

The Aftermath of the Crisis: Regulation, Supervision and the Role of central Banks

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Introduction

The financial crisis has brought to the fore a number of issues. It has been severe and widespread, and has affected many economies in different and long-lasting ways. Maintaining financial stability has once again become a major concern of policy makers; central banks are being heavily involved in this endeavour. A clear need has emerged for a substantial overhaul in financial regulation and supervision, also considering that the financial system of tomorrow will most likely be rather different from the one that has developed over the last two decades. Scepticism has grown about the role of finance in the economic system, and especially its apparent separation from, if not conflict with, the real economy. We should take stock of what has gone wrong, and in so doing reflect on the way forward, as it is already taking shape, as well as on how to better link our theories to real world developments.

In the decade before the crisis both the size of the financial system and its role and pervasiveness in the economy increased dramatically. The process has only slowed down with the crisis. In the euro area, the overall amount of financial resources collected by the private sector (bank credit, bonds issued domestically and stock market capitalization) rose from 140 per cent of GDP in 1996 to 210 in 2007, to further increase to 240 in 2012. Broadly similar patterns are found for the United States, where the ratio rose from 230 per cent in 1996 to 360 in 2007 and then declined to 310 in 2012, and for the UK, where the ratio increased from 280 to 440 per cent and then remained stable. The total outstanding notional amount of over-the-counter (OTC) and exchange-traded derivatives has risen from less than 100 trillion US dollars at the end of 1998 to around 500 trillion at the end of 2006, 700 at the end of 2007 and still 700 trillion in December 2012.

Financial deepening, by allowing greater diversification of risk and making finance accessible to larger numbers of countries and firms, can be instrumental to broadening economic development. But there is a risk that finance turns into an end in itself, with consequences that can be more damaging as the system becomes more interconnected and the potential for externalities increases.

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At the same time, the interaction between monetary policy and financial stability becomes more relevant as heightened financial complexity amplifies the widespread non-linearities in the dynamics of financial and economic variables and the consequences of interconnections between the financial and the real side of the economy. In these conditions, the risk of systemic crises increases.

The correct conduct of financial business requires competence and good faith on the part of intermediaries, as well as appropriate regulatory, supervisory and policy regimes. The fact that fragilities in the financial system were not properly and timely identified, and that their potential consequences for macroeconomic and price stability were largely underestimated reflects inadequacies in regulation and supervision, as well as in the analytical framework for monetary policy.

The financial crisis has provided two main lessons for policy-makers: first, complexity is not a justification for a light-touch approach to regulation and supervision, quite the contrary; second, financial stability is a precondition for price stability. Two implications, then, have followed suit: on the one hand, a deep and far-reaching reform in financial regulation and supervision was needed (including tighter international cooperation), on the other hand, central banks had to rethink their role and the tools of their trade, specifically concerning the relationship between monetary and macroprudential policies.

“Good” finance as a force for good

Finance has long been viewed as a morally dubious activity. My appeal to authority on this matter is a reference to a lecture delivered by Amartya Sen more than twenty years ago as the first Paolo Baffi Lecture on Money and Finance at the Banca d’Italia. Sen wondered: “How is it possible that an activity that is so useful has been viewed as being morally so dubious?”¹ He recalled a series of historical episodes: Jesus driving the money lenders out of the temple, Solon cancelling debts and prohibiting many types of lending in ancient Greece, Aristotle describing interest as an unnatural and unjustified breeding of money from money.

Superimposed on this “structural” mistrust, one can detect cyclical patterns in the public’s attitude towards finance, affected by the conditions of financial systems and shifts in the political mood about state intervention in the economy. Until the 1970s it was taken for granted that market

¹ A. Sen, *Money and value: on the ethics and economics of finance*, Paolo Baffi Lecture on Money and Finance, Rome, Bank of Italy, 1991, p. 28.

failures required the presence and response of a regulator to avoid suboptimal results. Then came the great inflation of the 1970s, combined with high unemployment, and the emphasis shifted to government failures. Governments, central banks and other regulators were blamed for failing to prevent these developments. This eventually led to an ideological swing: a push to reduce the extent of state intervention. The failures of the “regulated economy,” the pace of technological advance and the rapid expansion of international trade after the end of the Cold War fuelled a protracted process of financial deregulation that was halted only by the financial crisis that broke out in 2007. The latter triggered a move toward re-regulation – or better regulation – that is still under way. The pendulum keeps swinging and will certainly continue to do so.

The global financial crisis, with its huge costs for the whole society, has caused a further deep erosion of the trust in financial institutions. Witness to this are the widespread protests against the financial industry, from the Occupy Wall Street movement to the “Indignados” in Spain and their counterparts in other European countries. Anger has been fuelled not only by the discovery of wrongdoings and perverse incentives, but also by a perceived lack of action against those responsible, in a context of exceptionally high remunerations. The integrity of financial intermediaries’ codes of conduct has been called into question under many dimensions: honesty, the ability to manage financial risks and the commitment to take care of the interests of their clients.

In the first place, public attention was caught by cases of investment fraud, in which Ponzi schemes or other types of malpractice and malfeasance led many people to lose their savings. Feelings were exacerbated by the generous severance packages paid to top managers after distressed financial institutions were rescued with taxpayer money. Dubious practices were found in key junctures of the financial systems, such as credit ratings and interbank reference rates, not to mention the allegations of financial institutions’ involvement in activities related to money laundering and other fraudulent practices.

Most importantly, the crisis has shown that market participants were not capable of mastering the inherent complexity of the system that they themselves had contributed to develop over the course of the last two decades. Favoured by the breakthroughs in information technology and telecommunications, the securitization of banks’ assets expanded considerably, together with the supply of so-called structured financial instruments (ABSs, CDOs, etc.). The traditional model of credit intermediation gave way, especially but not only in the United States, to a system in which loans granted were rapidly transformed into other financial products having these loans as collateral and sold on the market: the so-called originate-to-distribute model (OTD). To the inherent difficulty

of evaluating the quality of loans, these developments added the problem of fully understanding the role of structured finance products.

