

Christian Noyer: Monetary policy – lessons from the crisis

Speech by Mr Christian Noyer, Governor of the Bank of France and Chairman of the Board of Directors of the Bank for International Settlements, at the Bank of France/Deutsche Bundesbank Spring Conference on “Fiscal and Monetary Policy Challenges in the Short and Long Run”, Hamburg, 19 May 2011.

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Ladies and Gentlemen,

It is a great pleasure for me to be here today at this conference, which has provided a lot of stimulating ideas on monetary and fiscal policy frameworks. In my address I will start by briefly discussing some general principles underlying the conduct of monetary policy which have not been altered by the financial crisis, in particular

the absence of a long-run trade-off between inflation and unemployment,
the benefits of low and stable inflation for economic activity.

Central banks, who bear the ultimate responsibility for inflation because of its monetary nature, ought to encode all of these principles into the fabric of monetary policy frameworks.

I will then talk about some of the crucial lessons from the crisis: that macroeconomic stability by itself does not guarantee financial stability and that the very same monetary policy, which successfully delivers inflation and output stability in the short-run, may sow the seeds of future disruption at longer horizons. A key lesson of the crisis is that inflation forecasts at (say) the two-year horizon are not a sufficient statistic for monetary policy, and that a thorough and broad-based analysis of underlying trends in monetary and credit aggregates may help in identifying longer-term risks to price stability. The second lesson of the crisis that I will stress today is that, contrary to the widespread view of the years leading up to the crisis, the zero lower bound of interest rates is not an issue of purely historical interest, and is rather relevant for contemporary policy-making.

I. General principles of monetary policy not altered by the crisis

The financial crisis has not invalidated the general principles underlying the design of monetary policy strategies during the previous two decades.

First and foremost among them is the absence of a long-run trade-off between inflation and unemployment, also known as the “natural rate hypothesis”.¹ Underlying the natural rate hypothesis is the key concept of monetary neutrality: in the long run, the Phillips curve is perfectly vertical, which is another way of expressing Robert Lucas’s famous *dictum* that “*You can’t buy a permanent economic high just by printing money*”.

A **second** key principle of monetary policy, which remains as valid today as before August 2007, pertains to the benefits of keeping inflation low and stable, due to the corrosive impact of inflation on economic activity. Such a consensus – which is today dominant within both academia and the policy-making community – developed in the wake of the major economic disruptions associated with the so-called Great Inflation of the 1970s. This world-wide monetary crisis cemented the contemporary agreement that pursuing price stability ought to be the fundamental goal of monetary policy.

A **third** key principle is a logical consequence of the first two: since inflation reflects, to a large or even dominant extent, the economic agents’ inflation expectations, it follows that in

¹ See Phelps (1968), Friedman (1968), and Lucas (1972a, b).

order to keep inflation under control it is of paramount importance to keep inflation expectations firmly anchored. As I will discuss later on, our success in firmly anchoring Euro area inflation expectations throughout the crisis proved very helpful in allowing us to fight the crisis' contractionary shock. As I will argue, if inflation expectations had not been so firmly anchored, the management of the crisis would have been much more difficult and our policy responses much less effective than they were.

The **fourth** principle of monetary policy not invalidated by the crisis is the ultimate monetary nature of inflation. Over the past two centuries, upswings or downswings in the trend money growth have usually been followed, a few years later, by swings in the same direction in trend inflation.² This relationship has remained significant over the past two centuries, across a variety of different monetary policy regimes and in spite of financial innovation. This naturally suggests that it is "hardwired" into the deep structure of the economy, i.e. that it is structural in nature. In turn, this suggests that by analyzing monetary developments – and in particular, by identifying swings in trend money growth, as well as its components and counterparts – a central bank can implement a more forward-looking monetary policy.

The monetary nature of inflation, and given that money growth at the long-run horizon is ultimately under the control of the central bank, logically leads to a **fifth** key principle: the central bank has ultimate responsibility for inflation. Of course, in the short-run macroeconomic dynamics, and therefore also inflation, are determined to a significant extent by events outside the central bank's control. The last four years provided a forceful reminder with the 2008 shocks in food and energy prices, which led to a temporary hump in Euro area inflation, followed by the large contractionary shock associated with the financial crisis and several months of deflation. These exceptional circumstances brought euro area HICP inflation to 4 per cent in the summer of 2008 and then to –0.6 per cent one year later. However, these large deviations from our definition of prices stability (an annual inflation rate below, but close to, 2%) have been short lived.

