
Are the Golden Years of Central Banking Over?

The Crisis and the Challenges

Geneva Reports on the World Economy 10

International Center for Monetary and Banking Studies (ICMB)

International Center for Monetary and Banking Studies
11 A Avenue de la Paix
1202 Geneva
Switzerland

Tel (41 22) 734 9548
Fax (41 22) 733 3853
Website: www.icmb.ch

© June 2009 International Center for Monetary and Banking Studies

Centre for Economic Policy Research (CEPR)

Centre for Economic Policy Research
53–56 Great Sutton Street
London EC1V 0DG
UK

Tel: +44 (0)20 7183 8801
Fax: +44 (0)20 7183 8820
Email: cepr@cepr.org
Website: www.cepr.org

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-0-9557009-0-3

Are the Golden Years of Central Banking Over?

The Crisis and the Challenges

Geneva Reports on the World Economy 10

Stefan Gerlach

*Institute for Monetary and Financial Stability
at University of Frankfurt and CEPR*

Alberto Giovannini

Unifortune Asset Management

Cédric Tille

*Geneva Graduate Institute for International
and Development Studies (IHEID) and CEPR*

José Viñals

Banco de España and CEPR

ICMB INTERNATIONAL CENTER
FOR MONETARY
AND BANKING STUDIES

CIMB CENTRE INTERNATIONAL
D'ETUDES MONETAIRES
ET BANCAIRES



International Center for Monetary and Banking Studies (ICMB)

The International Center for Monetary and Banking Studies was created in 1973 as an independent, non-profit foundation. It is associated with Geneva's Graduate Institute of International Studies. Its aim is to foster exchange of views between the financial sector, central banks and academics on issues of common interest. It is financed through grants from banks, financial institutions and central banks.

The Center sponsors international conferences, public lectures, original research and publications. It has earned a solid reputation in the Swiss and international banking community where it is known for its contribution to bridging the gap between theory and practice in the field of international banking and finance.

In association with CEPR, the Center launched a new series of *Geneva Reports on the World Economy* in 1999. The eight subsequent volumes have attracted considerable interest among practitioners, policy-makers and scholars working on the reform of international financial architecture.

The ICMB is non-partisan and does not take any view on policy. Its publications, including the present report, reflect the opinions of the authors, not of ICMB or of any of its sponsoring institutions.

President of the Foundation Board	Philipp Hildebrand
Director	Charles Wyplosz

Centre for Economic Policy Research (CEPR)

The Centre for Economic Policy Research is a network of over 700 Research Fellows and Affiliates, based primarily in European universities. The Centre coordinates the research activities of its Fellows and Affiliates and communicates the results to the public and private sectors. CEPR is an entrepreneur, developing research initiatives with the producers, consumers and sponsors of research. Established in 1983, CEPR is a European economics research organization with uniquely wide-ranging scope and activities.

The Centre is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions. CEPR research may include views on policy, but the Executive Committee of the Centre does not give prior review to its publications, and the Centre takes no institutional policy positions. The opinions expressed in this report are those of the authors and not those of the Centre for Economic Policy Research.

CEPR is a registered charity (No. 287287) and a company limited by guarantee and registered in England (No. 1727026).

Chair of the Board	Guillermo de la Dehesa
President	Richard Portes
Chief Executive Officer	Stephen Yeo
Research Director	Mathias Dewatripont
Policy Director	Richard Baldwin

About the Authors

Stefan Gerlach is Professor of Monetary Economics at the Institute for Monetary and Financial Stability at the Johann Wolfgang Goethe University in Frankfurt and a Research Fellow of the CEPR. Between 1992 and 2007, he served as an economist at the BIS. On leave from the BIS, in 2001-2004 he was Executive Director (Research) at the Hong Kong Monetary Authority and Director of the Hong Kong Institute for Monetary Research. He received an undergraduate degree from the University of Lund in Sweden in 1979 and a doctorate from the Graduate Institute of International Studies in Geneva in 1983, and has written in the areas of monetary theory and policy, and financial stability.

Alberto Giovannini is Chief Executive Officer Unifortune SGR SpA, an asset management company based in Milano, Italy, and has been Principal Policy Advisor of the Commission's Clearing and Settlement Advisory and Monitoring Group (CESAME). He was previously the Jerome A. Chazen Professor of International Business at Columbia University, where he taught and conducted research from 1983 to 1995. He has held many other public and private sector position, including Co-Chairman of the Council of Experts at the Ministry of the Treasury in Rome, Italy, Senior Strategist at Long-Term Capital Management and Deputy General Manager of Banca di Roma. Mr. Giovannini graduated from the University of Bologna and holds a PhD in Economics from the Massachusetts Institute of Technology.

Cédric Tille is Professor of International Economics at the Graduate Institute for International and Development Studies (HEID) in Geneva, which he joined in 2007. He worked for the International Research Function of the Federal Reserve Bank of New York from 1998 to 2007 as an economist and research officer. His research focuses on the implications of financial globalization for the international transmission of economic fluctuations and the conduct of policy. Mr. Tille holds a Ph.D. in economics from Princeton University and a B.A. and M.A. in economics from the University of Lausanne.

José Viñals was Deputy Governor at the Bank of Spain at the time this report was written. Since mid-April 2009, he has been Financial Counsellor and Director of the IMF's Monetary and Capital Markets Department. While at the Banco de España, he held a number of senior positions and served on a range of advisory and policy committees at the central bank and within the European Union, including as Chairman of the European Central Bank's International Relations Committee. A former faculty member in the Economics Department at Stanford University, he holds a Ph.D. in Economics from Harvard University, an M.Sc. in Economics from the London School of Economics and an M.A. in Economics from Harvard.

Contents

<i>About the Authors</i>	<i>v</i>
<i>List of Conference Participants</i>	<i>ix</i>
<i>List of Tables</i>	<i>xiv</i>
<i>List of Figures</i>	<i>xiv</i>
<i>Acknowledgements</i>	<i>xvii</i>
<i>Foreword</i>	<i>xix</i>
<i>Executive Summary</i>	<i>xxi</i>
1 Introduction	1
2 Before the Storm: The Golden Years of Central Banking	9
2.1 Inflation developments across the world	10
2.2 Trade and financial globalisation	16
2.3 How was inflation brought down?	25
2.4 The decline in real interest rates	34
2.5 Conclusions	37
3 The Transformation of Financial Markets	43
3.1 Market developments	43
3.2 Consequences for the structure of financial markets	52
3.3 Were the financial infrastructure and the regulatory and supervisory framework adequate?	56
3.4 Conclusions	58
4 The Great Unraveling	59
4.1 Financial market crisis	61
4.2 The inflation surge	74
4.3 The conduct of policy by central banks during the great unraveling	77
4.4 Conclusions	83
5 The Growing Challenges for Central Banks	85
5.1 Two traditional challenges	85
5.2 Conducting monetary policy at low interest rates	90
5.3 New challenges for central banks	93
5.4 Potential regulatory remedies	104
5.5 Conclusions	106
6 Summary and Conclusions	117
6.1 Before the crisis	117
6.2 The crisis	119
6.3 Lessons for policy-makers	120
6.4 Looking ahead	124

Discussion	127
Chapters 1 to 4	127
Chapters 5 and 6	136
<i>Endnotes</i>	<i>145</i>
<i>References</i>	<i>151</i>

List of Conference Participants

Vit Barta	Advisor to Vice-Governor Czech National Bank, Prague
Rémy Bersier	CEO Private Banking, Head of French speaking Switzerland Bank Julius Bär & Co. Ltd., Geneva
Claudio Borio	Head of Research and Policy Analysis Bank for International Settlements, Basel
Luigi Buttiglione	Managing Director Fortress Investment Group, London
Eric Chaney	Chief Economist for Europe Morgan Stanley, London
Charles Collins	Deputy Director, Research Department International Monetary Fund, Washington, DC
Jean-Pierre Danthine	Professor HEC, Lausanne Managing Director Swiss Finance Institute, Lausanne
José de Gregorio	Governor Central Bank of Chile, Santiago
Jacques Delpla	Senior Advisor, Fixed Income BNP Paribas, Paris
Slobodan Djajic	Professor, International Economics The Graduate Institute of International and Development Studies, Geneva
Cédric Dupont	Professor, Political Science Director, Executive Education The Graduate Institute of International and Development Studies, Geneva
Georges Gagnebin	Vice-Chairman of the Board of Directors Julius Bär Holding Ltd., Zurich

x Are the Golden Years of Central Banking Over?

Paolo Garonna	Deputy Executive Secretary United Nations Economic Commission for Europe, Geneva
Stefan Gerlach	Professor of Monetary Economics, Institute for Monetary and Financial Stability Johann Wolfgang Goethe University of Frankfurt, Frankfurt
Alberto Giovannini	CEO Unifortune Asset Management, Milan
Michel Girardin	Member of Senior Management Union Bancaire Privee, Geneva
Charles Goodhart	Norman Sosnow Professor of Banking and Finance London School of Economics, London
Philipp Hildebrand	Vice-Chairman of the Governing Board Swiss National Bank, Bern
Paul Inderbinen	Head of Section, IMF and International Finance Swiss Federal Finance Administration, Bern
Paul Jenkins	Senior Deputy Governor Bank of Canada, Ottawa
Hugo Frey Jensen	Director, Head of Economics Danmarks Nationalbank, Copenhagen
Thomas Jordan	Member of the Governing Board Swiss National Bank, Zurich
Pierre Keller	Former Senior Partner Lombard Odier Darier Hentsch & Cie, Geneva
Hans-Jürgen Koch	CEO and Global Head of Private Wealth Management International Deutsche Bank (Switzerland) Ltd., Zurich
Ulrich Kohli	Alternate Member of the Governing Board Swiss National Bank, Zurich
Donald L. Kohn	Vice-Chairman, Board of Governors Federal Reserve System, Washington, DC

Dino Kos	Managing Director, Morgan Stanley Investment Management Morgan Stanley, Hong Kong
Signe Krogstrup	Economic Advisor, Financial Stability Swiss National Bank, Zurich
Jean-Pierre Landau	Deputy Governor Banque de France, Paris
Bernhard Lippuner	Region Head Geneva Credit Suisse, Geneva
David Longworth	Deputy Governor Bank of Canada, Ottawa
Maurice Monbaron	Vice-Chairman of the Board Credit Agricole (Suisse) SA, Geneva
Carlo Monticelli	Senior Director, Treasury Department Ministry of Economy and Finance, Italy, Rome
Patrick A. Muhl	Senior Economist, Macro Analysis, Economic Research Credit Suisse, Zurich
Ugo Panizza	Senior Economist, Asian Department Debt and Development Finance Branch UNCTAD, Geneva
Avinash D. Persaud	Chairman Intelligence Capital Limited & Investment, London
Michel Peytrignet	Director, Head Economic Affairs Swiss National Bank, Zurich
Jean Pisani-Ferry	Director Bruegel, Brussels
Friederike Pohlenz	Deputy Head of Section IMF and International Finance Swiss Federal Finance Administration, Bern
Jan Frederic Qvigstad	Deputy Governor Norges Bank, Oslo

xii *Are the Golden Years of Central Banking Over?*

Jean-Jacques Rey	Honorary Executive Director National Bank of Belgium, Brussels
Alain Robert	Member of the Group Managing Board UBS AG, Zurich
Hans-Joerg Rudloff	Chairman of the Executive Committee Barclays Capital, London
Claudio Segre	Chairman, Argus fund SEFI SA, Geneva
Marwan Shakarchi	Chairman MKS Finance SA, Geneva
Neal Soss	Chief Economist Credit Suisse, New York
Alexander Swoboda	Professor, International Economics The Graduate Institute of International and Development Studies, Geneva
Jens Thomsen	Member of the Board of Governors Danmarks Nationalbank, Copenhagen
Angel Ubide	Director of Global Economics Tudor Investment Corporation, Washington, DC
José Viñals	Deputy Governor Banco de España, Madrid
Ignazio Visco	Member of the Board and Deputy Director General Banca d'Italia, Rome
Thomas Wiedmer	Alternate Member of the Governing Board, Department II Swiss National Bank, Bern
Jonathan Wilmot	Chief Global Strategist, Fixed Income Research Credit Suisse, London
Bernhard Winkler	Senior Adviser, Monetary Policy Stance Division European Central Bank, Frankfurt am Main
Pawel Wyczanski	Advisor, Financial System National Bank of Poland, Warsaw

Charles Wyplosz

Professor, International Economics
The Graduate Institute of International and
Development Studies, Geneva
Director
ICMB, Geneva

Jean Zwahlen

Senior Advisor for Asia
Union Bancaire Privee, Geneva

List of Tables

Table 2.1	Estimate of the average rate and persistence of inflation	15
Table 3.1	Bank assets and derivatives	46
Table 3.2	OTC derivatives (amounts outstanding)	47
Table 5.1	Panel estimates of Phillips curve	113

List of Figures

Figure 1.1	Inflation, industrialized countries and emerging markets	2
Figure 1.2	Recent inflation developments	2
Figure 1.3	Commodity prices	3
Figure 1.4	Policy interest rates	3
Figure 2.1	Inflation	11
Figure 2.2	Inflation volatility, 10 years standard deviation	12
Figure 2.3	Growth volatility, 10 years standard deviation	13
Figure 2.4	Persistence of inflation	14
Figure 2.5	International integration in industrialized countries	17
Figure 2.6	International integration in emerging markets	18
Figure 2.7	Long interest rates	21
Figure 2.8	Volatility of long interest rates	22
Figure 2.9	Short interest rates	23
Figure 2.10	Volatility of short interest rates	24
Figure 2.11	Interquartile range of equity return	24
Figure 2.12	Fiscal deficits	27
Figure 2.13	Impulse responses for interest rates	41
Figure 3.1	CDS spreads United States	44
Figure 3.2	Itraxx spreads Europe	45
Figure 3.3	EMBI spreads	45
Figure 3.4	Interest rate differential over foreign exchange volatility	49
Figure 3.5	Credit default swaps over commercial bank assets	51
Figure 3.6	Credit derivatives versus underlying debts	51
Figure 4.1	US home prices	62
Figure 4.2	Official interest rates	62
Figure 4.3	ABX indices	63
Figure 4.4	Stock market indices for the financial sector	64
Figure 4.5	Dollar exchange rates	64
Figure 4.6	Commercial paper outstanding	65
Figure 4.7	Capital losses/Capital raising global banks	66
Figure 4.8	Measures of confidence	69
Figure 4.9	GDP growth	70
Figure 4.10	Stock market indices	71
Figure 4.11	Long-term inflation forecasts	78
Figure 4.12	2009 inflation forecasts	78
Figure 4.13	Total assets central banks	81
Figure 5.1	Spread between 12 month interbank rate and official rate	94
Figure 5.2	Interest rates in United States	94
Figure 5.3	Interest rates in the euro area	95
Figure 5.4	Interest rates in United Kingdom	95

Figure 5.5	Decomposition of interbank one-year differential in United States	96
Figure 5.6	Decomposition of interbank one-year differential in euro area	96
Figure 5.7	Decomposition of interbank one-year differential in the United Kingdom	97
Figure 5.8	Temporary productivity shock	110
Figure 5.9	Temporary productivity shock and trend shift	110
Figure 5.10	Temporary productivity shock and small trend shift (delayed reaction)	111
Figure 5.11	Taylor rule and the zero lower bound	115

List of Boxes

Box 2.1	Sources of inflation data	38
Box 2.2	Estimating inflation persistence	38
Box 2.3	Globalization data	39
Box 2.4	Fiscal data	39
Box 2.5	An assessment of the links between short and long rates	40
Box 5.1	The interest rate in the New Keynesian Model	108
Box 5.2	Competition and the slope of the Phillips curve	111
Box 5.3	An empirical assessment of the Phillips curve	112
Box 5.4	Taylor rule and the zero interest rate bound	114
Box 5.5	The functioning of interbank markets	115

Acknowledgements

This is a complete revision of the report on ‘Low inflation: Testing times for central banks’ that we presented in May 2008 in Geneva. We thank our discussants Eric Chaney, Charles Collyns, Charles Goodhart, Philipp Hildebrand, David Longworth, Avinash Persaud, Neal Soss and Alexander Swoboda. Furthermore, we are grateful to Petra Gerlach-Kristen for comments and help with putting together the final draft, and to Tim-Oliver Berg, Eva Koscher and Longmei Zhang for research assistance. The views expressed are those of the authors and they are not necessarily shared by the institutions with which they are affiliated.

Foreword

The years from 1982 to 2007 were in many respects a golden age for central banking. In the early 1980s, armed with independence and mandates that allowed a single-minded focus on inflation, central banks created a framework that allowed them to successfully translate the political goal of low inflation into almost two decades of strong growth and moderate inflation.

At the time when the conference met in May 2008 to discuss this Report, it was already apparent that the golden age had ended. The turmoil in financial markets had already begun to distract central banks from their focus on inflation targeting. By the autumn of 2008, with the collapse of key markets and the disintegration of institutions such as Lehmann Brothers and AIG, concerns with systemic stability were paramount.