Structured finance products and the OTD intermediation model can facilitate risk management. The granting of mortgages to households is favoured by the possibility of managing the related interest-rate risk; the internationalization of firms depends crucially on the possibility of hedging foreign exchange risk; and the provision of retirement saving products at low cost over very long time horizons benefits from the ability to mitigate the impact of fluctuations in security prices. With the OTD model, credit risk is not concentrated in the banks' books, but is potentially dispersed among a multitude of investors. By making bank loans tradable, it reduces their illiquidity premium thus decreasing their cost.

However, we now understand that structured finance and OTD intermediation, coupled with lack of transparency, favoured excessive risk taking and opportunistic behaviour. Transactions often took place through scarcely regulated financial intermediaries characterized by high leverage and risk exposure, whose valuation (in which a crucial role was played by rating agencies, without any particular control by regulatory authorities or information providers) was carried out by means of statistical models and often on the basis of incomplete and insufficient data. In many instances complexity was instrumental to opportunistic behaviour fuelled by a distorted system of incentives especially with reference to executive compensation. The high leverage and complexity typical of structured financial instruments allowed them to be used to take high-risk, speculative positions.

Unnecessarily complex and opaque assets were used to prevent a correct assessment of creditworthiness or mask the economic impact of previous transactions, exploiting the ample scope for interpretation allowed by accounting standards. Banks' misuse of these instruments may also be linked to the drying-up of the sources of income from traditional credit business. This may have triggered actions designed to conceal from the market and from supervisors the real object of derivatives transactions.

The bottom line is that financial innovation can allow more efficient allocation of credit risk, but it also entails a number of dangers, some of them intrinsic to its mechanism, others more generally related to the greater interdependence of the financial system. The process of financial consolidation and the OTD model have produced intermediaries that are closely intertwined with the capital markets. This has had some important consequences for financial stability: a more connected world

improves risk diversification and can make markets more resilient, but when contagion is actually set off, an interlinked financial system heightens the risk that it may spread more widely.

But the negative perception of banking and finance should not lead to a blind backlash. As Amartya Sen argued, “finance plays an important part in the prosperity and well-being of nations”.² It is crucial for sharing and allocating risk, especially for poorer societies and people, insofar as risk aversion decreases with wealth. It is crucial for transferring resources over time and removing the liquidity constraints that hamper the economy and the exploitation of ideas. It is very important in promoting economic growth, especially by fostering innovation.

Indeed, we have countless historical examples of good financial innovations. Think, for example, of the “letters of exchange” introduced by Italian merchants in the Middle Ages: they were probably the first fiduciary money, and trade benefited enormously from this financial instrument. More recently, consider the development of “micro-finance” in the 1970s: an innovation that has enhanced financial inclusion, helping poor borrowers to smooth their income and cope with illness or other temporary shocks. And, in the last decades of the past century, recall the role of the “venture capital” industry in the promotion of successful innovative corporations such as Apple, Google or Intel.

Some countries are now increasingly investing in efforts to improve the financial literacy of the public, and this too is important. On the one hand, it helps to build the demand side of a more inclusive finance. On the other, financially literate citizens are better able to understand the efforts of regulators and policy makers to improve supervision and regulation, and less likely to subscribe to the simplistic view that “finance is evil”. But we should realise that – as the case of Bernard Madoff and others in the US and elsewhere clearly show – this is no panacea (Madoff’s customers were surely much better educated than average). Therefore, for purposes of consumer protection in the financial services industry, regulation and good supervision are the necessary complements to education and inclusion.

Complexity was used, somewhat perversely, as an argument in favour of a sort of benign neglect on the part of regulators. The big financial players argued successfully that innovation was too complex and too opaque for the regulators to get their heads around. Indeed, they said, to safeguard the international financial system from systemic risk, the main priority was promoting an “industry-led” effort to improve internal risk management and related systems. This, in a nutshell, was the

² A. Sen, *ibidem*, p. 28.

view espoused by the Group of Thirty report following the outbreak of the Asian crisis.³ But this thesis was often accompanied by the argument to the effect that “you, regulators and supervisors, will always be behind financial innovation; it would be better to allow us, the big financial international players, to self-regulate; we are grown-ups, we can take care of ourselves”. And, after all, “if someone makes mistakes some will gain what others lose; why can’t we be left alone to play this zero-sum game of ours?”

The regulators did not, in fact, have either the ability, or the right incentives to acquire the necessary information to deal with complexity, for two reasons. First, the big financial players are global, and national regulators had powers too narrow to be able to confront them. The difficulties in coordinating the regulators’ actions, in the face of a natural tendency to preserve each one’s particular sphere of influence, was a powerful drag on the ability to rise to the challenge posed by a finance gone global. Second, the phenomenon of regulatory capture was a definite reality. Powerful political and economic influences were at play, and in some cases prevailed.

Accepting the idea that benign neglect was the right course of action was, however, a critical mistake. The global financial crisis has highlighted the limits of the idea that self-regulation and market discipline are sufficient to ensure stable financial systems. Regulation and supervision have to keep pace with developments in the industry. National authorities need to be aware of the risk that their powers become narrow compared to the sphere of influence of the global players; the coordination of supervision across borders and across sectors is a key condition for the stability of the global financial system. More importantly, regulators and supervisors have to pay attention to keeping industry lobbies at due distance.