In line with the theoretical underpinnings of our monetary policy strategy, at the long-term horizon, the impact of all non-monetary shocks on inflation dissipates, so that inflation comes to be uniquely determined by money supply. It is for these reasons that the central banks bear the ultimate responsibility for inflation.

This leads me directly to the **sixth** and final principle, pertaining to the crucial role played by the institutional framework for the conduct of monetary policy. If central banks are, *de facto*, ultimately responsible for keeping inflation low and stable, such responsibility ought to be clearly enshrined in institutional frameworks for the conduct of monetary policy. In this respect, a key virtue of the Euro area's framework is that it clearly assigns the European Central Bank that primary responsibility.

Let me now turn to the lessons we learned from the crisis.

II. Lessons from the crisis and implications for policymaking

Although the financial crisis did not invalidate the just-discussed general principles underlying the conduct of monetary policy during the pre-crisis years, it nonetheless presented policymakers with several sobering lessons, calling for changes in both the intellectual framework surrounding monetary policy, and specific aspects of policymaking.

² On this see Papademos and Stark (2010), Section 4.

II.1. Macroeconomic stability does not ensure financial stability

The general assumption before the crisis was that the intense wave of financial innovation which had characterized the decade leading up to the crisis had contributed to making the financial system, and therefore the overall economy, more resilient. This resulted from “spreading risk around”, and allowing such risk to be borne by those most able to absorb it. Such an assumption appeared to be validated by the experience of the two decades leading up to the crisis, the so-called “Great Moderation” era, which had been characterized by historically unprecedented decreases in macroeconomic volatility across advanced economies. There was also a broad consensus with regard to the U.S., that, if – due to the bursting of an asset price bubble – financial instability were to threaten to derail economic growth, U.S. monetary policy would have been able to effectively react by means of interest rates cuts, as occurred for example in the U.S. following the 1987 stock market crash and the bursting of the “dotcom bubble” of the second half of the 1990s. This was the so-called “mopping up” approach to dealing with asset price bubbles, which I will discuss in more detail later on.

Of course, there had been a few dissenting voices questioning the dominant optimistic view. Borio and White, in particular, building upon Kindleberger’s classic historical analysis of bubbles and panics,³ had suggested that periods of inflation and output growth stability may sow the seeds of future instability, by engendering in the general public the erroneous notion that a new and much more stable era had been entered, in which the old rules did not apply any longer. In this respect, it is interesting to notice that the Great Moderation period had been characterized not only by large decreases in macroeconomic volatility for both inflation and output growth, but also by a dramatic compression of risk *premia* across several asset classes, which is compatible with the notion that economic agents were indeed regarding the volatility decreases as part of a “new norm” characterized by permanently more stable macroeconomic dynamics.

With the benefit of hindsight – and of the decisive “test” of the respective validity of the different viewpoints provided by the crisis – it is today easy to appreciate the soundness of Borio and White’s position. The Great Moderation years had been characterized, compared with the previous portion of the post-WWII era, by a significantly more frequent occurrence of asset price bubbles and subsequent crashes. A longer-term perspective focusing on the last two centuries even shows that the occurrence of asset price booms and busts under conditions of price stability, far from being a “fluke” of the Great Moderation era, have in fact been historically quite common.

Until the outbreak of World War I, indeed, monetary regimes based on commodity money, such as gold and silver, which had dominated for centuries, guaranteed an extent of price stability which is, by today’s standards, virtually unimaginable. In spite of such remarkable price stability, however, those standards had been recurrently plagued by financial crises and asset price booms and busts. Historical evidence therefore clearly shows that macroeconomic stability – defined as stability in inflation and output growth – does not necessarily imply financial stability. On the contrary, the experience of the years leading up to the crisis, provides evidence of Kindleberger’s thesis that macroeconomic stability does not automatically lead to financial stability, and, on the contrary, that it may well sow the seeds of future financial instability.

Dissenting voices, however, did not have *major* impact on the mainstream view, which remained resolutely optimistic.

I will return to this point in the last part of my speech, when I discuss a further key lesson of the crisis, that is, that we, central bankers, should be more open to dissenting voices.

³ See Kindleberger (2005).

What lessons should we draw from what precedes in terms of policymaking? Although (it is important to stress) we are currently in uncharted waters, and the new monetary framework is being developed as we speak, some issues are already clear. The new framework will feature two objectives – price and financial stability – which, based on standard economic analysis, means that we will need two separate set of instruments to achieve them. Further, based again on standard analysis, the assignment of instruments to objectives ought to be based on the principle of comparative efficiency: monetary policy is the natural instrument for pursuing price stability, whereas macroprudential policies – defined as a set of policies aimed at limiting both excessive credit growth and the build-up of systemic risk within the financial system – will have to take care of preserving financial stability.