The tenth Geneva Report on the World Economy examines the challenges facing central banks in the aftermath of the financial crisis. The Report identifies some of the most immediate and pressing challenges. Many countries, having reduced interest rates to almost zero, have been forced to resort to unorthodox policies in order to support aggregate demand. These quantitative easing policies blur the distinction between monetary and fiscal policy and so make the concept of central bank independence problematic, to say the least.

The Report also identifies other challenges, which though less pressing, are likely to prove more important in the longer term. In particular, the authors argue that monetary policy should address both financial stability and price stability concerns, and they call for 'pragmatic adjustments' to monetary policy which would allow it to lean against the wind in credit booms.

It is worth noting that the authors of the second Geneva Report on the World Economy, 'Asset Prices and Central Bank Policy' made essentially the same proposal – in 2000. Nine years ago the merits of the inflation-targeting framework seemed so obvious that this proposal received little attention. ICMB and CEPR are delighted to provide a forum for the authors of the tenth Report to raise these important issues once again. The global landscape has changed a great deal in the past nine years, and we are confident that this Report will be widely read and discussed.

Charles Wyplosz
Stephen Yeo
7 April 2009

Executive Summary

In just over a few months, the world had switched from highly favorable macro-economic and financial markets conditions to extreme financial turbulence and global recession. The question is whether we are now paying for past sins or whether ‘things happen’. We argue that the gradual disinflation since around 1980 was a major achievement but that it was accompanied by developments in financial markets that, while seen as propitious at the time, played a central role in the current crisis.

Disinflation was first and foremost due to greater public demand for price stability after the high inflation rates experienced in the 1970s and early 1980s. It also reflected better monetary policies, made possible by central bank independence and the designation of price stability as the overriding objective of monetary policy. Non-monetary factors such as globalization and favorable shocks played at best a supportive role.

Combined with the generalized perception that risks had fallen, low interest rates triggered a search for yield. As investors tried to raise returns by increasing leverage, they assumed more risk. Broker-dealers and banks responded to the demand for higher-yielding financial products by creating highly complex and opaque products. Investors relied heavily on ratings rather than on their own due diligence. The fact that these instruments had no track record of trading under stress and that the ratings pertained to credit risk, not market and liquidity risk, made this approach inappropriate. Once the financial crisis started, uncertainty about the size and location of losses led an almost unimaginable number of markets to experience problems.

The main causes of the current crisis are largely of a micro-economic nature. The list includes excessive incentives to take risk, lack of proper risk management in financial institutions, and regulatory and supervisory frameworks that were ineffective in identifying and resolving the problems that were accumulating in the financial system.

The ‘zero lower bound’ on policy interest rates is becoming highly relevant for a growing number of central banks. Tools to conduct monetary policy when policy rates reach zero exist, even if their effectiveness may be diminished when the financial sector is under stress and economic uncertainty is high.

The financial authorities must deal with the opacity of banks and particularly of investment banks. Many supervisors had little or no awareness of the risks that were assumed. In addition, liquidity transformation has broadened beyond depository banks towards other actors that have relied heavily on short-term money

market funding. This calls for strengthening the authority of regulatory agencies, which should extend to all agents engaging in liquidity transformation to the extent that they are potential recipients of central bank support, regardless of their specific form. It also calls for providing supervisors with the tools to gain adequate information on any financial intermediary that they deem of interest. Moreover, regulators need to tackle the conflicts of interests in banks and investment banks which perform investment business within a framework designed for client business. Finally, in addition to regulation being adequate, it is essential that supervision is effective.

Our main conclusion is that monetary policy and financial regulation should not be conducted in isolation. Indeed financial stability matters for the achievement of price stability while regulation can have macroeconomic implications. It follows that financial regulators need to take into account the broader macroeconomic consequences of their actions, beyond a narrow focus on individual institutions. It also follows that central banks should take financial considerations fully into account when they set interest rates, which also requires that they receive adequate aggregate information from the supervisory authorities – whenever different from the central bank – concerning the state of the financial system.

This does not mean that central banks should target any specific asset price, but they should lean in a not mechanistic fashion against large increases in credit and indebtedness (e.g. leverage). Such a ‘pragmatic’ adjustment to monetary policy would better take into account adverse financial interactions, which are only imperfectly incorporated into the models and structures currently guiding monetary policy decisions. This would not at all lessen the role of price stability as the primary goal of monetary policy but, merely ensure that the latter is more effectively pursued over the medium term.

1 Introduction

Are the golden years of central banking over? Over the last two decades central banks presided over a substantial, broad and sustained reduction of inflation rates from the heights of the 1970s and early 1980s (Figure 1.1). Central banks were also seen as being contributors to a generalized reduction in macroeconomic and financial market volatility.

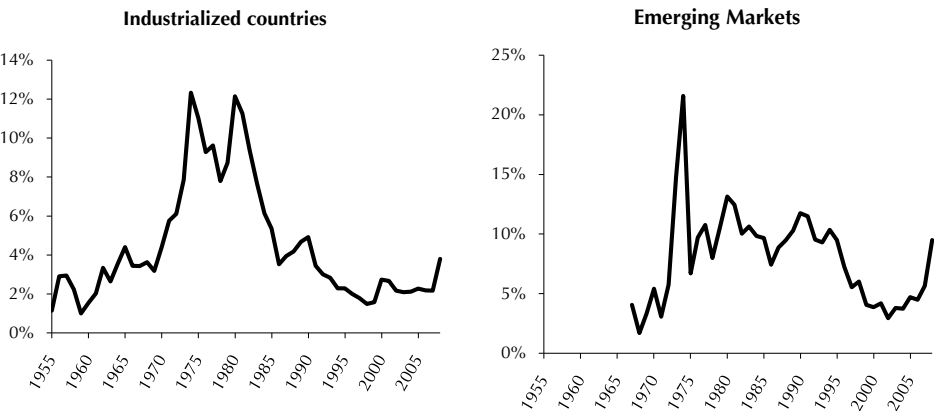
This favorable economic and financial environment came to an abrupt end in the second half of 2007. First and foremost, the world economy entered a period of unprecedented turmoil in financial markets which started with adverse developments in the US subprime mortgage market, and which was followed by the first bank runs in major economies in recent memory, the unprecedented freezing of interbank markets and other key financial markets, collapsing asset prices, massive losses in a range of systemically important financial institutions, and a sharp tightening in bank lending standards. The financial crisis increasingly spread to the real economy and set in motion a real–financial vicious circle which seems still to be gathering strength.

Second, inflation increased noticeably in 2007 and early 2008 (Figure 1.2). While most of this increase can be traced to higher commodity and energy prices (Figure 1.3), as evidenced by the fact that core measures of inflation and inflation expectation remained broadly stable in advanced economies, it fuelled a perception that central banks had lost their deft touch. Inflation has started to fall rapidly across the world, with deflation becoming a distinct possibility in some major economies as a recession is unfolding. Central banks have responded forcefully with large reductions in policy interest rates, especially since the fall of 2008 (Figure 1.4), and massive injections of liquidity in financial markets. This has brought official interest rates effectively to, or close to, the zero lower bound in major economies, raising new challenges for monetary policy in a particularly uncertain environment. Moreover, the deep and continuing problems in the financial sector in many advanced economies have led the authorities to introduce bank rescue plans and to pursue very expansionary fiscal policies in an attempt to deal with the crisis. A global effort has also been launched to redesign the international financial system so as to avoid repeating the excesses that led to the current crisis.

Given the size and pace of these developments, which, if anything, appear to have sped up in the last few months, it is too early to take stock of all the unfolding changes and present a detailed assessment of their implications for monetary and financial regulatory policies going forward. Still, urgent questions are being asked about what lessons central banks should draw from the crisis.

2 Are the Golden Years of Central Banking Over?

Figure 1.1 Inflation (median of annual data)



Source: Datastream

Figure 1.2 Recent inflation developments

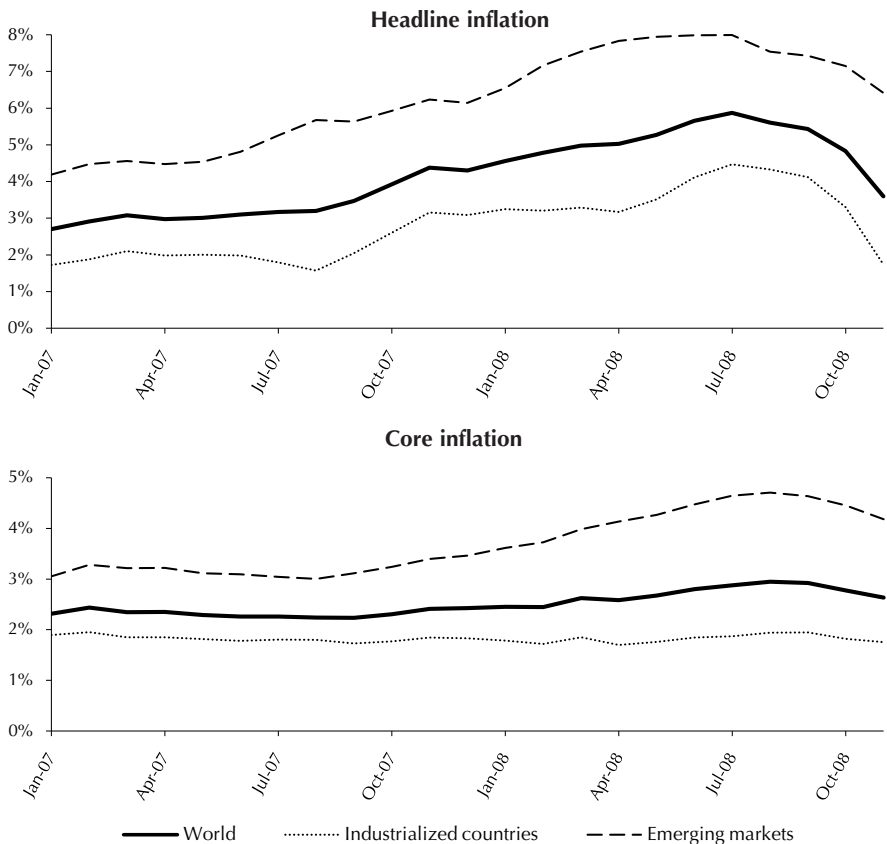


Figure 1.3 Commodity prices

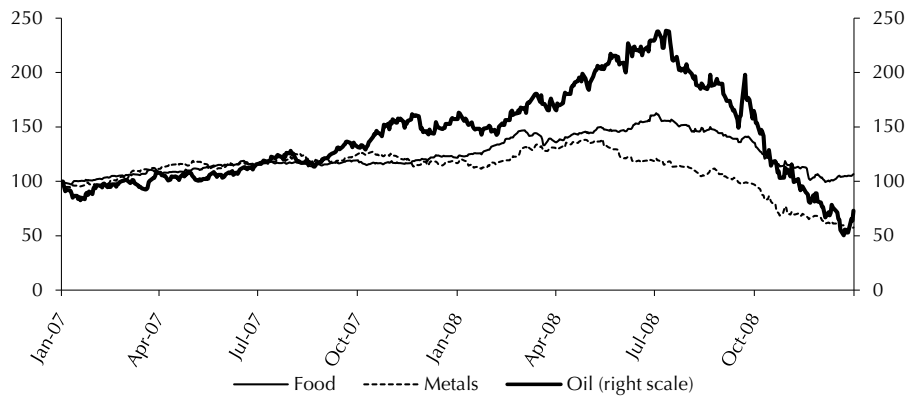
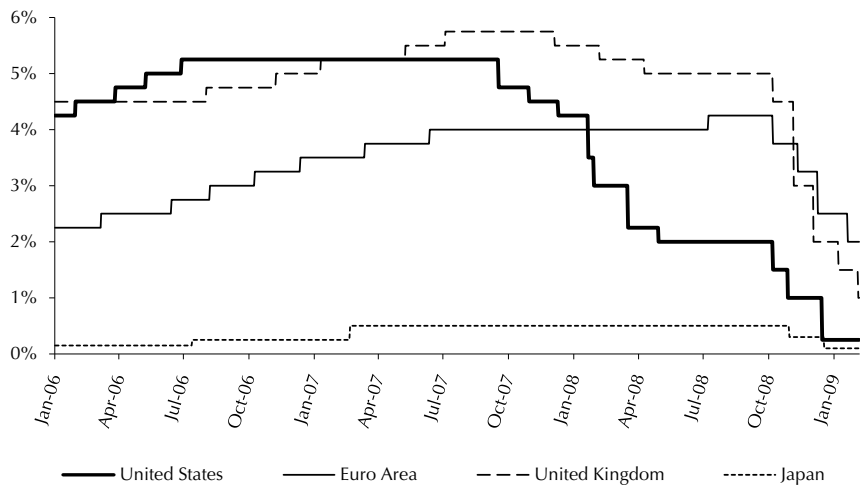


Figure 1.4 Policy interest rates



4 *Are the Golden Years of Central Banking Over?*

Many factors behind the crisis are unrelated to the conduct of monetary policy, such as financial institutions' failure to manage risk properly and weaknesses in the regulation and supervision of the financial system. Still, this does not imply that central banks cannot learn useful lessons for monetary policy, since the latter may not have been free of unintended side effects on financial markets prior to the turmoil. For instance, it is important to ask whether, as some observers claim, global imbalances, low interest rates and low inflation in recent years contributed to the run-up in asset prices and the excessive compression in risk spreads, thus setting the stage for the turmoil that ensued. Moreover, it is timely to consider whether the dominant intellectual view of monetary policy in many countries – which focuses narrowly on the management of inflation at a horizon of two years or so and downplays the role of credit and leverage – could have provided a fertile ground for the development of excessive leverage in the financial system and high indebtedness in the overall economy.

To explore these issues we structure our analysis as follows. In Chapter 2 we review the developments in the world economy in the years prior to the summer of 2007, a period that we think of as 'the golden years of central banking.' This period saw the coexistence of low inflation, steady economic growth, financial stability and rapidly increasing globalization. Central banks were widely perceived as being highly successful and monetary policy was seen as a key contributor to economic and financial stability. Inflation was low, stable, and reverted promptly to its long-run value following economic shocks. Globalization was proceeding steadily, both in terms of trade and financial linkages, with the pace of financial globalization among industrialized countries being especially noteworthy. Another important feature of the period was the gradual but substantial reduction in real interest rates, the contraction of risk spreads and a generalized rise in asset prices.

Assessing the reasons behind this period of tranquility is a central question. Specifically, did the achievement of low and stable inflation reflect structural improvements in the conduct of monetary policy that are unlikely to be undone? Or was it the result of an unusual constellation of favorable shocks, which made central banks' tasks easier but also led to overestimating the ability of monetary policy to control inflation?

Our assessment, recognizing that a firm and definitive determination of the relative importance of the various factors is hard to reach, is that monetary policy did play a central role in stabilizing inflation and the economy more broadly, through greater central bank independence and a focus on price stability as the main goal of monetary policy. This is not to say that other factors, such as higher competition from globalization or favorable shocks, were absent, but we view them as mainly having facilitated the task of disinflationary monetary policies rather than as key independent causal factors.

Since financial markets are at the core of the unfolding crisis, Chapter 3 focuses on their developments during the golden years of central banking. The reduction in inflation and real interest rates led to a decline in nominal returns across a broad spectrum of assets, giving financial market participants strong incentives to engage in a 'search for yield' into newer categories of assets. This was reinforced by the reduction of the volatility in financial returns, which made assets that previously were seen as risky look safe. Financial engineering developments opened new avenues to synthesize assets with the desired risk–return characteristics to sat-

isfy the growing demand for higher-yielding products. Finally, the globalization of financial markets broadened both the range of available investments as well as the range of borrowers and investors in specific markets.

These developments had profound implications for the structure of financial markets. The extent of leverage among participants increased substantially, with investors borrowing at low cost to fund investments with higher expected returns, raising risk at the same time. The proliferation of opaque and complex securitized products also led to the emergence of numerous 'niche' markets which were prone to illiquidity in times of market tensions. While this allowed for a fine-tuning of investors' risk exposures, it also created systemic vulnerabilities. Only a handful of participants were familiar with the details of specific niche markets, which impaired the dissemination of information during the crisis. The extensive use of leverage also blurred the distinction between broker-dealers and capital managers, leading to conflicts of interest and heightened challenges in the management of financial conglomerates. Finally, the nature of risk was altered, with the reduction of asset market volatility most of the time coming at the cost of larger movements during relatively unusual 'tail' events.

In Chapter 4 we review how the golden years of central banking came to an end. The rise in subprime defaults in late 2006 and early 2007 initially undermined the markets for mortgage-backed products that were held by a large number of financial institutions across the world. Uncertainty about the size and location of the related credit losses led markets to dry up, asset prices to fall and, in the end, to contagion to an almost unimaginable number of markets and institutions across the world.

These adverse developments were compounded by the rise in inflation in many parts of the world in the second half of 2007 and in the first half of 2008. We discuss the surge in the prices of food, energy and other commodities and how it was transmitted to inflation. We review why industrialized countries generally experienced smaller increases in inflation than emerging markets countries. The sharp fall in energy prices and the intensification of the global economic slowdown since the summer of 2008 have reversed the situation, and at the time of writing inflation rates look likely to fall substantially during 2009, in some countries perhaps to levels very close to or even below zero.