To a significant extent, the recent crisis also owes to insufficient market discipline (including the role played by credit rating agencies), which failed to reign in (or even counter) in a timely way imprudent behaviour, excessive leverage, or over-borrowing on the part of financial intermediaries (and sovereigns as well). At the same time, monetary policy overlooked the risks for price stability coming from the financial sector. The idea that it is optimal to “mop-up” after a bubble has burst rather than implementing “leaning against the wind” policies, which seemed to have passed the test of the dot-com bubble, led to a long period of excessive monetary accommodation.

³ Group of Thirty, *Global institutions, national supervision and systemic risk*, 1997. See also the article by J. Heimann, with the same title, and comments therein, in the special issue of *Banca Nazionale del Lavoro Quarterly Review* on “Globalization and stable financial markets”, March 1998.

It has now indeed become clear that financial stability is a precondition for price stability and that the “mop-up” approach is not always the best strategy. Notwithstanding huge monetary and fiscal interventions, six years after the burst of the credit-fuelled housing bubble most advanced economies are not yet back on stable growth trajectories. A key lesson of the last decade, also supported by an increasing number of theoretical and empirical analyses, is that too low for too long interest rates can stimulate risk taking and sow the seeds for the next crisis if left unchecked by regulators and markets alike.

All this called for a major effort, at a national but especially at an international level, to adjust and strengthen the regulatory and supervisory financial framework. It has also suggested that central banks should rethink their role and their instruments. This I will attempt to review and assess in what follows. I will also briefly discuss the importance of advances in our analytical understanding of the workings of financial markets and of its deviations from the stationarity assumption.

In search of a better regulatory and supervisory regime

Over the last few years the crisis has heightened appreciation of the benefits of a more stringent regulatory regime. At an international level, under the political impulse of the G-20, the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) have introduced substantial regulatory changes to reduce the frequency of financial crises and increase the resilience of economic systems. Much has been achieved.

The quantity and quality of capital that banks need to hold has been significantly enhanced to ensure that they operate on a safe and sound basis. Minimum capital requirements have been raised. The improvement in the quality of capital aims to ensure that banks are better able to absorb losses on both a going concern and a gone concern basis. The risk coverage has been increased, in particular for trading activities, securitisations and exposures related to off-balance sheet vehicles and arising from derivatives. An internationally harmonised minimum leverage ratio is going to be introduced, to serve as a backstop to the risk-based capital measure and to contain the build-up of excessive leverage in the system.

The BCBS has also introduced international standards for bank liquidity and funding, designed to promote the resilience of banks to liquidity shocks. A minimum requirement for the ratio between high quality liquid assets and net liquidity outflows that banks would face over a one-month horizon in stress conditions (Liquidity Coverage Ratio – LCR) will soon be adopted. The minimum LCR

will increase gradually in the coming years, so as to ensure that the new liquidity standard will not hinder the ability of the global banking system to finance the recovery.

At the behest of the G-20, the FSB has promoted initiatives to strengthen the regulation of the OTC derivatives market. The aim is to reinforce market infrastructures, in order to minimise contagion and spill-over effects among players that have become more and more interconnected. These initiatives will increase transparency through requirements to trade on organised platforms and to report transactions to trade repositories. They will also reduce and allow more systematic control of cross-exposures between financial firms in this market, by ensuring that central counterparties are placed between the two participants in standardised transactions and by setting minimum capital and margining requirements.

But further progress is needed in important areas. Work should focus on internal risk control arrangements and disincentives to excessive risk-taking, on the rapid implementation of the set of policies developed to address systemic risks from shadow banking, on reducing market participants' mechanistic reliance on credit rating agencies, on increasing transparency, including by completing international convergence of accounting standards. Board members and senior managers should possess a thorough understanding of the financial firms' overall operational structure and risks.

It is also fundamental that supervisors regularly assess banks' corporate governance policies and practices. Compensation policies need to be revised, in order to better align remuneration with risk-adjusted long-term performance and avoid excessive risk-taking and short-termism. In particular, when designing compensation policies, banks should take into account a number of issues: the variable portion of the compensation of risk takers must be paid on the basis of individual, business-unit and firm-wide measures that adequately assess risk-adjusted performance; bonuses must reward the achievement of stable earnings, not simply the fruit of extraordinary operations; executives' severance packages too must be clearly and effectively bound to the results attained, and reflect a more general evaluation of the manager's performance; compensation must be deferred long enough to validate the true quality of management.

The debate that has started with the so-called Volcker rule on the organizational structure of banks and the need to separate traditional credit business from activity in the financial field has been reinvigorated at a European level by the reports of the Vickers Commission in the United Kingdom and the Liikanen Group for the whole European Union. Both the Volcker rule and these reports call for a much needed discussion around business size and complexity in the financial sector; the

experience of the crisis has indeed shown that we should not be shy to thoroughly re-assess relative merits and costs of both (size and complexity). These reports trace out possible lines of intervention. Protecting retail deposits and taxpayers' money from the risks implicit in trading activities (what used to be called "speculation") – the rationale behind these proposals – is crucial. The experience of the crisis has shown that, even if no specific business model has performed particularly well or poorly, the banks' organizational structure has an impact on the propensity of managers to engage in excessively risky activities.

At all events, in today's globalized world it is crucial to make sure that countries cooperate and agree on the appropriate stringency of financial regulation. Countries should not compete by relaxing rules in order to attract financial business, as this generates negative externalities for other countries. This is a most delicate issue, and while a perfectly level playing field may not be achievable, we have to be conscious of the consequences of a "beggar-thy-neighbour" approach to regulation. The transition to a uniform system of rules and oversight of the financial sector must be hastened. In the euro area the plan for a banking union is ambitious; it goes in the right direction.

Some progress has been made on the convergence towards a single set of global accounting standards; but much remains to be done. The International Accounting Standards Board and the US Financial Accounting Standards Board expect to make progress on the two key outstanding issues of impairment of loans, where their deliberations should be completed in the next months, and insurance contracts, where both Boards are holding public consultations. Of these two outstanding issues, the need for convergence on a new forward-looking expected loss approach to provisioning is of most immediate concern for end-users and from a financial stability perspective.