II.2. Monetary policy and financial stability

During the years leading up to the crisis, the dominant doctrine was that monetary policy should not attempt to lean against bubbles as they inflate by raising interest rates, and it should rather only “mop up” the consequences of their eventual bursting by cutting rates aggressively. There were three main rationales behind such a position.

First, it was argued, it is impossible for central banks to identify a bubble in real time: if it were possible, markets would have identified it too, and the bubble would not have developed in the first place since central banks have access to the very same information as market participants. To be sure, this argument did not go unchallenged. On the one hand, the notion that estimating the equilibrium level of asset prices in real time is exceedingly complex is belied by the observation that central banks routinely undertake a conceptually similar estimation exercise when they compute potential output, and therefore the output gap. Since, from a strictly conceptual point of view, there is no difference between estimating the equilibrium level of GDP and the equilibrium value of the price of an asset, it logically follows that, given that central banks estimate the former, and use it as a crucial input in their monetary policy decisions, they could well do the same for the latter.

In addition, academic research has questioned the notion that, if the market knew the equilibrium level of a specific asset price, this, in itself, would be sufficient to cause the bubble in that asset to disappear. The logic underlying such an assumption is that if an investor knew with certainty the correct price of an asset which was currently mispriced, or had a reasonably good estimate of such a price, he would have every incentive to take a very large bet on this price, thus “making a killing”, and in the meanwhile contributing to bringing the price back to its equilibrium value. As argued already by Keynes in the 1930’s [and more recently, among others by Shleifer and Vishny],⁴ this logic misses a fundamental aspect of the way markets actually work: to put it in a nutshell, you may be right for longer than you can stay solvent. Even if you are right, consistently betting on that mispricing can drive you out of business if the majority of the other agents keep acting in such a way as to validate such mispricing. As in Keynes’ beauty-contest illustration, what matters for you is not so much to be right about fundamentals as to be right on what others will do.

This position was best expressed just one month before the beginning of the crisis by Chuck Prince, then CEO of Citigroup, when, in an interview with the *Financial Times*, he stated that⁵

“[w]hen the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you’ve got to get up and dance. [...] At some point, the disruptive event will be so significant that instead of liquidity filling in, the liquidity will go the other way.”

⁴ See Shleifer and Vishny (1997).

⁵ See “Citigroup chief stays bullish on buy-outs”, by Michiyo Nakamoto and David Wighton, published in the *Financial Times* of July 9, 2007.

Those words provide the strongest possible refutation of the notion that an asset price being out of line with fundamentals will by itself guarantee that such a misalignment automatically disappears. It is important to stress the *complex interdependence* at the core of the entire mechanism, in which an individual investor's strategy depends not only – as in the standard efficient markets' paradigm – on the discrepancy between the market price and the fundamental price, but also, and crucially, on what other agents are doing. And as is well known, such interdependencies can give rise to markedly sub-optimal outcomes, with the Prisoner's Dilemma being the simplest and best-known.

A **second** rationale for the “mopping up” position was that even if the central bank were able to identify an asset price bubble in real time, monetary policy is simply too blunt an instrument to try to deflate it, especially because bubbles typically affect only a subset of asset markets, whereas monetary policy exerts its impact on the overall economy. This implies that a central bank that wanted to deflate a bubble in (for example) the housing market would risk pushing the economy into a recession. Further, it has been argued that such a risk of “overkilling” is especially serious because, given the very nature of asset bubble dynamics, and the sizeable capital gains typically accruing to those who are “riding” them, the standard interest rate increase of 25, or even 50 basis point would most likely just be shrugged off. To put it differently, a central bank that *truly* wanted to deflate a bubble should be willing to run the risk of inflicting serious damage on the economy, by hiking interest rates by significant amounts. This is a very serious objection, and it is indeed behind the recent drive towards macroprudential instruments and regulation, as opposed to the adoption of “leaning-against-the-wind” monetary policies aimed at countering asset price bubbles exclusively *via* interest rate hikes.