Regarding the key issue of the underlying reasons for the crisis, we argue that, although macro factors were also present in the form of low interest rates and the associated attractiveness of leveraged positions, these were largely of a microeconomic nature. The latter led to excessive risk taking as exemplified by the relaxation of lending standards in the hope that risks could be easily transferred; the failure by originating banks to understand that risks sold to others could be returned; inadequate executive remuneration policies that rewarded excessively short-term profits; the opacity of complex structured finance products; the excessive reliance on ratings and the conflict of interests faced by rating agencies; and the massive reliance on short-term wholesale funding and the presumption that markets would always be liquid.¹ Furthermore, it is now clear that regulatory and supervisory frameworks were not effective in identifying and resolving the problems that were accumulating in the financial system.

Chapter 5 focuses on the challenges faced by policy-makers in general and central banks in particular. We first review standard challenges in the conduct of

monetary policy, such as differentiating between transitory and permanent shocks or responding to shocks that both depress growth and fuel inflation. We then discuss the 'zero lower bound' on policy interest rates, which has become highly relevant as many central banks have reached, or are near, this limit at a time of recession and rapidly falling inflation. While they still have tools to conduct monetary policy in such an environment, their task is made more difficult when the financial sector is under stress and economic uncertainty is high.

The disruptions in financial markets have also brought challenges for financial authorities into sharp focus. While compiling a detailed range of proposals exceeds the scope of our report, we identify major strategic issues that warrant attention. In particular, the maturity transformation between short-term liquid liabilities and long-term illiquid assets has broadened beyond depository banks, where it used to be concentrated, towards other actors such as investment banks heavily relying on short-term funding from money markets. The regulatory framework has failed to keep pace, exposing large swaths of financial markets to liquidity runs. The authority of regulatory agencies should extend to all agents engaging in liquidity transformation, since they are potential recipients of central bank liquidity, regardless of their specific form. The crisis has also highlighted potential conflicts of interests in financial institutions engaged in different lines of business, which regulators should take great care to tackle.

The crisis has also shown that monetary policy and financial regulation should not be conducted in isolation. For instance, a sustained period of low interest rates can fuel a search for yield by investors, calling for tighter financial regulation to prevent the buildup of imbalances and vulnerabilities. This aspect likely did not receive as much attention as it should have before the crisis. Financial regulators should also take the implications of their actions for the entire financial system, and the broader economy, into account, and not focus too narrowly on specific actors.

We end the report by summarizing our main conclusions for monetary policy. It seems clear that low inflation and the resulting low level of interest rates in many countries had the unintended side effect of inducing market participants to search for yield. In response, investors levered up their positions and purchased higher-yielding but riskier assets, which compressed risk spreads excessively. In turn these developments contributed to the crisis. Nevertheless, we firmly believe that price stability must remain the primary goal of monetary policy. In fact, the exceptional period of low and stable inflation and fast growth was mainly due to a greater focus on price stability in monetary policy and stronger policy frameworks, and thus provides suggestive evidence of the benefits of this policy.

While preventing financial crises should be a goal for policy in light of the fact that they can have very large economic costs, this is best achieved through financial regulation and supervision. Since low interest rates provide strong incentives to raise leverage and assume greater risk, the first-best regulatory and supervisory policy must be to take these effects into account through suitable built-in features such as, for instance, countercyclical capital ratios or forward-looking provisions.

However, if the regulatory and supervisory framework is inadequate for ensuring financial stability, central banks need to take this into account when setting policy since they naturally care about both price stability – which is their primary objective – and financial stability. This is the case for all central banks irrespective of their regulatory and supervisory responsibilities, as is demonstrated by the pro-

lification of financial stability reports produced by central banks and by the statutory assignment to them of certain tasks in this area (e.g. contributing to the smooth function of the financial system).

Other more controversial issues concern to what extent and how central banks should take into consideration financial stability when conducting monetary policy. Our view is that they should do so to a greater extent than was done in the past. This does not mean that central banks should add new goals for monetary policy. Nor does it mean that in setting policy central banks should target any specific asset price or level, but rather that they should be more willing than many might have been in the past to lean against large increases in credit and leverage. Indeed, if the horizon for price stability is sufficiently long (i.e. truly medium-term), monetary policy must take the risk of financial imbalances into account because financial instability can depress inflation below the central bank's objective over that horizon.

In sum, adding a clear macro-prudential dimension to financial regulation and supervision and introducing this perspective also in monetary policy can make the current policy frameworks more effective at delivering both price and financial stability, which are preconditions for sustained economic growth. While the practical difficulties of doing so must not be underestimated, we think this is an avenue worth pursuing.

2 Before the Storm: The Golden Years of Central Banking

This chapter reviews the main features that characterized the golden years of central banking that were interrupted, at least temporarily, in 2007. Our analysis proceeds in four steps, with the first two documenting the major patterns of the period. The first and most prominent feature is a prolonged time of low and stable inflation. Our emphasis on inflation is explained by the fact that the primary goal of monetary policy is to deliver price stability, which constitutes an essential pre-requisite for sustained economic growth. The second feature is the globalization of the world economy through more extensive international trade and financial linkages. We document it both through quantity measures of trade and financial flows and through price measures, stressing the convergence of interest rates towards lower values.

In our third step we assess the causes of the reduction of inflation, and ask whether they were linked to globalization. Our assessment from reviewing the extensive literature on the underlying causes of the reduction in inflation is that the focus of more independent central banks on price stability as the primary goal of monetary policy was a major force, albeit not the only one. The changes in the conduct of monetary policy in turn reflected, at a deeper level, a new political economy equilibrium characterized by the convergence of a supply of low inflation from policy-makers with a demand for low inflation from the public. Needless to say, understanding why these developments occurred is important when judging what inflation rates can be expected when the current financial crisis has settled.

Our final step focuses on the driving factors behind the broad reduction of real interest rates that we document to have taken place in this period. This has been the subject of extensive research that points to the ‘great moderation’ as an important cause, as stable growth and low inflation reduced risk premiums. While financial globalization also played some role, the evidence remains somewhat inconclusive.

The reader may be surprised that our list omits the profound transformation of financial markets that has been a major aspect of the global economic landscape in recent years. Far from considering this to be a secondary aspect, we regard it as highly relevant and discuss it at length in Chapter 3.

2.1 Inflation developments across the world

2.1.1 The reduction and stabilization of inflation

The evolution of inflation across a broad range of countries is documented in Figure 2.1, where we distinguish for clarity between geographical regions. We summarize the evidence for each region by presenting the median² inflation rate across the various countries (solid line), as well as the 25th and 75th percentiles (dotted lines) to illustrate the dispersion of inflation rates across countries.

Panel A shows the pattern of 22 industrialized economies from 1955 to 2008.³ We clearly see that before 1970 the median level of inflation was low and fairly similar across countries, with the interquartile range stable around 2–4%. The 1970s saw a dramatic change, as both the median level and international dispersion of inflation rose sharply. This was reversed from 1980 onwards, when inflation started to decline, reaching a low of 1.6% in 1999, with the dispersion narrowing substantially. At that time, it seemed plausible that certain industrialized countries might experience close to absolute price stability or even slip into deflation, and much attention was devoted to understanding what this new environment would imply for central banks' conduct of monetary policy.⁴ However, inflation did not fall further but generally stayed just above 2%, with a tight interquartile spread in the range of -1–3% until 2006. Inflation has since risen, as discussed in Chapter 1, in 2007 and the first half of 2008, and has fallen again subsequently.

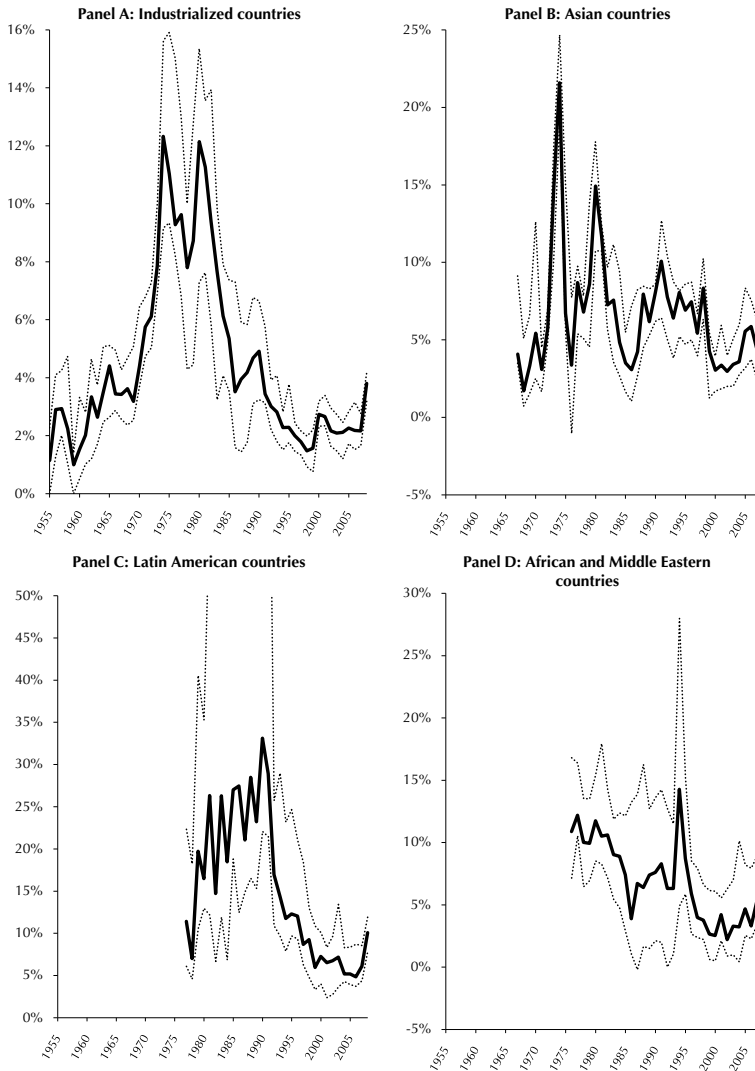
The pattern of inflation in emerging and developing countries is presented in Panels B–D for 10 Asian countries, 18 Latin American countries, and 29 African and Middle Eastern countries, respectively. Inflation has decreased and become less dispersed in Asia starting in the late 1990s, until the recent pickup (Panel B). While Latin America experienced high inflation, and even hyperinflation, in the 1980s, inflation has since fallen substantially and become less dispersed across the region (Panel C). A similar development took place in Africa and the Middle East, where the median inflation rate declined gradually over time and has stayed below 5% in the last decade, until the recent pickup (Panel D).

In addition to reaching a lower level from 1980 onward, inflation became more stable across the world. We measure the volatility of inflation by computing rolling ten-year standard deviations of inflation for the various countries in our sample. The median and 25th and 75th percentiles for this measure are shown in the four panels of Figure 2.2, which is constructed along similar lines to Figure 2.1. We observe that the level and volatility of inflation move together. Among industrialized economies (Panel A), inflation became more volatile in the 1970s and 1980s, with substantial heterogeneity across countries, and subsequently stabilized and became more uniform across countries. The evidence for emerging and developing economies also shows a clear reduction of inflation volatility, accompanied by a convergence across countries (Panels B–D).

This reduction of inflation volatility is part of a broader development in macroeconomics. Real variables have also become more stable, a phenomenon generally referred to as the 'great moderation'. In the United States, the volatility of GDP growth declined by half since the mid-1980s.⁵ This pattern is apparent in a broad

Figure 2.1 Inflation

Median and 25th and 75th percentile



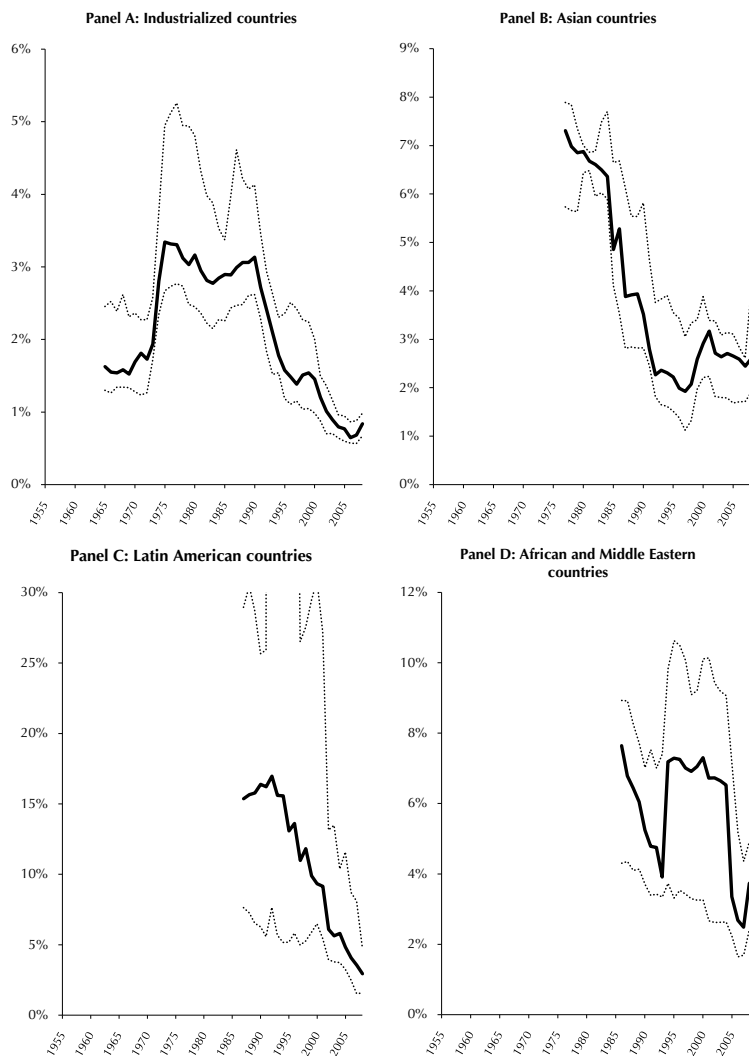
range of countries, as shown in Figure 2.3 which displays the median and 25th and 75th percentiles of ten-year standard deviations of GDP growth. Growth volatility has steadily declined among industrial countries since the first half of the 1980s (Panel A). No such trend is observed in Asian countries, where the crisis of 1997–98 led to sharp movements in GDP (Panel B). By contrast, the growth has become less volatile in Latin America (Panel C) and Africa and the Middle East (Panel D), even though it remains much more volatile than in the industrialized world.

Overall, the evidence shows a broad-based reduction in both the level and volatility of inflation in the last decade. Nonetheless, inflation in the 2–3% range remains, in general, a phenomenon mostly specific to advanced economies.

12 Are the Golden Years of Central Banking Over?

Figure 2.2 Inflation volatility, 10 years standard deviation

Median and 25th and 75th percentile

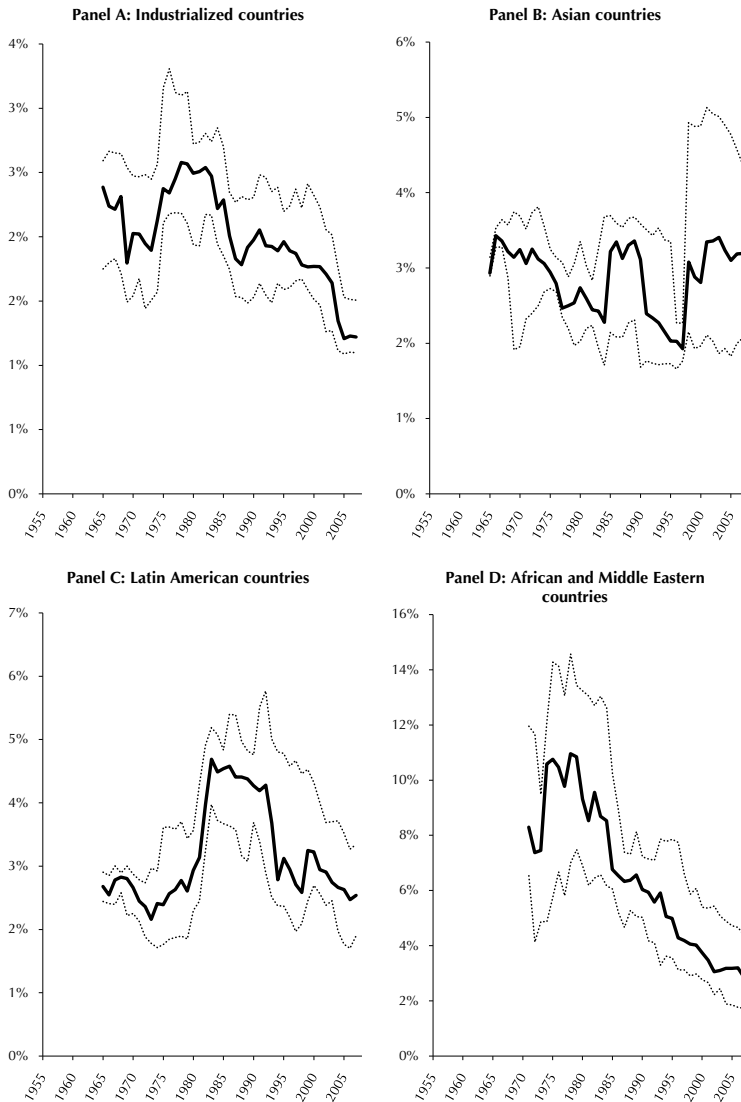


2.1.2 The persistence of inflation

In addition to the level and volatility of inflation, discussed above, its persistence is an important characteristic. This refers to the speed at which inflation reverts to its average level after an economic shock caused it to deviate from that level. The concept of persistence is relevant for monetary policy-makers because whether, and how strongly, central banks should react to shocks to inflation depends on whether they are expected to last. If inflation shows little persistence, a deviation from the average level is relatively benign as we can expect it to be short-lived. By contrast, a higher persistence implies that an increase in inflation away from its average will impose a cost on the economy over several periods, implying that the central bank should act forcefully to counter it. Furthermore, measures of the extent to which an increase

Figure 2.3 Growth volatility, 10 years standard deviation

Median and 25th and 75th percentile



in inflation is transitory may be helpful for understanding the sources of inflation. Thus, if shocks to inflation are transitory, then they are likely largely to reflect price level shocks and are thus of less concern to the central bank.