One element that is essential for guaranteeing systemic stability is the method of measuring risk-weighted assets (RWA), the denominator of capital adequacy ratios. RWA measures have recently attracted increasing attention from market analysts, banks and supervisory authorities. It has been argued – and this seems to be actually the case – that the methodologies for computing RWAs may not be comparable across institutions and, especially, across jurisdictions, and that they should more properly reflect risk in order to avoid ultimately jeopardising financial stability. These problems highlight the relevance of supervisory practices in determining banks' capital requirements (for example, in validating internal banks' models for calculating risk weights). Here, rigorous micro-prudential supervision is essential. We really need to work out a single rulebook, to move with determination towards taking joint responsibility and using peer reviews as much as possible in our

supervisory activity. Overcoming differences in accounting and supervisory practices is proving a major challenge on the way to the banking union in the euro area.

As for the initiatives to strengthen the regulation of the OTC derivatives market, these complex reforms are taking somewhat longer than originally planned. It is therefore necessary to pick up the pace, overcoming the difficulties of implementation and the industry's resistance. Authorities must make all efforts to remove the uncertainties arising when transactions involve a cross-border dimension, which is a recurrent condition in a global market. This is necessary to pre-empt regulatory arbitrage and, ultimately, to achieve the G20 objectives. Work is also in progress on other relevant issues at an international level (capital requirements for exposures to central counterparties, margining standards for non-centrally cleared transactions, as well as on authorities' access to trade repository data) and at a regional and national level.

It will be crucial to ensure that stricter regulation and supervision of banks will not push bank-like activities and risks towards non – or less – regulated institutions (the so-called “shadow banking” sector). Let us not forget that the financial crisis originated in the US securitization market, largely populated by unregulated or scantily regulated operators. While we have to address bank-like risks to financial stability emerging from outside the regular banking system, the approach should be proportionate, focussed on those activities that are material to the system, using as a starting point those that were a source of risk during the crisis. The FSB has released a final set of recommendations in August 2013.⁴ One should bear in mind, however, that the new recommendations will be able to address the specific risks that arose during the crisis, and we all recognise the ability of the shadow banking sector to innovate.

Although new regulations on systemically important financial institutions have recently been approved, the “too-big-to-fail” issue is still a major concern, and it merits strict monitoring. Systemically important financial institutions (SIFIs) are being identified in different sectors, and three types of measures will be applied to sharply reduce the threat that their failure poses to the wider system. First, legal and operational regimes will be changed to enable all financial institutions, including those operating across borders, to be resolved safely and without taxpayer loss if they fail. Second, requirements that SIFIs have higher loss absorption capacity will be introduced. Third, supervisory oversight (including sharing of risk data) will be stepped up to reflect the additional complexity of these institutions and the systemic risks they pose.

⁴ http://www.financialstabilityboard.org/publications/r_130829b.pdf.

Negative externalities associated with banks' behaviour (especially for large, interconnected financial firms) must be taken into account. A broad consensus has emerged on the idea that "macroprudential" policies directed towards preserving financial stability should limit systemic risk by addressing both the cross-sectional dimension of the financial system, with the aim of strengthening its resilience to adverse real or financial shocks, and its temporal dimension, to contain the accumulation of risk over the business or financial cycle.

Finally, even after the completion of the regulatory overhaul, it would be foolish to pretend that defaults can always be avoided. They may be the result of imprudent behaviour or of fraudulent operations. We need to be prepared for their occurrence, as the costs of public support tend to be very high. In Europe, according to the latest data gathered by the European Commission, the outstanding amount of public recapitalizations as of December 2012 came to 0.3 per cent of GDP in France, 1.8 in Germany, 5.5 in Spain, 4.2 in the UK, 4.3 in Belgium, 5.1 per cent in the Netherlands, and 40 per cent in Ireland. For Spain and Ireland these amounts are at their highest since 2008, in the other countries they are lower than the peaks reached in 2009. For the Spanish banks, a programme of recapitalization using European funds of up to €100 billion was authorized in July 2012, of which €41 billion (3.9 per cent of GDP) has already been disbursed. In Italy, taking also into consideration the additional public support provided to Banca Monte dei Paschi di Siena, public recapitalizations currently amount to 0.2 per cent of GDP. These figures indicate that the ongoing work on resolution regimes is very important in this regard, and rapid progress should definitely be made. This is particularly relevant in the euro area, where the new single supervisory mechanism (the SSM) is being implemented.

Observations on the analytical implications of economic and financial instability

Economic systems constantly evolve and transform. Changes in institutional arrangements, technological innovation and revisions in economic policy paradigms continuously reshape the framework in which economic agents (consumers and businesses) make their decisions. This in turn leads to changes in economic agents' behavioural patterns. When there is marked discontinuity with the past, such changes may be far-reaching and the past fails to provide enough guidance for the present (never mind the future). We should always remember that the financial system is part of a richer social, economic and political environment. The real world is subject to shocks that at times may have dramatic consequences, such as those that we have experienced in the last twenty years or so, with the end of the cold war, globalization and the sudden emergence of new major economic actors, the ICT revolution, and substantial (not completely anticipated) demographic changes.

However, a stationarity assumption of sorts underpins our theoretical and statistical models, in the case of economic forecasting and (macro) policy making as well as in the case of financial analysis and risk management. In general, the basic tenet is that future outcomes will be drawn from the same population that generated past outcomes, so that the time average of future outcomes cannot be persistently different from averages calculated from past observations, and future events can be predicted with a certain degree of statistical accuracy. In non-ergodic environments, on the contrary, at least some economic processes are such that expectations based on past probability distribution functions can differ persistently from the time averages that will be generated as the future unfolds.⁵ In case of acute uncertainty, no analysis of past data can provide reliable signals regarding future prospects.