Third, the historical experience of the period since the mid-1980s *appeared* to validate the “mopping up” position: in particular, aggressive rate cuts had succeeded in shielding the U.S. economy from the aftershocks of both the 1987 stock market crash, and the implosion of the dotcom bubble. In the light of the crisis, however, a new view of the experience of the last two decades and a half has gained prominence. According to this view, cutting rates aggressively in the aftermath of the bursting of a bubble (the so-called “Greenspan put” on asset prices) creates a moral-hazard problem by providing investors with a liquidity safety net. In the absence of any additional policy that could react to asset prices, as they gradually recover, over and beyond their effects on future inflation, this moral-hazard problem sows the seeds of the next crisis, raising the risk that the policymaker is induced to inflate bigger and bigger bubbles.

A key lesson of the crisis for policymaking is therefore that, in order to reduce inefficient and disruptive asset-price booms and busts, monetary policy should be complemented by other policies of a macro-prudential nature. Further, recent research has investigated other channels through which monetary policy can contribute to sowing the seeds of future financial instability. Low interest rates, for example, can contribute to the build-up of financial imbalances *via* the so-called “risk-taking” channel.⁶ Simply put, very low interest rates may create incentives for banks to take on more risks. Recent research has provided empirical evidence compatible with such a notion. It has been documented,⁷ for example, how market based measures of bank's risks as perceived by financial market participants tend to react positively to increases in interest rates, so that a lower interest rate leads investors to perceive banks as less risky. By the same token, several papers⁸ have shown that credit standards are correlated with the level of interest rates: lower interest rates, in particular, imply lower credit standards, including to customers who are perceived as representing a

⁶ See Borio and Zhu (2008).

⁷ See Altunbas *et al.* (2010).

⁸ See Jimenez *et al.*, (2008), Ioannidou *et al.* (2008), and Ciccarelli *et al.* (2009).

higher credit risk. On the theoretical side, research done at the *Banque de France*⁹ has shown that, when the regulatory environment is not transparent, a decrease in the level of real interest rate increases banks' risk-taking behavior. A time-honored principle of finance is that, *ceteris paribus*, the only way to increase the expected rate of return is to take more risk, and the result of such search for yield is therefore that banks will increase their risk exposure.

Finally, the recent experience has shown that the costs associated with the bursting of an asset price bubble can be simply staggering, and that monetary policy cannot be reasonably expected to completely shield the economy from the aftershocks. In particular, research spurred by the crisis – pursued, first and foremost, by Reinhart and Rogoff¹⁰ – has shown that, historically, the bursting of asset price bubbles has been associated, most of the time, with deep recessions, slow and drawn-out recoveries, large budget deficits and dramatic build-ups of national debt.

II.3. The (supposedly) encompassing role of inflation forecasts

Let me now turn to a third lesson of the crisis, that is, the *supposedly* encompassing role of inflation forecasts. The dominant presumption among inflation-targeting central banks during the period leading up to the crisis was that the central inflation projection at the desired horizon (typically, two years ahead) represents a *sufficient statistic* for monetary policy, in the specific sense of encoding *all* the information which is relevant for its conduct. This position had two logical corollaries: (i) interest rates should be moved in order to bring the central inflation projection in line with the inflation objective at the desired horizon; and (ii) they should react to asset price movements only to the extent that such movements impact upon the inflation projection at the relevant horizon. An important point to stress is that this presumption was never subscribed to within the Euro area. The European Central Bank, indeed, has always been very clear that its monetary policy decisions are not automatically and exclusively driven by its inflation forecasts. In particular, a close monitoring of money and credit trends – whose impact does not necessarily manifest in the inflation forecast at the two years horizon, but instead informs the assessment of inflation risks at the medium-to-long-term frequencies – plays an important role within its policy process. A key rationale for including a monetary analysis within the Euro area's monetary policy framework has been to “cross-check” the signals coming from the so-called “economic analysis”, which typically pertains to the short-to-medium term, with the longer-term information coming from the evolution of monetary and credit aggregates.

The financial crisis has led to a reassessment of the merits of the Euro area's monetary policy framework, and its reliance on a thorough and broad-based analysis of the evolution of monetary and credit aggregates. As I previously discussed, indeed, long-term historical evidence shows that periods of output and inflation stability have often been associated with the slow but relentless build-up of financial imbalances. A key problem for the traditional position of just focusing on the inflation forecast at (say) the two-year horizon is that typically these bubbles burst only after having built up over several years, but meanwhile, most of the time they do not appreciably impact upon inflation projections.

This logically implies that an exclusive focus on the two-year ahead central inflation projection will cause policymakers to miss the risk of undershooting the inflation objective sometime in the future, possibly by a non-negligible amount. In turn, this implies that the central projection for inflation does *not* represent a sufficient statistic for monetary policy, and that a more sophisticated approach, factoring in the possibility of “tail risks” such as the bursting of a bubble, should be taken into account. A possible way of addressing the problem

⁹ See Dubecq *et al.* (2010).