Assessing how persistent shocks to inflation are is not a straightforward task. In particular, estimating how long-lasting shocks are can be highly misleading if one fails to take account of occasional changes in the average inflation rate over time.⁶ To see this, suppose that central banks raised temporarily their inflation objectives, or became willing to tolerate a higher inflation rate for a few years, but that inflation did not become more persistent. The resulting increase in inflation could then be misinterpreted as a long-lasting deviation from the previous level of inflation (i.e.

a high level of persistence), instead of a temporary change in the average inflation rate. Specifically, we would observe an initial period of low average inflation (say 2%), with short-lived movements around this average, followed by a period of higher average inflation (say 3%), with equally short-lived fluctuations around the new average. An observer failing to realize that the average has changed would infer that there is a unique average inflation rate (2.5%) from which actual inflation differs over sustained periods, i.e. inflation is very persistent.

We study the persistence of inflation in 23 industrialized countries since 1965, with Box 2.2 describing the results in detail.⁷ Our measure of persistence can be expected to fall between zero and one, with a higher value showing greater inflation inertia.⁸

The results are presented in Figure 2.4, with a detailed exposition in Table 2.1. We first estimate inflation persistence for each country individually, and then average the results. The first column of Panel A shows that over the full sample inflation displays a substantial degree of persistence. This estimate, however, overlooks the shifts in average inflation since the early 1960s that we documented in Figure 2.1. We address this issue by splitting the sample into four subperiods, corresponding to different average inflation rates. The last four columns in Panel A show that this reduces our estimates of persistence, which range from 0.4 to 0.6, compared to 0.85 over the full sample.⁹

Figure 2.4 Persistence of inflation

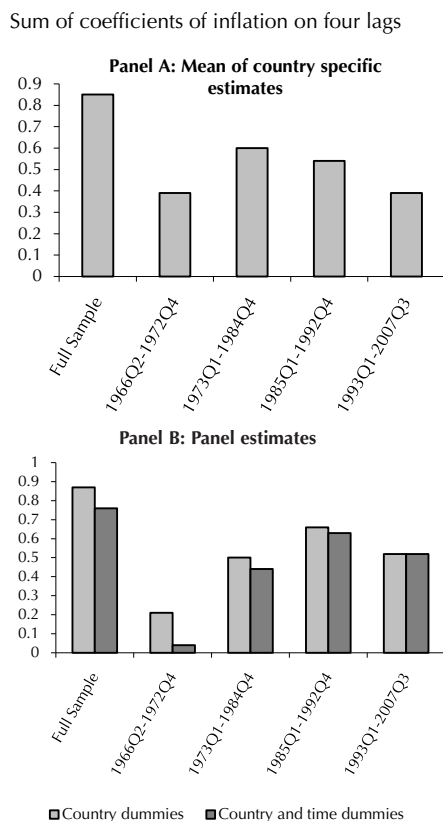


Table 2.1 Estimates of the average rate, and persistence, of inflation

	Full sample			1966Q2–1972Q4			1973Q1–1984Q4			1985Q1–1992Q4			1993Q1–2008Q1		
	Mean	SE	AR	Mean	SE	AR	Mean	SE	AR	Mean	SE	AR	Mean	SE	AR
Australia	5.8	1.6	0.86	0.06	4.3	1.0	0.55	0.30	10.1	1.4	0.60	0.19	5.0	3.3	0.84
Austria	3.4	0.9	0.87	0.06	2.6	2.5	1.20	0.31	5.5	1.0	0.71	0.16	2.6	0.6	0.64
Belgium	4.3	1.1	0.89	0.05	5.5	3.1	0.83	0.25	7.3	1.2	0.74	0.12	2.5	0.5	0.60
Canada	4.4	1.3	0.89	0.05	3.9	0.3	-0.05	0.36	8.3	1.1	0.74	0.13	4.0	0.4	0.28
Denmark	5.0	1.3	0.78	0.08	6.3	1.0	-0.12	0.46	9.5	0.8	0.21	0.26	3.1	0.6	0.29
Finland	5.4	2.0	0.91	0.04	5.5	1.0	0.23	0.32	10.3	2.0	0.80	0.12	4.1	0.8	0.66
France	5.1	2.1	0.94	0.03	6.3	1.7	0.77	0.20	10.0	0.8	0.63	0.15	3.0	0.4	0.51
Germany	3.0	0.7	0.86	0.06	na	na	1.00	0.19	4.1	1.0	0.78	0.12	2.2	1.0	0.77
Greece	10.4	2.7	0.88	0.05	2.4	0.7	0.09	0.38	17.1	1.3	0.33	0.17	16.4	1.2	0.40
Iceland	7.1	2.5	0.88	0.06	7.7	1.5	0.34	0.40	13.4	1.9	0.55	0.21	3.2	0.4	0.51
Ireland	6.8	2.4	0.92	0.03	4.7	3.0	0.85	0.25	14.4	0.9	0.40	0.16	5.5	0.8	0.72
Italy	3.1	1.7	0.86	0.05	5.5	0.4	-0.26	0.42	6.9	2.8	0.77	0.12	1.5	0.7	0.55
Japan	4.0	1.1	0.87	0.05	4.5	1.2	0.50	0.37	6.8	1.2	0.74	0.14	2.2	0.9	0.59
Luxembourg	3.5	0.7	0.55	0.09	2.5	0.4	-0.72	0.40	5.7	1.7	0.59	0.15	1.5	0.5	-0.36
Netherlands	3.7	1.0	0.86	0.06	5.8	0.8	0.06	0.38	5.0	1.9	0.85	0.11	1.5	1.1	0.77
New Zealand	6.6	1.8	0.86	0.05	6.2	1.0	0.38	0.30	12.4	1.1	0.68	0.10	6.3	3.4	0.67
Norway	5.2	1.2	0.80	0.07	6.0	1.2	0.17	0.39	8.7	1.0	0.56	0.19	4.0	2.5	0.84
Portugal	10.4	2.7	0.80	0.07	8.2	0.9	-0.09	0.34	20.3	1.4	-0.1	0.27	9.5	1.6	0.61
Spain	7.4	2.9	0.93	0.04	6.2	1.5	0.58	0.28	14.7	1.4	0.60	0.17	6.0	0.8	0.52
Sweden	5.1	1.5	0.85	0.06	5.1	2.0	0.70	0.28	9.3	0.6	0.26	0.22	5.8	1.3	0.54
Switzerland	2.9	0.8	0.84	0.06	5.2	2.2	0.82	0.20	3.9	1.5	0.75	0.14	3.2	1.2	0.78
UK	6.0	2.0	0.88	0.05	7.1	1.7	0.66	0.23	11.3	2.6	0.73	0.14	4.8	0.7	0.42
US	4.7	1.0	0.87	0.05	4.5	0.6	0.55	0.25	7.5	1.4	0.78	0.11	3.8	0.5	0.36
Mean	5.4		0.85		5.3		0.39		9.7		0.60		4.4		0.54
Std deviation	2.1		0.08		1.5		0.46		4.2		0.23		3.2		0.26
Panel (a)			0.87	0.01			0.21	0.07	10.1	1.4	0.60	0.19			0.66
Panel (b)			0.76	0.01			0.04	0.07	5.5	1.0	0.71	0.16			0.63

Notes: Standard errors in italics. Panel (a): Regressions include country dummies. Panel (b): Regressions include country and time dummies.

A closer look reveals that the persistence of inflation moves together with its level, documented in Figure 2.1. The increase in the level inflation in the 1970s was accompanied by an increase in persistence. Inflation remained persistent over the late 1980s, even when its level was decreasing. After 1993, the persistence declined to the low level of the 1960s.

We check the robustness of our results by estimating the persistence over the entire panel of countries (Panel B). The picture remains broadly unchanged under this alternative procedure, both when we control for country-specific effects (light grey bars) and country and time-specific effects (dark grey bars).¹⁰ One difference between the two panels is that the recent decrease in persistence is smaller when estimated with a panel procedure.

Table 2.1 presents the results for the entire sample, as well as for each sub-period. Each panel shows results for individual countries, as well as the average and dispersion across countries. The first two columns show the average and standard deviation, respectively, of the inflation rate. We measure persistence by regressing inflation on four lags, and the sum of the coefficients is shown in the third column, with the last column giving the standard error. We also report the estimated persistence from panel estimates.

Our results are compatible with the analysis of Altissimo et al. (2006) that focuses on countries in the euro area under the ECB Inflation Persistence Network project. As in our approach, they stress the need to account for breaks in the inflation process to prevent obtaining spurious estimates of high persistence.

2.2 Trade and financial globalization

Another major development in the global economy over the last 20 years has been the growing integration of countries into the world economy, both in terms of trade flows and, in particular, financial flows and holdings. As detailed below, the median ratio of cross-border assets and liabilities to GDP more than doubled in industrialized economies since the mid-1990s.¹¹ In addition, financial integration has proceeded at a faster pace than trade integration. Emerging economies have also experienced a substantial, albeit more moderate, increase in their external assets and liabilities. For these countries, trade and financial integration have moved in steps.

In this section, we review the evidence of trade and financial globalization in terms of quantities, such as trade flows and international holdings of financial assets. We then review the evidence in terms of prices, such as interest rates. The section ends with an assessment of integration through migration.

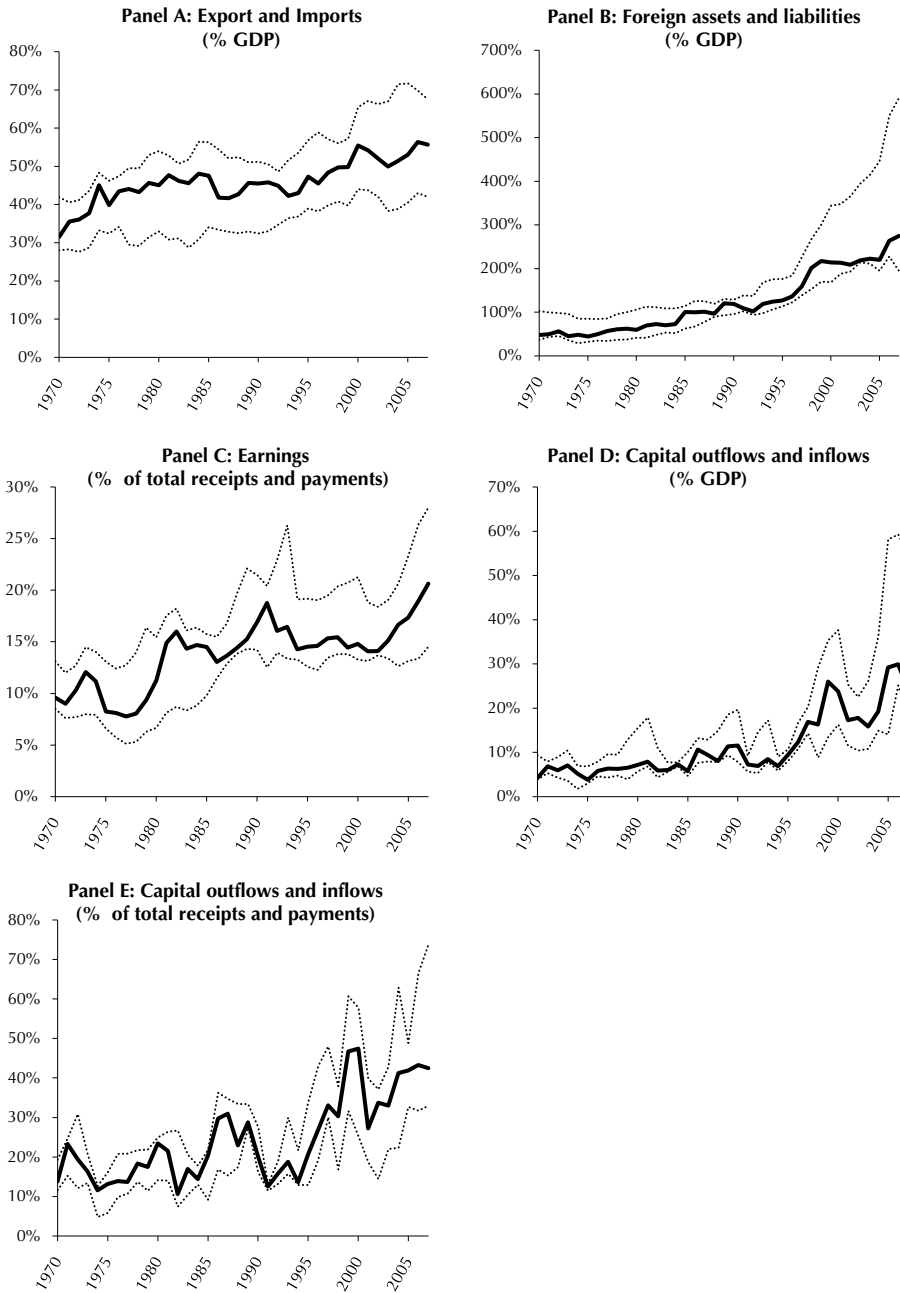
2.2.1 Quantity measures of international integration

We illustrate the pattern of globalization along several complementary dimensions for a broad range of countries from 1970 to 2007.¹² Our sample includes nine industrialized economies (Figure 2.5) and 12 emerging markets (Figure 2.6).

Trade

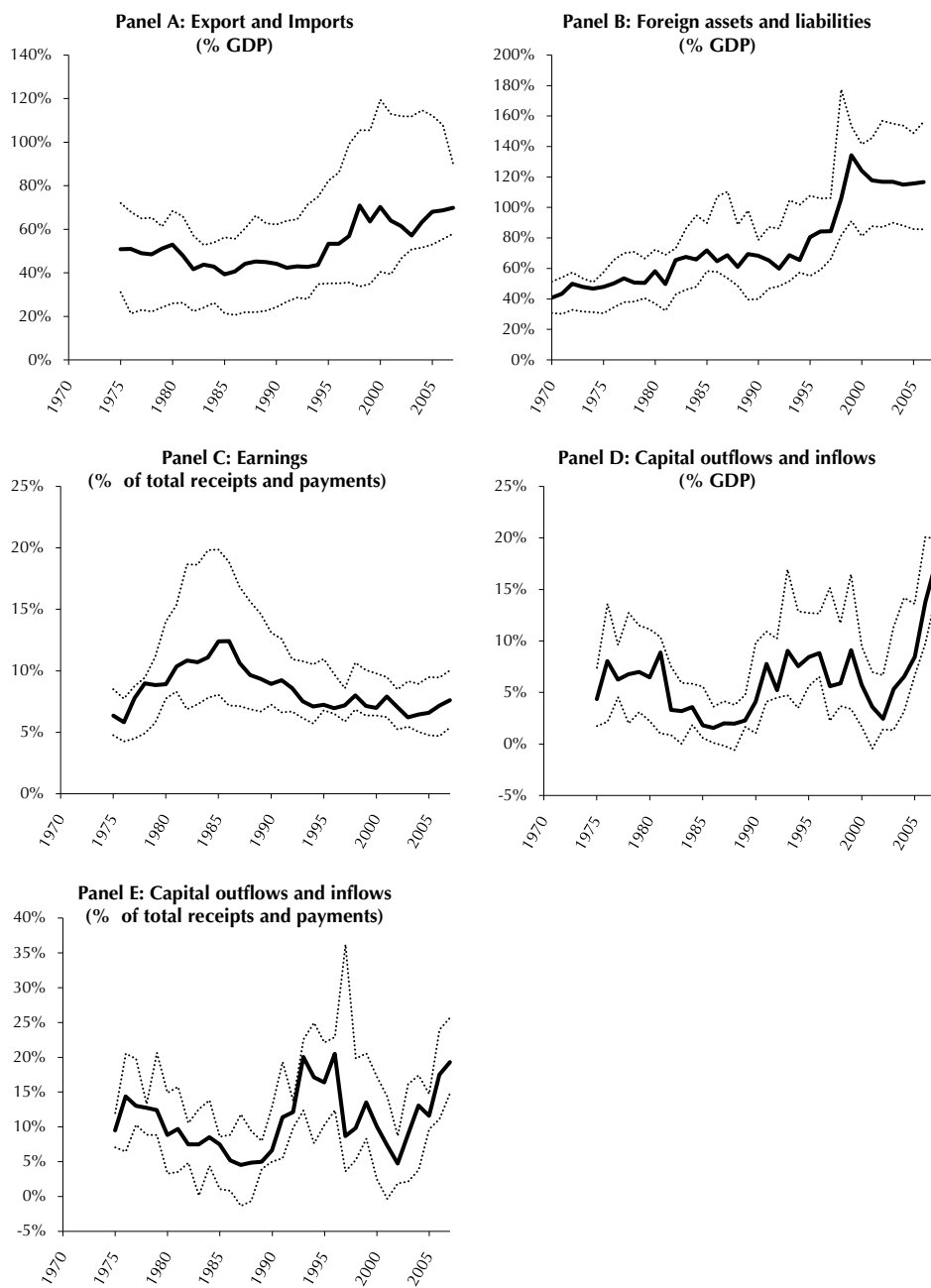
We first assess the evolution of trade integration, which we measure by taking the sum of exports and imports, relative to GDP. This measure is presented in Panel A

Figure 2.5 International integration in industrialized countries
Median and 25th and 75th percentile



18 Are the Golden Years of Central Banking Over?

Figure 2.6 International integration in emerging markets
Median and 25th and 75th percentile



of Figures 2.5 and 2.6. Instead of detailing the evidence for specific countries, which can show a substantial heterogeneity, we focus on broad patterns. Specifically, we present the median value as well as the 25th and 75th percentiles.¹³

Among industrialized countries, trade globalization has increased steadily since the 1970s, with higher trade flows relative to GDP. This development has been gradual and did not accelerate in recent years. Among emerging markets trade integration showed little trend until the mid-1990s, but has since risen substantially.¹⁴ The median trade integration was broadly similar in industrialized and emerging economies until the mid-1990s, but has since picked up in emerging markets. The situation is also more heterogeneous among the emerging markets in our sample, as shown by the wider interquartile range relative to industrialized economies.