The challenges posed by the non-ergodic nature of economic systems may be met by recognizing that our models are by necessity “local” approximations of very complex economic and financial developments. One needs to be modest, using theory and empirical models as starting points for, not straightjackets in, our decision making. And perhaps not enough attention has been paid by the financial community to the need for establishing institutional and behavioural norms to reign on patterns of instability and developing proper learning devices to deal with major shocks and regime changes.

These challenges are compounded by another general characteristic of the quantitative analysis of economic phenomena: the difficulty of running parallel worlds, i.e. producing data through experiments designed and controlled by the researcher. Even when economic forces do follow repetitive patterns, it may not be easy to spot empirical regularities, because contingencies – especially the exceptional ones – cannot be re-created at will, in the laboratory, for cognitive purposes. Our experience will always be limited, partial and episodic. These aspects are not always taken into account in economics or finance. As Charles Kindleberger noticed: “For historians each event is unique. Economics, however, maintains that forces in society and nature behave in repetitive ways”.⁶

Why is it that the parameters and laws governing economic systems tend to change over time? A distinction can be made between exogenous uncertainty, when an individual’s actions do not affect

⁵ P. Davidson, “Is probability theory relevant for uncertainty? A Post Keynesian perspective”, *Journal of Economic Perspectives*, 5, 1, 1991.

⁶ C. P. Kindleberger, *Manias, panics and crashes: a history of financial crises*, New York: Basic Books, 1989, p. 14.

the probability of an event occurring, and endogenous (or behavioural) uncertainty, when they do.⁷ In economic systems, this second type of uncertainty can be particularly important. This has not been sufficiently recognized, I believe, in the way (applied) macroeconomics and finance have evolved since the 1980s, with the ascendancy of the rational expectations revolution in the former and the efficient market hypothesis in the latter.

In macroeconomics this may have led to placing too much faith in the ability of dynamic stochastic general equilibrium (DSGE) models to represent or sufficiently approximate the real world on which economic policy is applied. These fundamentally linear models are the result of the intertemporal optimization by representative agents of objective functions under conditions of uncertainty, given technological and budget constraints and the “rationality” of their expectations (i.e. perfect foresight barring a random error). Indeed, going beyond the assumption that society and nature always behave uniformly and consistently over time has deep implications in policy making as well. This can be easily seen in monetary policy, where no mechanistic use of forecasting models can be made if one allows for the possibility of structural changes.⁸

An important lesson of the financial crisis – one that is generating substantial research activity – is that the interactions and feedbacks between the real and the financial sectors and the non-linearities that emerge especially during crises are not adequately captured by the available models. Many of the effects associated with financial and asset price imbalances are likely to be highly non-linear and complex. The reaction of monetary policy should then also be non-linear and it should respond to asset price misalignments and financial imbalances. When the probability of a crisis becomes non-trivial, the interest rate path towards ensuring monetary stability might be different than in ordinary circumstances. These aspects were not well captured in the empirical models used to support monetary policy decisions, something understood but perhaps not adequately recognized in discussions on flexible inflation targeting frameworks that took place a decade or so ago.⁹

⁷ I. Visco, “On the role of expectations in Keynesian and today’s economics (and economies)”, Convegno Internazionale dell’Accademia Nazionale dei Lincei, “Gli economisti postkeynesiani di Cambridge e l’Italia”, Rome, 11-12 March 2009 (http://www.bancaditalia.it/interventi/intaltri_mdir/en_Visco_110309.pdf).

⁸ See, among others, J. Vickers, “Inflation targeting in practice: the UK experience”, *Bank of England Quarterly Bulletin*, November 1998.

⁹ See C. Borio and P. Lowe, “Asset prices, financial and monetary stability: exploring the nexus”, BIS Working Papers, 114, July 2002 (<http://www.bis.org/publ/work114.pdf>). See also C. Bean, “Asset prices, financial imbalances and monetary policy: are inflation targets enough?”, BIS Working Papers, 140 (with discussions by I. Visco and S. Wadhvani, <http://www.bis.org/publ/work140.pdf>).

One of my preferred quotes is from Herbert Simon:¹⁰

Good predictions have two requisites that are often hard to come by. First they require either a theoretical understanding of the phenomena to be predicted, as a basis for the prediction model, or phenomena that are sufficiently regular that they can be simply extrapolated. Since the latter condition is seldom satisfied by data about human affairs (or even by the weather), our predictions will generally be only as good as our theories. The second requisite for prediction is having reliable data about the initial conditions – the starting point from which the extrapolation is to be made.

We must recognize that empirical models reflect historical experience in the values of their parameters and are mostly reliable when it is “business as usual”, that is, as long as our systems are not subjected to unusual pressure. It can be argued that their contribution to making informed decisions is limited, as they tend to become unreliable precisely when, following signs of structural discontinuity, the benefits of correct forecasting are greatest. Indeed, anomalous observations that do not fit the main mechanisms at work in the historical period used for statistical estimates are frequently put aside (“dummied-out”), their information content is neutralized. This is reasonable, as episodic observations of exceptional phenomena are generally inadequate to capture complex inter-relations between economic and financial variables. And yet those very deviations from the norm may contain precious information on how the economy works in conditions other than those usually prevailing.

Much of the same reasoning applies to the analysis of financial market developments. The wave of financial innovation in the last two decades was fuelled by the idea, in principle correct and fruitful, that the proliferation of new (and complex) financial instruments, allowing agents to insure against many dimensions of risk, was a way to “complete the markets”, to get closer to the theoretical Arrow-Debreu world, enabling investors to transfer resources efficiently across time, space and states of the world. But this idea relied on the presumption that the world is basically stationary, that the future is pretty much the same as the past, that we can extrapolate from relatively small samples, and that there is a single “data generating process” that we can identify and understand.