¹⁰ See Reinhart and Rogoff (2009).

within the traditional forecast-based framework which has been dominant among inflation-targeting central banks is to extend the forecast horizon beyond two years ahead. The risks to the central inflation projection deriving, say, from excessive credit growth and the resulting build-up of an asset price bubble would then be encoded in the probability distribution for inflation at longer horizons. This would allow the central bank to meaningfully discuss the dangers associated with such a build-up, and – assuming that within future policy frameworks monetary authorities will be endowed with macro-prudential instruments – it will allow them to explain to the public the adoption of measures designed to curb credit growth. In essence, this is what the ECB has been doing through its “monetary analysis”, as a key rationale for its close monitoring of money and credit aggregates has precisely been to keep track of the evolution of medium-to-long-term tail risks which simply do not map onto the central projection for inflation.

Let me now turn to another lesson of the crisis, namely the practical relevance of the zero lower bound for monetary policy purposes.

II.4. The zero lower bound is a relevant issue for contemporary monetary policy

For many years before the crisis, the general consensus within both academia and the central banking community had been that the zero lower bound (henceforth, ZLB) and the associated problem of the liquidity trap, in which conventional monetary policy – that is, the one associated with setting short-term interest rates – all but loses its ability to impact upon the economy, were issues of mainly historical interest. Japan’s recent experience with the ZLB, and its difficulty in extricating itself from a liquidity trap situation, presented a troubling counter-argument to this position, but that could be “explained away” as the result of a series of policy mistakes on the part of Japanese policymakers.

As a consequence of the financial crisis, there is, today, a generalized recognition that the ZLB may be a much more significant problem for monetary policy than previously thought. After all, over the last eight decades the world has seen three major episodes, with the associated liquidity traps: the Great Depression, the Japanese experience of the 1990s, and the current crisis. By any standards, three episodes within a period of eighty years cannot be regarded as just an “anomaly” in the functioning of the economy, or as something of only minor relevance.

On the other hand, the experience with non-conventional policies during the crisis offers some reassurance that the problem posed by the ZLB may in practice be manageable, and that policymakers may therefore be able, if similar circumstances were to arise again, to avoid once again the slide into deflation. In this respect, let me stress again that the ability, on the part of central banks, to provide both conventional and unconventional stimulus to the economy has been substantially enhanced by the anchoring of medium to long run inflation expectations at a level consistent with their price-stability objective. The crisis has therefore illustrated the advantage deriving from stable inflation expectations, which increase the effectiveness of monetary policy in the face of large contractionary shocks by transmitting integrally moves in nominal interest rates into moves in real interest rates.

Let me now turn to a final, and separate, lesson of the crisis, pertaining to the necessity of broadening the spectrum of views available to policymakers, and more generally of being more receptive to opinions and positions outside of the “mainstream”.

II.5. The need to broaden the spectrum of views available to policymakers

An interesting example of this necessity can be found in a report, recently released by the *International Monetary Fund*,¹¹ assessing its performance during the years before 2007, and

¹¹ See International Monetary Fund (2011).

in particular its failure to sound alarm bells regarding the impending economic disaster. Among the problems the report identifies, key issues which are discussed are:

“a high degree of groupthink, intellectual capture, a general mindset that a major financial crisis in large advanced economies was unlikely, [and] lack of incentives to [...] raise contrarian views”.

The report also makes clear that some contrarian views raising doubts about the prevailing consensus were indeed present within the IMF – most notably, as I previously discussed, they had been presented by the Fund’s Chief Economist, Raghuram Rajan, in an address at Jackson Hole in 2005 – but that in most cases, they had simply not been included in the final versions of the Fund’s official documents produced for policymakers, and therefore failed to make any dent in the mainstream position, which remained resolutely optimistic.

Although the risks associated with issues such as “groupthink” and “intellectual capture” are always present, they can be countered by broadening the spectrum of views available to policymakers. The latter should always search for logical inconsistencies, problematic assumptions, and inconsistencies with historical evidence pertaining to analogous situations, and present alternative scenarios based on different assumptions and competing analytical frameworks.

It should finally be noted that contrarian views are probably easier to arouse in a decision-making process that does not rest on a single unified analytical framework, such as one that would be used, for instance, to produce the central bank’s inflation projections. In this respect, the ECB’s monetary policy strategy, which aims to pass some robustness checks by making use of various theoretical and empirical approaches, may already provide the Governing Council with a relatively broad spectrum of views about risks to price stability.