International assets and liabilities

We consider three manifestations of financial globalization. The first is in the size of cross-border financial holdings. We measure it by taking the total value of assets held by a country's residents abroad and of liabilities of the country to foreign residents, relative to GDP. This measure is presented in Panel B.

Compared to trade globalization, financial globalization is a more recent phenomenon, and became increasingly important from about the mid-1990s onwards. Among industrialized countries, the median value of holdings more than doubled from 127% of GDP in 1995 to 274% in 2007. Emerging markets economies, by contrast, have experienced a more moderate increase, with the value of holdings to GDP remaining at around 120%, well below that in industrialized countries.¹⁵

Earnings on foreign assets

The second dimension of financial integration captures the earnings on external assets and liabilities. Dividend and interest earning flows enter the current account, in addition to trade flows. The balance on earning streams is sizeable in many countries, in particular in Japan, Switzerland and the United Kingdom, reaching a magnitude that is similar to – or in excess of – the trade balance. While net earnings are much smaller elsewhere, including in the United States, they can still play a substantial role in gross terms.¹⁶ Dividing the current account between trade flows and earning streams is relevant as the latter are substantially more volatile than the former. A larger role of earning streams then tends to make the current account more sensitive to developments in financial markets. We measure this aspect by taking the sum of interests and dividends received and paid, and scale them by the total value of trade flows and earning streams. The results are shown in Panel C.

Among industrialized economies, the rise in the value of external assets and liabilities (Panel A) has translated into a growing role for earning streams in the current account, with our measure doubling since the 1970s. While the situation was stable through the 1980s and 1990s, this hid the offsetting impact of rising holdings (Panel A) and the steady reduction in nominal yields that reflected lower inflation and lower real returns, as discussed later. Since the early 2000s, the reduction in nominal yields tapered off¹⁷ and the rising values of assets and liabilities have translated into a sharp increase in the role of earnings.

Emerging countries show a different pattern. Earnings streams played a big role in the early 1980s, mostly because of large payments on external debt. Their role

has since gradually decreased. This decrease, however, hides a substantial shift. While the high earning streams of the early 1980s reflected interest payments to foreign creditors, emerging countries have since tended to reduce their liabilities and increase their assets. With a substantial share of assets taking the form of foreign exchange reserves in safe assets with relatively low yields, earning streams have not picked up substantially.

International capital flows

The third dimension of financial globalization is cross-border capital flows. We measure these by taking the total value of outflows and inflows in the financial account, scaled by GDP. The results are shown in Panel D. We also contrast financial flows with gross receipts and payments in the current account (the total value of trade flows and asset earnings). This allows us to assess whether the two sides of the financial account moved in line with the two sides of the current account, or whether financial integration proceeded at a faster pace. The values are presented in Panel E.

Industrialized economies have witnessed a surge in international capital flows, which more than doubled as a share of GDP since the early 1990s. The pickup in capital flows also exceeded the rise in trade and earning flows. While financial flows accounted for 20% of trade and earning flows in 1990, the share has since doubled.

By contrast, there is little evidence of a surge in capital flows for emerging markets economies until recently. Note that this can hide a substantial shift in the nature of capital flows. Many emerging markets economies changed from being recipients of funds to providers of funds, mainly through an accumulation of external reserves. Such a large shift in net financial flows can have little impact on gross flows, with large inflows being replaced by large outflows. A similar pattern is observed when scaling capital flows with trade and earning flows.

Overall, the evidence presented in this section shows that the pickup in globalization among industrialized countries over the last ten years is predominantly a financial phenomenon, leading to larger capital flows, asset holdings and earning streams. By contrast, the evidence for emerging economies shows a more prominent role of real integration through trade flows since the mid-1990s. Continued financial globalization therefore seems likely.

2.2.2 Price measures of international financial integration

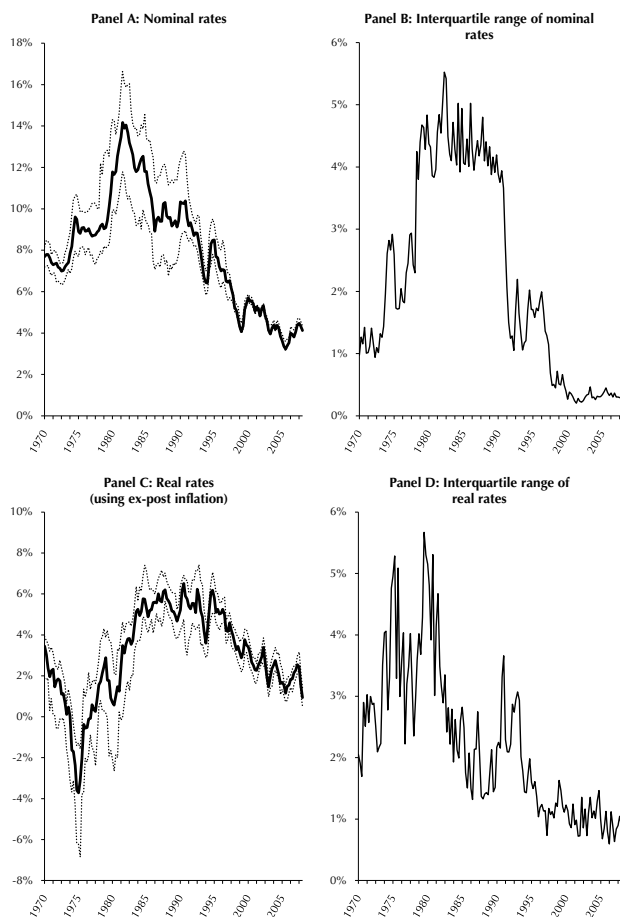
We complete our above analysis of quantity measures of integration by reviewing price measures. The growing integration in financial markets can be expected to lead to a convergence in the return on comparable assets in different countries, as investors have more opportunities to arbitrage across countries.

Long-term interest rates

We start with an analysis of long interest rates, captured by the yield on ten-year government bonds for a range of industrialized countries (Figure 2.7).¹⁸ Panel A presents the evolution of these interest rates, showing the median and the 25th and 75th quartiles to give a sense of the heterogeneity across countries. Nominal yields rose in the 1970s, as inflation was increasing. They peaked at around 14% in 1982, and have since steadily come down to a low of 4%.

Figure 2.7 Long interest rates

Median and 25th and 75th percentile



The international dispersion of interest rates is measured by the interquartile range (Panel B). While the dispersion remained high throughout the 1980s, at close to 5 percentage points, we observe a substantial international convergence in the first half of the 1990s with the range dropping to half a percent by the end of the decade.

It is important to bear in mind that a convergence of nominal interest rates across countries does not necessarily reflect financial integration but can be simply driven by a convergence of inflation rates. We assess this by computing real interest rates. Specifically, we measure real rates as the difference between the nominal rate and realized inflation. Our measure thus differs from the theoretical concept that relies on expected inflation.¹⁹ While the cross-country differences in real interest rates can be affected by trends in the real exchange rate, in which case a convergence in real interest rates does not necessarily reflect financial integration, this is unlikely to be a major issue among industrialized countries.²⁰ We therefore take the convergence of real interest rates as primarily reflecting financial integration.

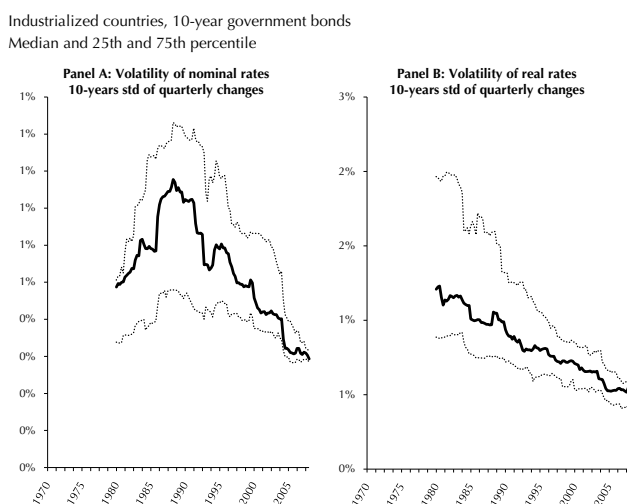
The level (median and quartile) and interquartile range of real interest rates are presented in Panels C and D respectively, which are similar to Panels A and B for nominal rates. Real interest rates were low until the early 1980s, and then increased quickly to 6% by 1985, staying at this high level until the mid-1990s.

Two phases of the behaviour of real interest rates are apparent. We first observe convergence in the first half of the 1980s, reflecting the fact that most central banks chose a tight stance of monetary policy in order to reduce inflation to the level observed before the sharp increases in the 1970s. The dispersion increased somewhat in the later part of the decade, as the tightening of monetary policy proceeded at different paces in different countries. This was followed by a substantial convergence in the mid-1990s, with the interquartile range remaining stable just below one percentage point.

There is thus evidence that some of the convergence of nominal interest rates in the late 1980s primarily reflected a convergence in inflation rates. However, that is not the only factor at play, as we also observe a clear convergence of real interest rates throughout the sample, pointing to growing financial integration.

Another potential indicator of financial globalization is the volatility of interest rates. A broad pool of international investors in a particular country's asset market enhances its liquidity, thereby limiting its volatility. Interest rates have indeed become less volatile, as illustrated in Figure 2.8, which shows rolling standard deviations of quarterly changes in interest rates, both in nominal (Panel A) and real (Panel B) terms. Nominal rates first became more volatile in the 1980s, before stabilizing substantially. Real rates by contrast show a steady trend towards reduced volatility. This pattern was observed across the board, with the dispersion of volatility across countries coming down noticeably throughout the sample.

Figure 2.8 Volatility of long interest rates



Short interest rates

The pattern documented for long interest rates is also observed at the short end of the yield curve. The level and interquartile dispersion of three-month interest rates is shown in Figure 2.9, which is constructed in the same way as Figure 2.7. Nominal rates steadily decreased in the early 1980s (Panel A), with the cross-country dispersion falling in the early 1990s (Panel B). Real interest rates rose through the 1980s, before turning around to reach low values in the last decade (Panel C). The international dispersion of short interest rates gradually decreased throughout the sample (Panel D).

As is the case for long interest rates, short interest rates have also become more stable, both in nominal terms (Figure 2.10, Panel A) and in real terms (Panel B). This development was broadly based with the interquartile ranges falling sharply.

Figure 2.9 Short interest rates

Industrialized countries, three-month government bonds
Median and 25th and 75th percentile

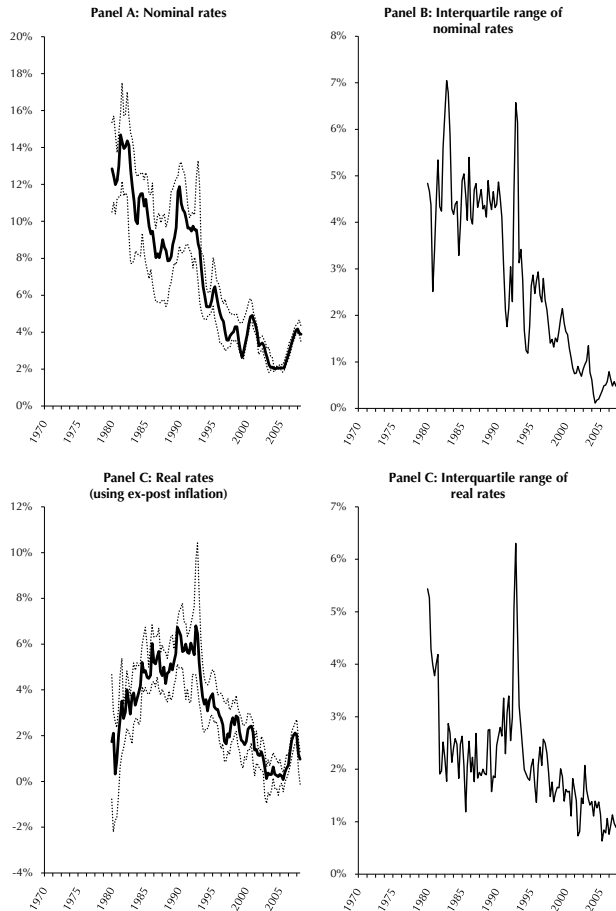
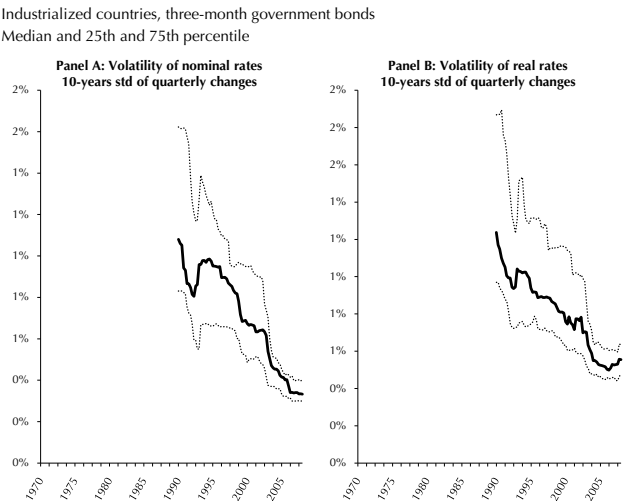


Figure 2.10 Volatility of short interest rates



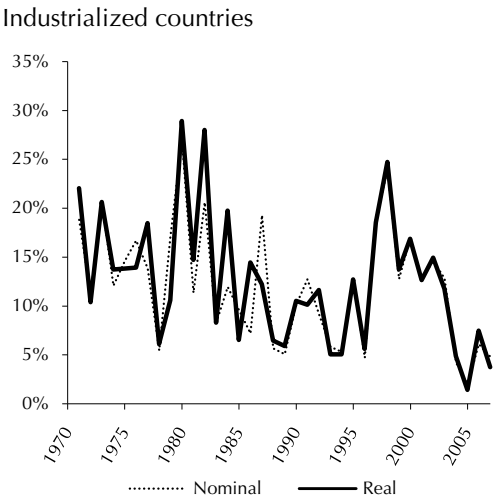
Equity returns

We complete our analysis by looking at the return on equities for nine industrialized countries. We focus on the interquartile dispersion of annual rates of returns for brevity. The evidence shows a convergence of returns across the various countries both in real and nominal terms (Figure 2.11). A fair amount of heterogeneity nonetheless remains, and the trend is not uniform, with an increase in dispersion from 1996 onwards.²¹

Overall assessment

Our results are compatible with other contributions that find evidence of growing international financial integration. For instance, the gap between onshore and off-shore interest rates for similar assets fell in the early 1980s and remained very

Figure 2.11 Interquartile range of equity returns



small and stable since then. The returns on European equity markets have also become closely integrated in the mid-1990s.²² In addition, the correlation of stock and bond returns across countries has increased since the mid-1990s and there is some evidence that the volatility of interest rates and equity returns declined over the last two decades (disregarding the most recent developments).²³

2.2.3 International migration

The evidence presented above points to heightened integration in terms of productive capital. While labour is much less mobile than capital, international migration offers an additional channel of integration.

