIT Press, Cambridge, MA.

Friedman, M., and Schwartz, A.J. (1963), *A monetary history of the United States 1867 – 1960*, Princeton University Press, Princeton, N.J.

Grilli, V., Masciandaro, D., and Tabellini, G. (1991), "Institutions and policies", *Economic Policy* 6 (13), 341 – 392.

Hayek, F.A. (1977), *The denationalization of money*, Institute for Economic Affairs, London.

Hellwig, M.F. (1993), "The Challenge of Monetary Theory", *European Economic Review* 37, 215 – 242.

Hellwig, M.F. (2007), "Switzerland and Euroland: European Monetary Union, monetary stability and financial stability", in: *The Swiss National Bank 1907 – 2007*, Verlag Neue Zürcher Zeitung, Zürich, 741 – 780.

Hoshi, T., and Kashyap, K. (2004), "Japan's financial crisis and economic stagnation", *Journal of Economic Perspectives* 18 (Winter), 3 -2 6.

Hoshi, T., and Kashyap, K. (2010), "Why did Japan stop growing?", NBER working paper, National Bureau of Economic Research, Cambridge, MA.

International Monetary Fund (2008), *Containing Systemic Risks and Restoring Financial Soundness: Global Financial Stability Report*, April.
<http://www.imf.org/External/Pubs/FT/GFSR/2008/01/index.htm>.

Monopolkommission (2004), *Wettbewerbspolitik im Schatten ‚Nationaler Champions‘: Fünfzehntes Hauptgutachten 2002/2003* (Competition policy in the shadow of 'national champions': Fifteenth Biennial Report), Bunestagsdrucksache 15/3610, also Nomos-Verlag, Baden-Baden 2005.

Sapir, A., Hellwig, M.F., and Pagano, M. (2012), A contribution from the Chair and Vice-Chairs of the Advisory Scientific Committee to the discussion on the European Commission's banking union proposals, Report No. 2 of the Advisory Scientific Committee of the European Systemic Risk Board.

Sargent and Wallace (1981), "Some unpleasant monetarist arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review* 5 (3), 1 -17.

Schnabel, I. (2004). "The German Twin Crisis of 1931" *Journal of Economic History* 64: 822–871.

Schnabel, I. (2009). "The Role of Liquidity and Implicit Guarantees in the German Twin Crisis of 1931." *Journal of International Money and Finance* 28: 1–25.

Svensson (1999), "Inflation targeting as a monetary policy rule", *Journal of Monetary Economics* 43 (3), 607 – 654.

Tobin (1963), "An essay on the principles of debt management", Commission on Money and Credit (ed.), *Fiscal and Debt Management Policies*, Prentice Hall, Englewood Cliffs, N.J.

White (2007), „Is Price Stability Enough?“, in: *The Swiss National Bank 1907 – 2007*., Verlag Neue Zürcher Zeitung, Zürich, 647 – 677.

Woodford, M. (2003), *Interest and prices: Foundations of a theory of monetary policy*, Princeton University Press, Princeton, N.J.

Woodward, B. (2000), *Maestro: Greenspan's Fed and the American Boom*, Simon&Schuster, New York.