But we know that the real world is more complex. The determinants of asset prices are not fixed, but vary over time. Asset returns do not follow a normal distribution, as it is assumed by conventional valuation formulas. Myopic behaviour, herding and other types of distorted incentives on the part of individuals and financial institutions can generate negative externalities and move financial markets’ expectations and risk premia away from fundamentals. And, lately, scholarly

¹⁰ H. A. Simon, *The sciences of the artificial*, MIT Press, Cambridge, Mass., 1972, p. 170.

work has been attributing a new, enhanced role to psychological elements and the recognition that there are limits to what one can know. In the field of the so-called behavioural finance this may even go as far as to validate “irrational” actions. And eminent economists argue that these elements play a role in explaining both conservative attitudes and speculative bubbles.¹¹

The potential limitations of quantitative analysis are therefore not restricted to macroeconomics, econometric modelling and forecasting but also apply to finance. And they may have dire consequences. The case of the CDOs is instructive. These credit derivatives, that in the first half of the last decade recorded an impressive growth, were priced according to valuation models whose results were very sensitive to modest imprecision in parameter estimates and highly exposed to systemic risk (i.e. strongly affected by the performance of the economy as a whole).¹² As a result, CDOs not only did not increase the risk bearing capacity of the economies, but their implosion between mid-2007 and mid-2008 was at the core of the global financial crisis. Innovative financial instruments with unsound theoretical foundations may exacerbate negative externalities and be sources of instability in their own right.

Rather than in the development of unlikely “catch-all” models, the key to tackling the problems created by discontinuity must lie, first of all, in a better understanding of its nature and so in defining models in which the relations are based on parameters that remain stable in the long term. Research must therefore aim to identify sufficiently fundamental and reasonably dependable mechanisms that do not change over time. To provide sensible accounts of rational choices, quantitative models necessarily have to focus on systematic factors, and draw their own conclusions on the basis of key relations. In this respect it is worth recalling Bruno De Finetti’s argument for a “theory of finance”, made as early as 1957.¹³

In order for a theory of behaviour to say something, it must necessarily be restricted to that which is derived as the consequence of a few main concepts and criteria and which can accordingly (if somewhat arbitrarily) be defined as ‘rational behaviour’. Then the theory will set out conclusions that are valid in the absence of accessory factors. This is not to deny or downplay the possible presence or importance of such factors; only, it is preferable to shift the study of deviations from the ‘theoretical’ behaviour implied by those conclusions to a later moment and to the detailed plane of complementary observations, rather than cloud all distinctions in a single theoretical construct

¹¹ G. A. Akerlof and R. J. Shiller, *Animal spirits: how human psychology drives the economy and why it matters for global capitalism*, Princeton, Princeton University Press, 2009.

¹² See J. Coval, J. Jurek and E. Stafford, “The economics of structured finance”, *Journal of Economic Perspectives*, 23, 1, 2009.

¹³ B. De Finetti, *Lezioni di matematica attuariale*, Roma: Edizioni Ricerche, 1957, p. 71 (my translation).

which, in the attempt to embrace and set on an equal plane the congeries of systematic and accessory factors, would be reduced to a non-theory suitable solely to conclude that all kinds of behaviour are equally possible (for caprice or madness, even, as is in fact the case).

Obviously, De Finetti's "later moment" should not be overlooked in applied research. Against the risk that the theoretical paradigms underlying the approximation of reality implicit in a model may prove particularly inadequate in certain situations, it is useful to employ a battery of different models and cross-checks. This "multi-pronged" approach to modelling and forecasting also makes it possible to more effectively filter and interpret the great mass of partial and fragmentary or even contradictory data that gradually become available. But in dealing with non-ergodic processes, what really is all the more essential is to integrate the signals provided by quantitative models with information outside the models, take stock of related historical experience in its entirety, and intervene on the basis of both theory and sound practical judgement (good sense).

In both empirical microeconomics and finance, work is under way to deal with the issues that have been considered here. Deviations from the assumption of normal distributions, "fat tails" and the modelling of extreme events are being taken into account both in research and applications. And it should be recognized that the importance of human behaviour does not imply that economic systems necessarily have to be prone to instability. In fact, the very existence of behavioural uncertainty may tend to create a set of institutions, as well as conventions and habits, which help to deal with the problems highlighted in Keynes' "beauty context" example and ensure the stability of the main economic processes, as emphasized by Herbert Simon.¹⁴ Still, I believe, more attention should be paid to how to account for learning in the crucial adjustment periods that follow extreme events that cannot be simply taken as random extractions from a stable, even if non-normal, probability distribution. Widening the class of probability distributions remains however, for the time being, the practical response to phenomena such as the ones we have been dealing with in this difficult period.

Rethinking monetary policy and the role of central banks

The crisis has raised important questions on the appropriate tools – conventional versus unconventional measures – and objectives – price versus financial stability – of monetary policy,

¹⁴ H. A. Simon, "The role of expectations in an adaptive or behavioristic model", in M. J. Bowman (ed.) *Expectations, uncertainty and business behavior*, New York, Social Sciences Research Council, 1958.

and more generally on the role of central banks and their relationships with other economic and financial authorities.

I would first observe that the crisis has shown that there are crucial advantages in “not tying central banks’ hands too tight”. This was very important in allowing monetary authorities to adopt the appropriate measures to counteract the crisis. Had monetary policy been constrained by a too rigid framework (such as in the past a commodity standard) or too strict pre-specified rules, its ability to react to the crisis would have been severely impaired. The capacity of central banks to adapt the size, scope and type of interventions to the evolution of financial disruptions and to differences in the structure of financial systems was in fact crucial to avoid the occurrence of destructive scenarios and to restore trust.