Migration to industrialized countries has clearly risen in recent years. The median share of foreign-born workers in the labour force in industrialized economies rose from 3.4% in 1995 to 5.6% in 2004, with several countries experiencing increases exceeding 4 percentage points.²⁴

2.3 How was inflation brought down?

The first section of this chapter documented a substantial decline of inflation across the industrialized world and beyond since the early 1980s.

We next assess the reasons behind this reduction in inflation. Over the medium-run, inflation is primarily a monetary phenomenon. This does not mean that non-monetary factors, such as fiscal deficits, do not matter, but that any impact of non-monetary factors on medium-term inflation must be through affecting the medium-term stance of monetary policy. Other than through the above channels, non-monetary factors should have no medium-term impact on inflation. However, a series of persistent shocks can have a temporary, although persistent impact on inflation through both direct and indirect channels.

We first assess the role of fiscal policy, globalization, and shocks to the terms-of-trade, which are all non-monetary factors. While it is difficult to determine with any precision the relative importance played by different factors in the reduction of inflation, our assessment is that the influence of non-monetary factors was significant although limited. We then review the sizeable changes in the framework under which central banks operate, and argue that they are likely to have been the major reason for the reduction in inflation.

These changes in the central banks' monetary policy frameworks were in turn not exogenous but reflected a new political economy equilibrium characterized by increased social demand for, and supply of, low inflation. In terms of the supply of low inflation, central banks have developed over time a much better understanding of the nature of inflation, as well as of how monetary policy impacts on wage setting and on the price formation of firms. In terms of demand, following the episode of large and volatility inflation in the 1970s, there was great public demand for a reduction in inflation. While the resulting change in the conduct of monetary policy had a large and highly desirable impact in terms of lower and more predictable inflation, it seems to have led many observers to develop the too optimistic view that central banks had become capable of controlling inflation almost perfectly. Nevertheless, it should be recalled that since monetary policy

does fully influence the price level only at a time horizon of 12 or 18 months, central banks are not always able to rapidly offset price level shocks. Their strong track record of controlling inflation thus set the stage for the public to be surprised when oil, food and other commodity prices rose precipitously in 2007–8. This surprise may have been one factor exacerbating the great uncertainty in financial markets at that time.

2.3.1 The role of non-monetary factors

Fiscal policy

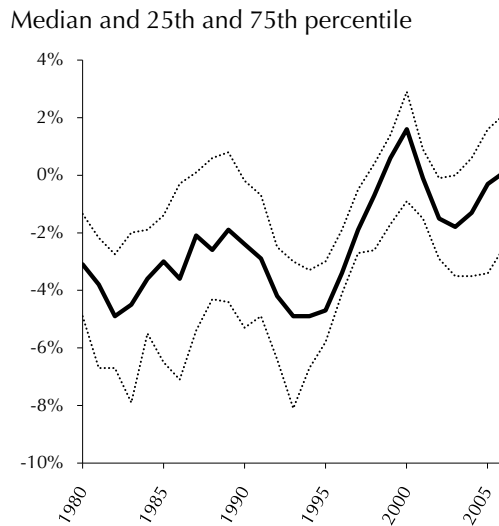
A government that faces difficulties in raising taxes and borrowing can be tempted to put pressure on the central bank to help finance its spending. This can take less obvious forms than direct deficit financing by the central bank. For instance, the government can ask the central bank to extend credit to loss-making public enterprises, pressure it to keep interest rates low to ease the servicing of public debt, or request it to be the residual buyer at primary auctions of government debt. There is much evidence that fiscal dominance played a crucial role in many historical episodes of high inflation. Indeed, hyperinflations, such as those in Germany and elsewhere in Europe in the 1920s, have been typically triggered by large public deficits.

A large stock of public debt can also influence inflation, even in the absence of any *current* central bank credit expansion to the government. In a situation of fiscal dominance, with a given path of fiscal deficits, the central bank's ability to control inflation is limited by the need to let money growth evolve in a way compatible with fiscal deficits. In particular, tighter monetary policy now, which leads to higher interest rates and public debt servicing costs, may lead to more expansionary monetary policy in the future.²⁵

Empirical studies have generally found strong links between governments' fiscal positions and inflation rates.²⁶ For instance, inflation is higher in countries with a high ratio of public debt to GDP, or with a large informal sector that can avoid formal taxes but not the inflation tax. The role of fiscal deficits in episodes of very high inflation is also well known.

While fiscal considerations clearly mattered in the past, and still do in some cases, they are unlikely to be able to account for the recent experiences of the industrialized economies. First, the link between fiscal deficits and inflation has been cut by the introduction of legal restrictions on central banks' ability to purchase public debt and lend to the government and government-owned enterprises, and by making the central bank legally independent. Such restrictions are, for instance, explicit in the euro area.²⁷

Second, while inflation has decreased since the early 1980s (Figure 2.1), fiscal consolidation in industrialized countries occurred nearly a decade later; that is, somewhat after the process of granting independence to central banks started in earnest. Using data for industrialized economies,²⁸ the median fiscal balance as a share of GDP remained in deficit until the mid-1990s, and significant fiscal consolidation occurred only after 1995 (Figure 2.12 shows the median and 25th and 75th quartiles). Fiscal considerations thus appear unable to account for the reduction in inflation in developed economies.

Figure 2.12 Fiscal deficits

Globalization

Our analysis of the role of globalization proceeds in two steps. We first look at the potential ‘permanent’ channels through which globalization can influence inflation by changing the incentives of central banks to pursue more or less expansionary monetary policies. We then turn to more direct temporary, although possibly persistent, channels through imported disinflation/inflation.

As documented above, globalization has been a major driver of change in the world economy. It has long been recognized that an economy’s openness can impact on inflation. Central banks that conduct monetary policy in a discretionary fashion run the risk of adopting a too expansionary policy stance in order to boost economic activity, leading to higher steady state inflation.²⁹ Openness weakens this mechanism by reducing the effective extent of price stickiness as import prices move in response to exchange rate fluctuations, while domestic prices and wages are typically fixed for at least some period of time. A monetary expansion then has a larger immediate impact on inflation and a smaller impact on real variables, thereby reducing the central bank’s incentive to inflate.

A complementary mechanism operates through competition, which can be enhanced by the presence of foreign competitors. Globalization may thus lead to more competition and more flexible prices, reducing the ability of a central bank to boost real activity through unexpected shifts in monetary policy, limiting its incentive to inflate and lowering average inflation rates.³⁰

Globalization could also have reduced inflation by lowering the bargaining power of price and wage setters. When firms or workers in some sectors have strong pricing power, they may raise their price relative to the rest of the economy. The central bank could be induced to temporarily offset this by adopting an expansionary stance to boost the price level in the rest of the economy, a policy that can only have a temporary impact on relative prices. Any development that reduces the pricing power of the monopolistic sector, such as exposure to foreign

competition, then feeds into lower inflation. While this effect is at best temporary, a series of such shocks can lower inflation in quite a protracted manner.

Large immigration flows can impact on inflation through wage moderation, as workers have less leeway to push for higher wages when they face competition from immigrants. While this effect is temporary, if immigration increases for a number of years, the net effect may be a reduction in inflation for an extended period. Although the impact is clear in theory, its empirical relevance is limited and disputed. In particular, it is not clear that immigration lowers the wages of native-born workers,³¹ and possible adverse effects are of a relatively moderate magnitude. The lack of a sizeable impact of immigration suggests that employers respond by adopting production processes that are more labour-intensive.

Immigration is the most immediate channel through which the bargaining power of labour is affected, but it is not the only one. The integration of countries with large populations into international trade boosts the effective worldwide labour supply even without any migration flows. The global labour supply, controlling for the various countries' integration in international trade, has indeed quadrupled since 1980, reflecting largely the entry of Asian economies into world trade. This development has been accompanied by a reduction of the share of national income paid to labour in industrialized countries, especially in countries with more rigid labour markets. While this decline is seemingly strong evidence of a causal link, recent decades have also witnessed substantial technological change, such as the widespread introduction of information technology, that has reduced the demand for unskilled labour. There is evidence that the contribution of technological change has slightly exceeded that of labour globalization in accounting for the decrease in the labour share of output in industrialized economies.³²

Overall, we interpret the evidence as suggesting that immigration has had a limited impact on wage pressures and thus on inflation. While the magnitude of this channel remains relatively unexplored across countries, some studies shows that it can be nevertheless sizeable in those countries that experienced large immigration flows.³³

An additional channel operates at the level of individual firms, and relies on the fact that only the most productive firms export.³⁴ Higher competition from foreign producers reduces the pricing power of existing firms, leading to lower prices and higher average productivity as marginal firms exit the market. The ability of globalization to affect inflation durably through this channel is however limited, as domestic firms may establish operations abroad where competition is relatively less intense, thereby reducing the extent of domestic competition. In addition the mechanism affects the price level, but not the average inflation rate over some period of time. Furthermore, globalization raises the monopoly power of domestic firms by giving them access to foreign markets, leading to higher domestic prices. The net impact of globalization through the mix of firms operating in the domestic market is thus ambiguous.

The empirical evidence on the role of globalization in the reduction of inflation remains inconclusive. A first problem is that globalization and inflation did not move in step. The episode of high inflation that started in the mid-1970s and ended about a decade later was followed by a sustained period of low inflation (Figure 2.1). The increase of trade openness among industrialized economies since the early 1970s, however, took place at a steady pace (Figure 2.5). It is possible that the steady increase

in trade integration hides substantial shifts in the trade pattern with a growing role of low-cost emerging markets in recent years (Pain et al. 2006). This does not solve the timing issue however, as the rising integration of low-cost producers in the world economy took place in the 1990s, after inflation had already decreased to low levels. Similarly, the increase in financial integration (Figure 2.5) took place fairly recently.

Another factor casting some doubt on the role of globalization is the limited extent to which low-cost producers compete with firms in industrialized economies. With emerging markets and industrialized economies specializing in the production of different types of goods, the impact of globalization on competition need not be high. Finally, trade integration was on the rise in the 1970s, even though inflation surged at that time.

Furthermore, while it is true that the emergence of large scale producers of manufacturing goods such as China and India has led in recent years to lower import prices in advanced economies, those effects have been overall rather limited and persistent, but by no means permanent. Cheaper imports from low cost countries are estimated to have lowered inflation in industrialized economies by between 0–0.25% per year since 2000, with a slightly lower impact in the aftermath of the Asian crisis.³⁵ The limited magnitude of the reduction in inflation reflects the fact that the United States and the euro area are relatively closed economies. The impact is also likely to be short-lived. Overall, the impact of improved terms-of-trade on US inflation has been small.³⁶ In sum, we are very doubtful that globalization has been the main force behind the moderation of inflation. Indeed, we are not aware of any formal evidence tying the decline in steady-state inflation rates to globalization. Still, it is fair to say that globalization has overall probably helped the disinflationary process until very recently by providing a favorable backdrop to the pursuit of monetary policies aimed at price stability, thus making their task easier.

We conclude with a word on financial globalization. The impact of greater financial market integration on the inflation process remains unclear but it seems likely that greater capital mobility exerts a ‘disciplinary’ effect on countries with bad economic policies, providing strong incentives for central banks to reduce inflation. Financial globalization also enables domestic investors to invest abroad instead of holding domestic government debt, putting pressure on governments to market their debt rather than forcing the central bank to purchase it. In addition, globalization gives government access to deep world financial markets, thereby reducing the need to rely on the inflation tax. Overall, we hypothesize that financial globalization may have helped support anti-inflationary policies, even though it may not account for the initial adoption of such policies.

Favorable shocks

Another potential explanation for the decline in inflation is the ‘good luck’ hypothesis according to which the decline in inflation is due to favorable shocks, such as improvements in the terms-of-trade that reduced the price of imported goods.³⁷ While movements in the terms-of-trade are obviously related to international trade, we consider them to be distinct from the earlier discussion on globalization. Specifically, our discussion above asked whether changes in the magnitude of international trade and financial linkages could be linked to inflation. Here, by contrast, we focus on how movements in international relative

prices, for a given extent of international linkages, matter. The oil shocks of the 1970s for instance constitute an example of the latter aspect.³⁸ Movements in the terms-of-trade prices can trigger 'second-round' effects by forcing domestic producers who face a loss of market share as consumers shift towards imports to cut their prices, and by influencing inflation expectations and wage demands, leading to broad effects on the entire price structure of the economy.

It is important to remember that terms-of-trade fluctuations constitute shocks to the price level. As such they do not have permanent effects on the rate of inflation unless they induce policy-makers to change their objectives for inflation. In sum, while there is evidence that declining import prices have reduced inflation, the impact is small and transitory, but possibly persistent.

An indirect effect at best

Our overall assessment is thus that non-monetary factors played at most a secondary role in the reduction in inflation since the mid-1980s. While non-monetary developments *per se* are unlikely to affect steady state inflation, they could have given central banks an opportunity to gear monetary policy towards keeping inflation low. For instance, lower import prices may have led to a temporary decrease in inflation. This gave central banks a window of opportunity to cement these inflation gains, which could have proved politically difficult otherwise because of the cost in terms of economic activity. By providing a favorable backdrop, even a temporary one, that permitted central banks to reduce their inflation objectives, non-monetary factors may have made 'opportunistic disinflation' possible.³⁹

2.3.2 The role of monetary policy

The framework of monetary policy has evolved substantially since the early 1980s in three main ways: the widespread introduction of central bank independence, the enshrinement of price stability as the primary goal of monetary policy, and the adoption of more transparent and effective policy frameworks.

Central bank independence

Our discussion above of fiscal factors highlighted the adverse consequences for monetary policy of having the central bank subordinated to the government. Indeed, there is considerable evidence that greater central bank independence is associated with lower inflation with no loss of real economic growth, which is why many countries have been keen to adopt this strategy.⁴⁰ Many, if not most, industrialized economies have explicitly placed the central bank outside the realm of the executive branch. Even in countries where no formal change in legislation has taken place, such as in the United States, it has become generally accepted that political considerations should not interfere with monetary policy.⁴¹ Freeing central banks from short-term political considerations has allowed them to focus squarely on achieving and maintaining price stability, which is the main objective for monetary policy for most central banks.

However, while central bank independence is highly desirable, it is important to stress that on its own it is not sufficient to guarantee that price stability will be achieved. Indeed, both central bank independence and low inflation could both reflect deeper structural features of the economy, such as aversion to inflation on

the part of the financial sector.⁴² In addition, central bank independence is of limited importance unless economic conditions are compatible with low inflation and this objective enjoys broad political support. Still, independence has the benefit of removing the option of financing fiscal deficits through the inflation tax.⁴³

The emphasis on central bank independence is a consequence of the important role played by expectations of future monetary policy and economic conditions in the determination of the current rate of inflation. Recent research has moved from stressing the role of central bank independence *per se* to highlighting the need for policy-makers to use it to anchor expectations. This is why it needs to be supported by appropriate arrangements raising transparency of monetary policy and improving the central banks' communication with the public and financial markets.

The emphasis on price stability

As emphasized above, central bank independence cannot on its own lower inflation and needs to be supported by an effective and transparent framework for monetary policy. In particular, a clear nominal anchor in the form of an explicit ultimate objective of monetary policy – for instance, in the form of an inflation target or a numerical definition of price stability – is important.

The central role of a nominal anchor for inflation is illustrated by the fact that before 1973 and after 1993 inflation was low and displayed little persistence. Prior to the 1970s, the Bretton Woods regime provided a nominal anchor in the form of exchange rate pegs. The move to floating exchange rates in the 1970s removed this anchor and put the burden of shaping inflation expectations on individual central banks. Nominal anchors have been reinstated subsequently, allowing for a lowering and a stabilization of inflation.

Specifically, there has been a widespread focus on price stability as the primary objective for monetary policy, in many cases through the introduction of explicit inflation targeting. This framework was first adopted in New Zealand in 1989, with the Bank of Canada, the Bank of England, the Riksbank and others following soon thereafter. The success of these frameworks has led many emerging markets central banks – including Chile, South Africa, Israel, Thailand and Korea to mention but a few – to adopt inflation targeting.

But not all central banks have introduced inflation targeting. Rather, the adoption of inflation targeting has been a way for countries with a record of high and volatile inflation to signal a clear break with the past. By contrast, central banks with a more favorable inflation performance – including the Federal Reserve, Bank of Japan, the ECB (which has largely inherited the Bundesbank's record) and the Swiss National Bank – have felt little need to adopt formal inflation targeting, even though price stability remains their overriding objective.⁴⁴ Moreover, the ECB and the Swiss National Bank have defined price stability as inflation rates up to 2% per year. The Bank of Japan has indicated that the same range is generally consistent with Board members' understanding of medium- to long-term price stability.⁴⁵

Communication and decision processes

A publicized focus on keeping inflation low is not enough unless the central bank provides additional information about how it intends to achieve its goal. The management of inflation expectations is recognized to be at the centre of a suc-

cessful monetary policy strategy, calling for a high degree of transparency and communication in the conduct of monetary policy.

The need for transparency also reflects the limited ability of central banks to influence inflation in the short run, and their trading-off between inflation and growth at short horizons.⁴⁶ Communication takes many forms, such as a prompt communication of policy decisions and accompanying statements, regular press conferences, and regular inflation (or monetary policy) reports giving a more detailed assessment of economic conditions, uncertainties, and prospects. This provides the public with a clear understanding of the bank's view of economic conditions and the effectiveness of monetary policy.