III. Conclusion

Let me now conclude. The financial crisis has exposed several shortcomings in the monetary policy frameworks of the pre-crisis era, and more generally in their intellectual foundations. Not only does maintenance of output and inflation stability not automatically deliver financial stability, but on the contrary, the very same monetary policy which successfully keeps output and inflation stable in the short run may well lead to the build-up of financial imbalances and asset price bubbles which threaten macroeconomic stability at longer horizons. Further, commitment to “mopping up” such bubbles by means of aggressive interest rate cuts implemented after their bursting has proved to be most unwise. Moreover, the recent experience demonstrated that such a strategy may well be unable to shield the economy from the costs deriving from the bursting of the bubble, costs which in many cases may simply be staggering. Also, the sheer size of the macroeconomic shock associated with the bursting of the bubble may be sufficient to plunge the economy to the zero lower bound. This is the bad news.

The good news, however, is that, first, many of the principles underlying pre-crisis monetary policy frameworks are still perfectly valid, so that, in a sense, we do not have to “reinvent the wheel”. Second, the adoption of macro-prudential policies aimed at taking care of the build-up of disequilibria in asset markets, or within specific segments of such markets, offers the possibility of effectively tackling the problems which led us to the current predicament.

Thank you for your attention.

References

Altunbas, Y., Gambacorta, L., and Marqués-Ibáñez, D. (2010), “Does Monetary Policy Affect Bank Risk-Taking?”, ECB Working Paper n. 1166, March 2010.

Borio, C., and White, W. (2003), "Wither Monetary and Financial Stability? The Implications of Evolving Policy Regimes", presented at: *Monetary Policy and Uncertainty: Adapting to a Changing Economy*, a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, August 28 – 30, 2003.

Claudio Borio and Haibin Zhu (2008), "Capital Regulation, Risk-Taking, and Monetary Policy: A Missing Link in the Transmission Mechanism?", BIS Working Paper n. 2588, December 2008.

Ciccarelli, M., Maddaloni, A., and Peydró, J.-L. (2009), "Trusting the Bankers: Another Look at the Credit Channel of Monetary Policy", ECB, *mimeo*.

Dubecq, S., Mojon, B., and Ragot, X. (2010), "Fuzzy Capital Requirements, Risk Shifting and the Risk Taking Channel of Monetary Policy", Banque de France, *mimeo*.

Friedman, M. (1968), "The Role of Monetary Policy", *American Economic Review*, 58(1), 1–17.

International Monetary Fund (2011), *IMF Performance in the Run-Up to the Financial and Economic Crisis: IMF Surveillance in 2004–07*, available at <http://www.imf.org>.

Ioannidou, V., Ongena, S., and Peydró, J.-L. (2008), "Monetary Policy, Risk-Taking and Pricing: Evidence from a Quasi-Natural Experiment", ECB, *mimeo*.

Kindleberger, C. (2005), *Manias, Panics, And Crashes: A History Of Financial Crises*, Palgrave Macmillan, 5th edition.

Lowenstein, Roger (2000), *When Genius Failed: The Rise and Fall of Long-Term Capital Management*, Random House.

Lucas, R.E., Jr. (1972a), "Expectations and the Neutrality of Money", *Journal of Economic Theory*, 4, April 1972, 103–24.

Lucas, R.E., Jr. (1972b), "Econometric Testing of the Natural Rate Hypothesis", in Eckstein, O., ed., *The Econometrics of Price Determination*, Board of Governors of the Federal Reserve System, Washington, D.C.

Papademos, L., and Stark, J. (2010), *Enhancing Monetary Analysis*, European Central Bank, Frankfurt-Am-Main.

Phelps, E.S. (1968), "Money-Wage Dynamics and Labor Market Equilibrium", *Journal of Political Economy*, 76 (S4), 678–711.

Rajan, R. (2005), "Has Financial Development Made the World Riskier?", presented at: *The Greenspan Era: Lessons for the Future*, a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, August 25 – 27, 2005.

Rajan, R. (2010), *Fault Lines*, Princeton University Press.

Reinhart, C., and Rogoff, K. (2009), *This Time Is Different*, Princeton University Press.

Shleifer, Andrei, and Robert W. Vishny (1997), "The Limits of Arbitrage", *Journal of Finance*, Vol. LII, No. 1, March 1997, 35–55.