Measures on both sides of the Atlantic were ultimately addressed to ensure the proper functioning of the monetary transmission mechanism, necessary to pursue the final monetary policy objectives of the respective central banks. But the interventions have been tailored to the specific circumstances and to the characteristics of the different economies. For example, the quantitative-easing measures of the Federal Reserve (in a “zero lower bound” context) were aimed at promoting stronger economic growth and a level of inflation consistent with its mandate by intervening on specific segments of the financial markets and of the yield curve. The unconventional measures adopted by the Governing Council of the ECB addressed the malfunctioning of specific markets hit strongly by the crisis and aimed at avoiding major repercussions on bank credit, which plays a predominant role in the financing of the euro area economy.

In the assessment of the effectiveness of these measures we need to keep in mind the counterfactual. This is especially evident in the euro area, where the ECB 3-year LTROs decided at the end of 2011 prevented a liquidity crisis in the banking system and the likely major credit crunch that would have followed. Similarly, the announcement in the summer of 2012 of the possibility of intervening in the secondary market for government securities with Outright Monetary Transactions (OMT) was prompted by the need to address market malfunctions and distortions due to the sovereign debt crisis, which were hampering the transmission of monetary policy and risking to ignite a financial collapse with potentially devastating consequences for the European economy.

Widening yield spreads between government bonds in the euro area are the consequence of two factors, one national and the other European, linked respectively to the weaknesses of some countries’ economies and public finances (sustainability risk), and to the incompleteness of the

European construction and the attendant fears of a break-up of the monetary union (redenomination risk). Consequently, Europe's response to the sovereign debt crisis has had to be two-pronged: individual countries have pledged to adopt prudent budgetary policies and structural reforms to support competitiveness; a far-reaching reform of EU economic governance has been undertaken.

The time needed to implement Europe's complex strategy to counter the economic crisis will be long. The distortions that have affected financial markets and have resulted in significant financial fragmentation across countries can in the meanwhile undermine the transmission of monetary policy and jeopardize the entire process. In July 2012 the yield differential between 10-year Italian BTPs and the equivalent German Bunds was still just over 500 basis points, compared with estimates of about 200 basis points consistent with the predominant Italian and German economic fundamentals. It is in this context that the ECB Governing Council announced the introduction of the OMT program. Countering an excessive increase in sovereign yields when it stems from redenomination risk and distorts monetary policy transmission is fully within the Eurosystem's mandate.

The OMT will only be activated in the presence of severe market strains and are confined to the securities of countries adhering to a macroeconomic adjustment or precautionary programme financed with the resources of the European Stability Mechanism (ESM, a financial backstop jointly funded by EU countries set up during the crisis). Their continued operation then depends on observing the conditions attached to the programme. There are no ex ante limitations on the duration or amount of the intervention.

This initiative has been made possible by the credibility of the Eurosystem and the progress made with both national reforms and the design of European governance. The two factors fuelling the crisis are not independent. On the one hand, fears of euro reversibility are linked in the first place to those concerning the sustainability of public debts and the competitiveness of member countries. On the other hand, the financing of the programmes with ESM resources is an incentive to further strengthen the governance of the Union, which is essential to achieve a permanent reduction in the redenomination risk and the related component of the interest rate differential. Monetary policy can guarantee stability only if the euro-area's economic fundamentals and institutional architecture are consistent with it.

The announcement of OMT produced immediate benefits: medium- and long-term yields in the countries under pressure decreased and the fragmentation of markets along national borders was

attenuated. Albeit with fluctuations linked to temporary tensions at the national level and to the remaining, pronounced uncertainty about the determination of all member states to proceed with the strengthening of the Union, the yield spreads between euro-area government securities remained on a downward trend. That between ten-year BTPs and Bunds is about 250 basis points today.

To ensure stability over the longer run, the effort to reform the European governance has been stepped up. The subsequent stages are outlined in the report *Towards a Genuine Economic and Monetary Union* (presented in June 2012 and updated in December by the President of the European Council, working closely with the Presidents of the European Commission, the Eurogroup and the ECB) and in the *Blueprint for a Deep and Genuine Economic and Monetary Union* published by the Commission last November. Both documents envisage a banking union, the introduction of autonomous fiscal capacity for the whole euro area, and a common budget; they set the scene for the eventual political union.

The Banking Union is a keystone of institutional reform. It has three key components: a single supervisory mechanism (SSM), a single bank resolution mechanism, and a harmonized deposit insurance scheme. Such an important institutional innovation will require an organizational adaptation as far-reaching and at least as complex as that leading to the single monetary policy, with substantial investment in human resources and technical infrastructure. Priority has been given to the launch of the SSM, but work must progress expeditiously also on the other two components, which are both crucial to align supervisory and crisis management responsibilities, as well as to break the perverse bank-sovereign loop. The harmonization of regulatory and supervisory practices is a precondition for success; it will be crucial in the comprehensive assessment of banks' balance sheets that will be carried out before the launch of the SSM.

Related to the debate on the appropriate measures, the crisis has raised concerns about the interaction and possible conflicts between policies addressed to maintain price stability and those aimed at preserving financial stability. It has also raised the question of whether central banks should revise their objectives or strategies.

In my view there is no need to question the current objectives; in the case of the Eurosystem, that of preserving (medium term) price stability. I do not believe, in particular, that financial stability should become an explicit objective of monetary policy at the par with price stability, for two main reasons: first, the benefits of our monetary framework have become more – not less – evident during the crisis, with inflation expectations remaining well-anchored throughout; second, assigning

financial stability as an explicit additional objective to monetary policy could risk blurring responsibilities, increasing moral hazard and creating potential conflicts. However, I believe that there is no question that preserving financial stability resides fully within the responsibilities of (even if perhaps not only) central banks.