The monetary policy decision-making has also evolved towards a more structured approach. Interest rates are increasingly commonly set by committees as opposed to by an individual decision-maker. Committees take many forms, depending on the specific circumstances. In geographically small economies, such as Sweden or Switzerland, committees typically consist of the senior management of the central bank. In larger economies, such as in Japan and the United Kingdom, they sometimes have external members drawn from the private sector or the academic sector. In the very largest economies, such as the euro area or the United States, they include representatives from the participating – national or regional – central banks. Whatever the exact composition, the benefit of committees is that they allow for a thorough review and debate of alternative policy proposals. The ensuing policy decisions are immediately communicated to the public and explained in the form of a statement by the policy committee or a press conference and in some cases also through the publication of minutes at a later time.

The conduct of monetary policy has also benefited from improved conceptual frameworks for assessing current and future economic conditions, which reflect better modeling tools and an improved understanding of the transmission channels of monetary policy. This has contributed to increase the effectiveness of monetary decision-making processes and facilitated communication with the public.⁴⁷

Evidence on the role of monetary policy

The central role of monetary policy in determining the average rate of inflation is compatible with the findings of formal studies of inflation dynamics. These studies think of inflation as consisting of a highly persistent component and short-lived fluctuations, and show that the role of the persistent component has decreased over time, in line with the evidence of Figure 2.4.⁴⁸ From an economic perspective, one can think of the short-lived movements as reflecting shocks to inflation, such as movements in energy and food prices, taxes or subsidies. By contrast, the persistent component can be thought of as resulting from the conduct of monetary policy. Consider for instance a shock that raises inflation. A central bank without a clear anchor could choose not to incur the cost of bringing inflation back down, and thus let inflation change permanently. This would lead inflation to drift over time. By contrast, a central bank with a firm anchor is committed to bring inflation back towards its objective following a shock.^{49,50}

To sum up, monetary policy has changed substantially since the early 1980s. Central banks have been granted greater leeway to operate without interference, and have used this freedom to focus monetary policy on achieving and main-

taining price stability. Furthermore, monetary policy has increasingly benefited from improved internal decision-making processes. Finally, central banks have become more transparent in their assessment of economic conditions and the reasons underlying their interest rate decisions, which has helped anchor inflation expectations.

2.3.3 What made the shift in monetary policy possible?⁵¹

Having discussed *how* inflation was brought down, we ask next *why* this happened. A reduction of inflation ultimately reflects the assessment of the feasibility and desirability in delivering low inflation by the central bank, and the public's support for such a policy, which we refer to as the 'supply' and 'demand' for low inflation.

The supply of low inflation

A first factor behind the central banks' shift of focus towards low inflation was the recognition of the ineffectiveness of activist demand management policies seeking to systematically exploit Phillips curve trade-offs.⁵² A second factor is that disinflation episodes in the 1980s were achieved at a cost in terms of real activity that, while substantial, was not as dire as feared, showing that disinflation was feasible.⁵³ The feasibility of focusing on price stability was demonstrated by the success of central banks that adopted inflation targeting early on, such as New Zealand and Canada, in bringing down inflation to levels much below their historical record.

In addition, the relevance of central bank independence and transparency has been recognized by multilateral institutions, which 'pushed' for a strengthening of the institutional frameworks underpinning monetary policy, which were subsequently adopted in many countries across the world. For instance, the IMF has promoted central bank transparency, and together with the BIS, central banks, and financial agencies, has developed a *Code of Good Practices on Transparency in Monetary and Financial Policies*.⁵⁴ The practices identified in the code, which in large part summarizes existing central bank procedures and customs, may have raised the credibility of monetary policy and in this way facilitated the achievement and maintenance of low inflation. Indeed, it is possible that absent such pressure, some countries would not have found the will and support to implement reforms to their monetary policy framework.

The demand for low inflation

The changing focus of central banks would likely have been hard to implement had the public's attitude not shifted in favour of low inflation policies. Faced with the cost of the high inflation in the 1970s, the public repudiated the high-inflation 'stop and go' policies of the past and expressed preference for policies oriented towards price stability.⁵⁵ Although identifying what the social attitudes towards inflation are is not easy, the survey study of Shiller (1997) shows that the public regards inflation as harmful because it lowers the standard of living.

The public's view is in line with empirical evidence on the cost of inflation. For instance, high inflation lowers the level or growth rate of per capita income. Empirical studies find significant welfare gains from going to price stability (that is,

inflation in the 0–2% range), even if starting from low or moderate inflation of 4–5%.⁵⁶

We conclude our discussion with a note of caution. While the ‘supply’ of low inflation is likely to stay, the ‘demand’ could prove less robust as the memories of the costs associated with high inflation episodes fade. This is particularly important at times of severe economic unrest, which runs the risk of voices calling for monetary policy to forget about safeguarding price stability over the medium term. At times like the present, where due to the financial crisis both economic activity and inflation are declining, it is natural for monetary policy to adjust so as to lower interest rates and thus avoid both deflationary and contractionary risks. Yet, whatever actions are taken in the present difficult circumstances to help redress the situation should not be at odds with the preservation of low inflation over the medium term. In our view, central banks thus should not take the low inflation political equilibrium described above for granted, and need to continue to preserve social support for price stability.

2.4 The decline in real interest rates

Another aspect of ‘the golden years’ of central banking before 2007 was the decline of real and nominal interest rates across the world. A key issue, to which we now turn, is what factors led to the decline in real interest rates.

2.4.1 Monetary policy and the real interest rate

Both long (Figure 2.6) and short (Figure 2.8) real interest rates have experienced a sustained and sizeable decline since the early 1990s. As noted above, these measures are computed using actual inflation instead of expected future inflation. Several studies nonetheless show that the decline in real rates is robust to this aspect.⁵⁷

The evidence of reduction in both short and long real interest rates has led some observers to argue that this is a consequence of central banks keeping short-term nominal interest rates at historically low levels in recent years. The fact that both short and long interest rates declined does not, however, shed any light on the direction of causality.

We believe that long real interest rates fell for structural reasons, which we discuss below, and central banks matched the new equilibrium through lower short interest rates. First, economic theory suggests that while central banks control short nominal and real rates (the latter as inflation displays some inertia), they have no or at best little impact on long real rates. Second, a formal econometric exercise based on data for the United Kingdom (for which data is available for a long period of time) shows that the causality goes from real (indexed) yields on long bonds to the short-term nominal rate set by the central bank.⁵⁸

2.4.2 Why have real interest rates fallen?

A substantial literature has emerged that seeks to explore the causes behind the reduction in real interest rates. It focuses on long real rates which, unlike short real

rates, are relatively unaffected by the monetary policy stance. The starting point splits the real long-term interest rate into four components.

The first component is the expected value of the successive short-term real interest rates which reflects the structural growth rate of the economy. Specifically, the real interest rate should be high in an economy that is expected to grow quickly, either through a rapid population growth or a strong growth of labour productivity. Intuitively, the real interest rate is the price of current consumption relative to future consumption. When the economy expands quickly, consumption goods will be more abundant in the future than currently. As a result, consumption is relatively expensive today, inducing consumers to postpone their purchase to a future date where more goods will be available.⁵⁹

The second component reflects the uncertainty surrounding growth. When investing funds for a long period, say ten years, an investor can either purchase a long-term bond which provides a known return, or invest in a short-term bond, say three months, and reinvest the proceed in a new bond when the first bond matures. Holding the long-term bond entails a loss of flexibility as the investor is locked into a yield for the entire duration of the bond. In the presence of substantial uncertainty on the payoff of short-term assets, investors require a compensation to hold the long-term asset in the form of a risk premium that pushes the long-term interest rate above the expected value of successive short-term interest rates. This mechanism operates for both nominal and real interest rates. In sum, we expect the real interest rate to be low in an economy with stable growth.

The third component reflects inflation uncertainty. The intuition is identical to the one outlined above for growth uncertainty, with investors asking for a higher premium when inflation is more volatile.

The final component is investors' preference for current relative to future consumption. If investors are impatient so that current consumption is more valuable to them than future consumption, they require compensation in the form of a high interest rate in order to delay their consumption. By contrast, more patient households are willing to postpone consumption, thus putting pressure on real interest rates to fall. A shift of world income from impatient to patient countries, such as the shift of real income to high saving Asian economies, can then be expected to lower the real interest rate.

Several contributions have assessed the potential growth rate of the United States in recent years, and find little evidence of a slowdown. Researchers point to a decline in the growth rate of the working age population, as well as a reduction in productivity growth, at least until the late 1990s.⁶⁰ This was compounded by a slowdown of productivity growth until the last decade. In the United States, labour productivity⁶¹ expanded 2.4% annually between 1950 and 1975, a pace that fell to 1.4% in the next 15 years. The pace of productivity has since picked back up, rising to 2.5% a year since 1995. In line with this evidence, estimates of the structural growth rates show a decline since the mid-1980s, with a recovery starting in the mid-1990s.⁶² A slowdown in structural growth thus appears ill-suited to account for the reduction in real interest rates since the early 1990s. This said, assessing the potential growth rate of an economy is a difficult exercise, and the findings should be taken with some caution. Substantial uncertainty remains on the potential growth rate of the US economy, and it is quite possible that estimates could be revised downwards, contributing to lower real interest rates. Looking at

a broader sample of industrialized countries shows that potential growth in European countries remained broadly constant since 1990, and thus lagged behind the United States where potential growth picked up. Japan is the only major country where potential growth slowed down.⁶³

Lower volatility of growth and inflation appears relevant in accounting for the reduction in real interest rate. As discussed above, industrialized economies have experienced a 'great moderation' since the early 1990s, with a reduction in the volatility of growth and inflation (Figures 2.2 and 2.3). Holding long-term assets thus became less risky and the associated risk premium fell. Several studies find that this moderation played a substantial role in driving the reduction of real interest rates.⁶⁴

The reduction of real interest is also potentially linked to the rise of trade and financial globalization discussed above. Specifically, the large accumulation of foreign exchange reserves by Asian countries resulting from current and capital account surpluses, as a way to insure against a repeat of the financial crisis of 1997–98, effectively amounted to an increase in the patience of world savers. This accumulation also reflected the export-led growth strategies of countries like China, which led them to prevent the appreciation of their currency *vis-à-vis* the US dollar. The ensuing 'savings glut' constituted a shift of the net supply of savings, causing a reduction of the equilibrium interest rate, although the evidence remains debated.⁶⁵ The highly developed US financial markets would have led the world savers to use the US as a financial intermediary, pushing interest rates down in the process of financing the large United States current account deficit.⁶⁶ A closer examination of the evidence indicates that low investment, even more than high savings, accounted for the low level of real interest rate. In particular, investment rates in emerging Asia – outside of China – fell substantially in the wake of the financial crisis of the late 1990s.⁶⁷

Another structural change in world financial markets can be traced to requirements of pension funds to hold assets with maturities matching their liabilities. This could have led to an exogenous increase in the demand for long-term government debt, relative to short-term instruments, causing a reduction in long interest rates. The empirical relevance of this channel remains, however, in doubt.⁶⁸

Overall the evidence points to two main factors behind the reduction in real interest rates: a decline in the volatility of growth and inflation, and global developments in the form of higher *ex ante* saving and particularly lower *ex ante* investment, which have the same impact on interest rates as an increase in the patience of world investors.

Our analysis of real interest rates would not be complete without a discussion of the 'conundrum' of short and long interest rates in the mid 2000s. Between June 2004 and June 2006, the Federal Reserve increased the Federal Funds Rate by 4.25 basis points with no impact on long-term interest rates, in sharp contrast to historical patterns. While this aspect is distinct from the steady reduction in real interest rates discussed above, they are linked in that both indicate that long rate appeared anchored at relatively low levels in the mid-2000s. Studies have linked the surprising behaviour of long interest rates to a reduction in the risk premium required by investors to hold longer-term assets, which in turn was a consequence of the reduction in risk as reflected in the low implied volatility of returns on Treasury securities.⁶⁹

2.5 Conclusions

In this chapter we documented the main characteristics of the ‘golden years’ of central banking since the late 1980s. The lessons from our analysis can be summarized along five points.

First, the period saw broad and sustained declines in the level, volatility, and persistence of inflation, especially among industrialized economies. All of this took place while growth was higher and more stable.

Second, international linkages became more prominent. While trade links were already substantial in the early 1970s, financial globalization surged since the 1990s. Financial integration proceeded at a much faster pace than trade integration for industrialized economies, while the two moved in step in emerging countries.

Third, in our view the sustained reduction in inflation primarily reflected improvement in the conduct of monetary policy, with central banks gaining more independence and using it to implement strategies focused on medium-term price stability. While non-monetary factors, including globalization, played a role, we view them more as providing a conducive environment for monetary policy than as independent developments.

Fourth, these developments in the conduct of monetary policy reflected a new political equilibrium marked by the convergence between greater public demand for low inflation and recognition by policy-makers of the benefits from focusing monetary policy on that goal.

Fifth, the period saw broad and substantial reductions in real interest rates. While assessing the exact roots remains a difficult task, the reduction in the volatility of real economic activity and inflation most likely played a major role, as did an increase in the world economy’s propensity to save (or more exactly also a decline in its propensity to invest). We view the reductions of nominal interest rates by central banks in recent years to be more of a consequence of lower equilibrium real rates – in a context of lower inflation and inflation expectations – than a cause thereof.

Another aspect of the ‘golden years’ of central banking is that financial markets went through major transformations. Given the central role of this dimension in understanding the current financial crisis, we leave it to a more detailed assessment in the next chapter.

BOX 2.1 Sources of inflation data

All data are annual. The inflation data are from the International Monetary Fund (except for 2008 where we use forecasts from the Economist's Intelligence Unit) and cover 24 industrialized economies (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the United States), 10 Asian countries (India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Singapore, South Korea, Sri Lanka and Thailand), 18 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela) and 29 African and Middle Eastern countries (Algeria, Bahrain, Burkina Faso, Burundi, Cameroon, Côte d'Ivoire, Cyprus, Egypt, Ethiopia, Gabon, Gambia, Ghana, Iran, Jordan, Kenya, Kuwait, Libya, Madagascar, Mauritius, Niger, Nigeria, Saudi Arabia, Senegal, Seychelles, South Africa, Syria, Swaziland, Tanzania, and Togo).

BOX 2.2 Estimating inflation persistence

Our formal assessment of the inflation process relies on quarterly data since 1965Q1 for a sample of 23 industrialized countries (as in Box 1, without Iceland). We break the sample in four periods, with transitions in 1973Q1, 1985Q1 and 1993Q1.

Table 2.1 presents the results for the entire sample as well as for the sub-periods. The first two columns of each panel show the average and standard deviation, respectively, of the inflation rate. We regress inflation on four lags and measure persistence by the sum of the autoregressive coefficients and present these in the third column and the associated standard errors in the fourth column. We also report at the bottom of the table panel estimates of inflation persistence.

BOX 2.3 Globalization data

All data are measured in US dollar and annual. We consider 9 industrialized economies (United States, Japan, Germany, France, Italy, United Kingdom, Canada, Australia and Switzerland) and 12 emerging economies (India, Brazil, Argentina, Mexico, South Africa, China, Thailand, Korea, Indonesia, the Philippines, Malaysia and Singapore). Together these countries account for three-quarters of world GDP (whether evaluated at market of purchasing power parity exchange rates).

The values for cross-border financial holdings are taken from Lane and Milesi-Ferretti (2007) who provide values up to 2004.⁷⁰ Holdings for 2005–2007 are taken from the International Monetary Fund International Financial Statistics (IFS) database and national sources, with the data for several emerging economies ending in 2006. The various components of the current account and the financial account are taken from the IFS database. The data on GDP are taken from Lane and Milesi-Ferretti (2007), with recent values from the International Monetary Fund World Economic Outlook database.

Monthly data on interest rates on 10 year government bonds and three-month interest rates are taken from the IFS for 16 industrialized countries (Australia, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States). Annual data on stock prices are taken from the IFS for nine countries (Australia, Canada, France, Germany, Italy, Japan, Switzerland, the United Kingdom and the United States).

BOX 2.4 Fiscal data

The fiscal deficit data are taken from the IMF World Economic Outlook for 21 industrialized countries (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the United States).

BOX 2.5 An assessment of the links between short and long rates

We study end-of-month data from the Bank of England's website for the United Kingdom, specifically the one-month nominal interbank rates and the ten-year indexed (real) yield. We focus on the period from January 1993, that is, after the establishment of the Bank of England's inflation targeting regime.⁷¹ We estimate a VAR of the two interest rates, specified in levels. We consider four lags, as indicated by the Akaike information criterion.

The impulse responses are computed under the identifying restriction that monetary policy does not respond to the real interest rate within the month, that is, the contemporaneous correlation between short nominal and long real rates is due to reactions by the latter to the former. Since the correlation between the residuals is 0.21, the results are insensitive to the ordering used.