Indeed, the crisis has not put into question the idea that over longer horizons there is no trade-off between price stability and financial stability objectives – rather, there are synergies. But it has shown that short-term interactions may be very complex and conflicts cannot be excluded. It has become clearer than it was before the crisis that price and financial stability are directly and strongly interconnected, that risks to any of these two objectives can quickly spread to the other, create dangerous loops and quickly undermine trust in financial markets. This certainly implies that the instruments of monetary policy are not neutral with respect to financial stability. It also calls to address the latter with specific policy tools.

But it also calls for efforts in the conduct of monetary policy, along three dimensions: the information set used in the assessment of the risks for price stability; pre-emptive reaction to signals of financial instability; and effective communication. Monetary authorities need to monitor a broader range of indicators, look for early signals of financial instability, develop models capable to capture the interactions between the financial sector and the real economy and be cautious in using standard macro-econometric models in circumstances of financial unrest. Although central banks should not regularly intervene to exert a direct control on asset prices, they should not wait until a crash occurs before acting, given that the costs of this strategy have proved to be very large; rather they should lean against the formation of financial imbalances and not be shy to react to early signals of financial instability. Indeed, this is something of which one could have been convinced of even before the last crisis. Monetary authorities should not overlook the potential impact, not only of their actions (or inactions), but also of their communication on the solution of financial stability problems and the consequent repercussions on price stability.

The implementation of new frameworks of policies, however, is all but easy. Building models which are able to capture interactions between price and financial stability is difficult. As to macroprudential policy, we still lack a well defined analytical apparatus and operational definitions of its objectives and instruments. Indicators and early warning signals are available, but a coherent framework to interpret them and to measure the effectiveness of macroprudential policy is still lacking. Preliminary results confirm that it has some potential to stabilise the economy over and above what can be achieved by monetary policy alone, but that this varies depending on the type of

shock or setup considered.¹⁵ I would dare to say that proper understanding of how this can be effectively achieved is still in the making.

Final remarks

The crisis has shown that benign neglect should never have been an option. It has called for a major overhaul of the regulatory and supervisory financial framework, especially at an international level. In a globalized financial marketplace, with large and powerful participants, individual action by national authorities would be bound to fail. By the same token, the boundaries of supervision should be widened to encompass all relevant intermediaries, regardless of the specific industry sector they belong to. I have discussed the work underway, highlighted the results achieved and stressed the areas where more effort is needed.

The correct conduct of financial business also requires competence and good faith on the part of intermediaries, both factors being decisive to ensure sound and prudent management and preserve the confidence of savers. This necessity is heightened by the complexity of the external environment, by the presence of large intermediaries, and by the economic and reputational damage that can result from illicit behaviour. No market can function without rules, nor is prudent management possible without correct conduct, embodied not only in scrupulous compliance with the law and the supervisory rules but also in complete adherence to business ethics.

The dramatic events of the past five years have highlighted the limitations of modelling and quantitative analysis in finance and in economics. The common assumption of stationarity is at odds with the unpredictably changeable nature of the real world. This is not to say that all the analytical efforts of the past and the progress achieved should be disregarded. It means rather that in order to make the best out of them one needs to remember that models are by necessity “local” approximations to very complex phenomena and they should be used with sound practical judgment as a framework, not a straightjacket, for our decision-making. Quantitative analysis and modelling can also help to establish institutional and behavioural norms to rein in patterns of instability and developing proper learning devices to deal with major shocks and regime changes. In turn, models should take into account the impact of such norms on economic developments.

¹⁵ P. Angelini, S. Neri and F. Panetta, "Monetary and macroprudential policies," Banca d'Italia, Working Papers, 801, March 2011 (http://www.bancaditalia.it/pubblicazioni/econo/temidi/td11/td801_11/td_801/tema_801.pdf). See also P. Angelini, S. Nicoletti-Altimari and I. Visco, "Macroprudential, microprudential and monetary policies: conflicts, complementarities and trade-offs", in A. Dombret and O. Lucius (eds.), *Stability of the Financial System: Illusion or Feasible Concept?*, Edward Elgar, Cheltenham, UK, 2013 (also Banca d'Italia, Occasional Papers, 140, November 2012, http://www.bancaditalia.it/pubblicazioni/econo/quest_ecofin_2/qef140/QEF_140.pdf).

Central banks have a crucial role to play. There are clear complementarities between financial and monetary stability. Sometimes these are formally recognized in their official mandate, but even when this is not the case, central banks must take them into account in their policy decisions. In this respect, I would like to quote from a book by the brilliant Banca d'Italia economist Curzio Giannini, who passed away prematurely about ten years ago. In that “beautifully written and illuminating” work, as Charles Goodhart describes it in his foreword, Curzio clearly saw the likely consequences of financial developments, and concluded:¹⁶

In the years to come, the most interesting developments will probably be precisely in the sphere of supervision and regulation. [...] Whatever its detractors may say, the central bank has no need to move into new lines of business. Capitalism generated the central bank and capitalism will come to it again, even if the current infatuation with the financial markets' self-regulating capacity were to endure. [...] The central bank produces an intangible but essential good – trust – of which capitalism (based as it is on a pyramid of paper if not mere electronic signals) has an immense need. We must not forget that trust, or its synonym “confidence”, derives from the Latin *fides*, meaning faith, which cannot be produced simply by contract. In fact the legitimacy of central banks does not lie in their policy activism, or the ability to generate income, or even, save in a highly indirect sense, their efficiency. Rather, [...] it derives from competence, moderation, the long-term approach, and the refusal to take any tasks beyond their primary role. If, as I am sure, there is another phase in the development of central banking, it will spring from these values.

In the end this is, perhaps, what society should expect, if not from the financial sector, from those who are called to look after financial stability.

¹⁶ C. Giannini, *The age of central banks*, Edward Elgar, Cheltenham, UK, 2011, p. 255 and pp. 258-259, English translation, *L'età delle banche centrali*, Bologna, Il Mulino, 2004.