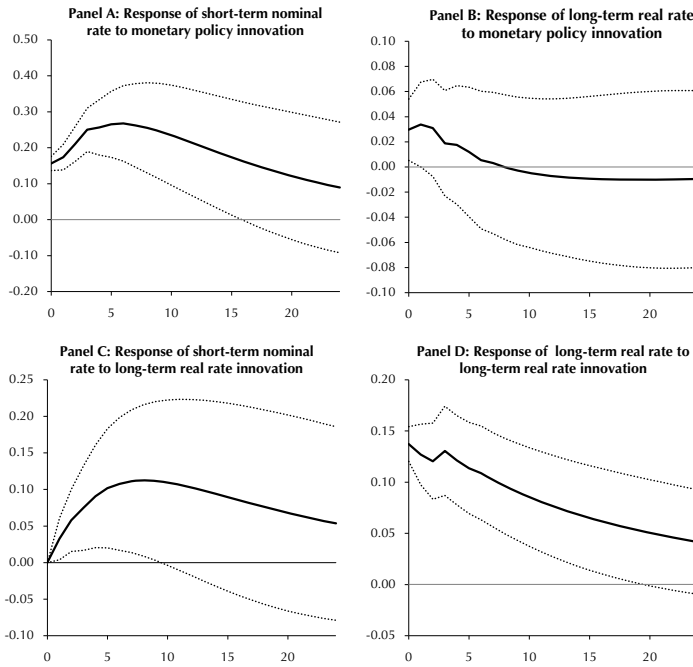
We first study the transmission of shocks to the one-month nominal rate. A typical contractionary policy shock raises the one-month rate by about 15 basis points (Panel A, Figure 2.13). Over time the short interest rate reverts back to the initial level, being about 9 basis points above the initial level after two years (although insignificant, as evidenced by the fact that the confidence band includes zero). The shock however has little impact on the long real yield (Panel B) which temporarily increases by about 3 basis points in response to the tightening of monetary policy.

By contrast, changes in the long real interest rate impact on the short nominal rate. A typical shock in the long real rates raises them by about 15 basis points (Panel D), with the effect being insignificantly different from zero after about 18 months. The shock also leads to an increase in the short nominal interest rate, indicating the reactions of monetary policy (Panel C). Both the short and long interest rates are about 9 basis points above their initial level three quarters after the shock and by about 5 basis points after two years.

Overall, our analysis suggests that changes in monetary policy have negligible effects on long-term real interest rates.⁷² By contrast, movements in long real yields are soon reflected in short-term nominal rates.⁷³

Figure 2.13 Impulse responses for interest rates

(percentage points)



Note: Response to Choleski one standard-deviation innovations; two standard-errors bands

3 The Transformation of Financial Markets

In this chapter we turn to the profound changes in financial markets that occurred during the golden years of central banking. While these changes reflect innovations in financial products that would likely have taken place regardless of the decline in inflation and the increase in globalization, our view is that low interest rates, reduced volatility in financial markets, financial innovation and globalization interacted in a way that led to the buildup of financial imbalances in the tranquil period that abruptly ended in the summer of 2007.

Our analysis proceeds in three steps. We first review what we regard as the four major developments in financial markets before the onset of the crisis: the decline in nominal interest rates, the reduction of the volatility of returns, financial innovation and globalization. We assess in particular the channels through which the reduction in interest rates affected investors' incentives to 'reach for yield' and led them to increase their leverage. In the second section, we review the consequences of these developments for the nature of financial markets. We stress their increasing complexity, which affected liquidity as well as the impact on market participants' incentives, and changes in the nature of risk. Our third step discusses how well market infrastructures, valuation standards, internal risk-management systems and regulatory and supervisory frameworks adapted to the profound transformations in financial markets. Throughout our analysis we aim at focusing on the major developments, avoiding a detailed taxonomy of the specific changes in particular markets.

3.1 Market developments

3.1.1 Four major developments

We identify four broad trends that have been important over the last two decades: the gradual decline in nominal returns, the reduction in their volatility, extensive financial engineering and globalization.

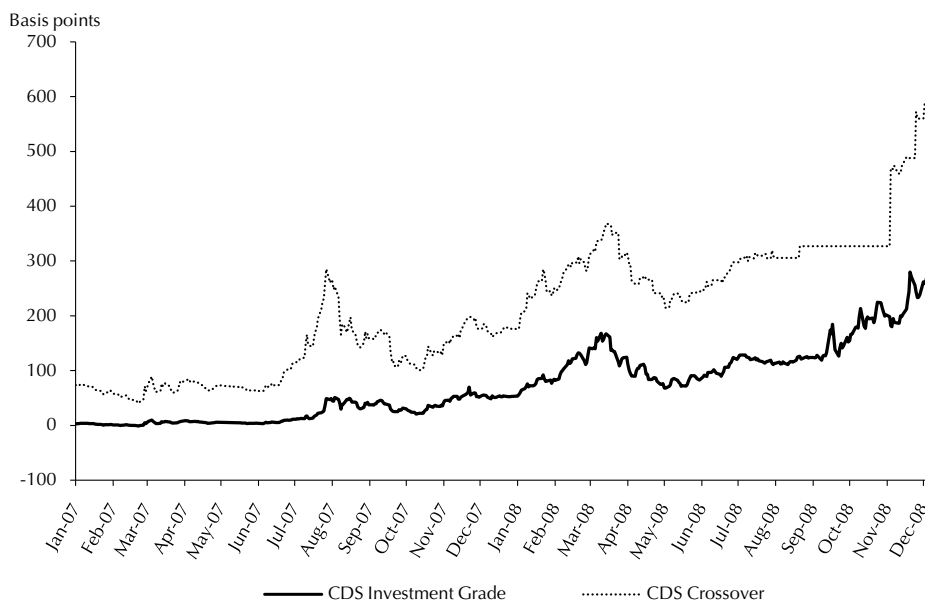
First, as we have discussed at length in Chapter 2, inflation rates in many countries have been brought down to the range that many associate with price stability. While non-monetary factors played a role, our assessment is that the key driver was a strengthened credibility of monetary policy, as a consequence of central banks keeping 'their eyes on the prize' and a whole host of institutional reforms

(including central bank independence, transparency, accountability, and a generalized adoption of monetary policy strategies focusing on price stability). As a result inflation expectations fell at the same time as real returns declined, depressing the expected nominal returns on a whole range of assets, as documented in Chapter 2.

Second, before the crisis the volatility of returns decreased across a range of financial assets, reflecting at least partly better monetary policy, as discussed at length in the 2007 CEPR/ICMB report (Ferguson et al. 2007).⁷⁴ This reduction was observed both in terms of actual and implied volatility, as well as in lower spreads between risky and safer assets. Spreads on a broad range of risky assets reached historic lows before the crisis started, as illustrated by CDS spreads in the United States (Figure 3.1), Itraxx spreads in Europe (Figure 3.2) and spreads on emerging markets debt (Figure 3.3). Given the expected difference between the return on risky assets and funding costs, a decline in volatility raises the Sharpe ratio (the ratio of the expected excess return, normalized by the standard deviation of the excess return) and supports risk-taking behaviour by investors.

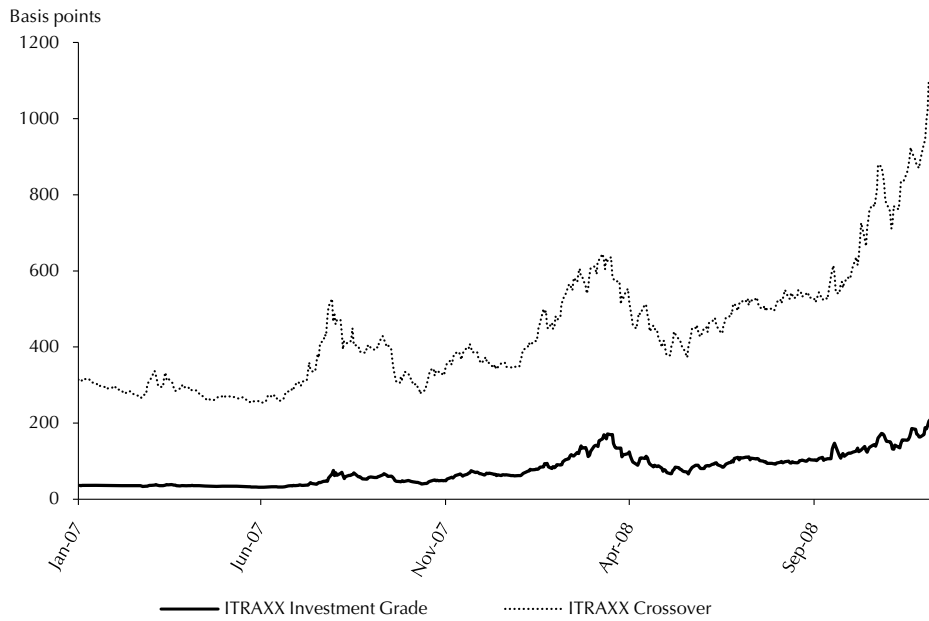
Third, far-reaching financial innovation led banks to achieve greater liquidity and manageability of their loan portfolio: bank loans were securitized and traded, and credit derivative markets developed. Furthermore, there was a generalized increase in leverage as a device to raise returns, with many financial intermediaries extensively relying on short-term financing from wholesale corporate paper markets.⁷⁵ The higher leverage is illustrated by Table 3.1, which compares the evolution of bank assets and derivatives contracts, and by Table 3.2, which provides a breakdown of the various types of over-the-counter derivatives by risk category and

Figure 3.1 CDS spreads unit



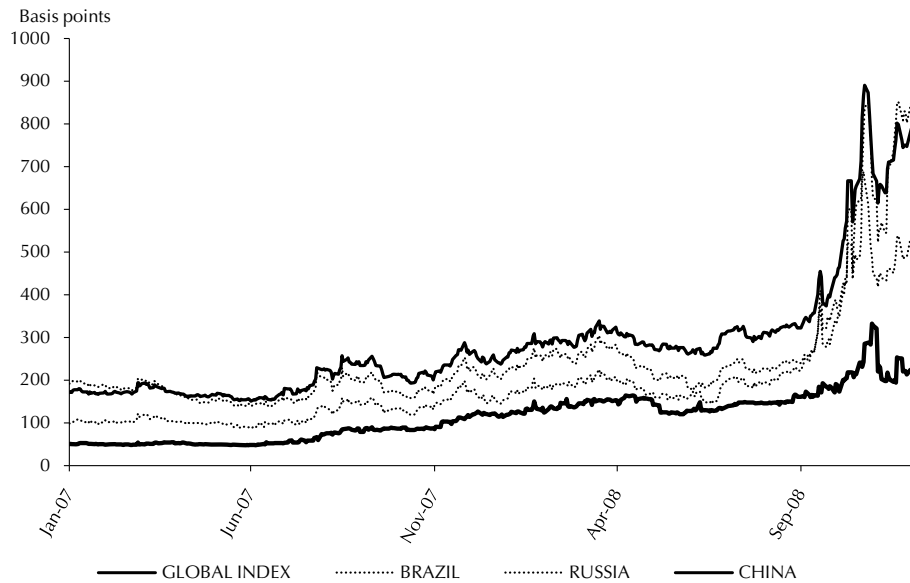
Source: Bloomberg

Figure 3.2 Itraxx spreads



Source: Bloomberg

Figure 3.3 EMBI spreads



Source: Datastream

Table 3.1 Bank assets and derivatives

USD billions	December 2003	December 2004	December 2005	December 2006	June 2007	December 2007	June 2008
Total Derivative							
Contracts	197,167	257,894	297,670	414,845	516,407	595,341	683,726
Of which CDS	–	6,396	13,908	28,650	42,580	57,894	57,325
Commercial Bank assets	40,628	49,578	55,673	70,861	72,648	74,435	84,785
Ratio derivatives/assets	4.9	5.2	5.3	5.9	7.1	8.0	8.1
Ratio CDS/Assets (in %)	–	12.9	25.0	40.4	58.6	77.8	67.6

Source: Commercial bank assets (IMF), derivatives (BIS and ISDA) and own calculations.

Table 3.2 OTC derivatives (amounts outstanding, USD billions)

	Dec. 03	Jun. 04	Dec. 04	Jun. 05	Dec. 05	Jun. 06	Dec. 06	Jun. 07	Dec. 07	Jun. 08
Total contracts	197,167	220,058	257,894	281,493	297,666	370,178	414,845	516,407	595,341	683,725
Foreign exchange contracts	24,475	26,997	29,289	31,081	31,360	38,127	40,271	48,645	56,238	62,983
Forwards and forex swaps	12,387	13,926	14,951	15,801	15,873	19,407	19,882	24,530	29,144	31,966
Currency swaps	6,371	7,033	8,223	8,236	8,504	9,696	10,792	12,312	14,347	16,307
Options	5,717	6,038	6,115	7,045	6,984	9,024	9,597	11,804	12,748	14,710
Interest rate contracts	141,991	164,626	190,502	204,795	211,970	262,526	291,582	347,312	393,138	458,304
Forward rate agreements	10,769	13,144	12,789	13,973	14,269	18,117	18,668	22,809	26,599	39,370
Interest rate swaps	111,209	127,570	150,631	163,749	169,106	207,588	229,693	272,216	309,588	356,772
Options	20,012	23,912	27,082	27,072	28,596	36,821	43,221	52,288	56,951	62,162
Equity-linked contracts	3,787	4,521	4,385	4,551	5,793	6,782	7,488	8,590	8,469	10,177
Forwards and swaps	601	691	756	1,086	1,177	1,430	1,767	2,470	2,233	2,657
Options	3,186	3,829	3,629	3,464	4,617	5,351	5,720	6,119	6,236	7,520
Commodity contracts	1,406	1,270	1,443	2,940	5,434	6,394	7,115	7,567	8,455	13,229
Gold	344	318	369	288	334	456	640	426	595	649
Other commodities	1,062	952	1,074	2,652	5,100	5,938	6,475	7,141	7,861	12,580
Forwards and swaps	420	503	558	1,748	1,909	2,188	2,813	3,447	5,085	7,561
Options	642	449	516	904	3,191	3,750	3,663	3,694	2,776	5,019
Credit default swaps	–	–	6,396	10,211	13,908	20,352	28,650	42,580	57,894	57,325
Single-name instruments	–	–	5,117	7,310	10,432	13,873	17,879	24,239	32,246	33,334
Multi-name instruments	–	–	1,279	2,901	3,476	6,479	10,771	18,341	25,648	23,991
Unallocated	25,508	22,644	25,879	27,915	29,199	35,997	39,740	61,713	71,146	81,708

Source: BIS Quarterly Review, December 2008 (Table 19).

instrument. Since 2003 bank assets expanded at a very rapid pace, doubling by mid-2008, while the increase in outstanding amount of derivative contracts was even faster, exceeding a factor of three.

Fourth, the surge in international financial integration opened new opportunities to search for yield, and disperse risk, across various countries. The resulting perception among investors that risk was better diversified was associated with a greater willingness to assume more of it. In turn, this compressed risk spreads, generated capital gains for the early entrants and attracted additional investors. Overall, while globalization may not have been of primary importance for inflation developments, it played a major role in financial markets.

In addition these developments were closely linked. The decline in real and nominal yields made traditional bank intermediation relatively less profitable, giving banks incentives to seek fee and trading income. The reduction in volatility made non-traditional assets look safe and the lower interest rates led to a search for yield as investors attempted to prevent returns from falling, in many cases relying on financial engineering techniques and non-traditional assets – including emerging markets assets.

3.1.2 Impact on investors' incentives

Taken together, the four trends outlined in the previous section had profound effects on financial institutions by providing strong incentives to engage more intensely in risk trading through leverage.

The reduction in nominal returns in recent years led investors to 'reach for yield.' For instance, financial institutions that sold financial products with guaranteed returns – such as insurance companies that sold annuities and pension funds operating defined benefit plans – increasingly faced the risk that their returns would fall below the target return necessary for these products to be profitable. To raise returns, investors had incentives to leverage existing positions and to enter markets for new and highly complex financial instruments – 'niche markets' – in which risk-adjusted returns appeared high, both in absolute terms and relative to more standard instruments. Better informed investors and those willing to bear more risk may also have hoped to raise returns by moving ahead of the crowd into new markets in the hope of reaping capital gains as other investors moved in and bid up asset prices.

Thus, lower nominal rates led investors to increase their exposures to riskier assets and to raise returns by building up leveraged positions, in particular since the across-the-board decline in financial markets volatility suggested that the level of risk was not so great. While some of that leveraging may have been easy for supervisors and counterparties to see, other parts were more opaque, involving off-balance sheet vehicles, and subject to rollover risk, as demonstrated by the recent developments in asset-backed commercial paper markets. Moreover, with the demand for risky assets rising, financial institutions had incentives to originate and securitize more of them, and not to worry about their long-term performance since the risk was shifted to third parties through credit risk transfer mechanisms.

This search for yield strategy was reinforced by principal-agent problems arising from the fact that the agents – investors – benefited from the upside potential of risky assets – in terms of higher profits if things go well – while they faced lim-

ited losses from the downside potential, due for instance to limited liability. Moreover, and as we discuss in Section 3.2.1, the search for yield strategy placed great demands on investors' ability to judge risk in markets with a limited track record of trading and no track record at all of trading under stress.

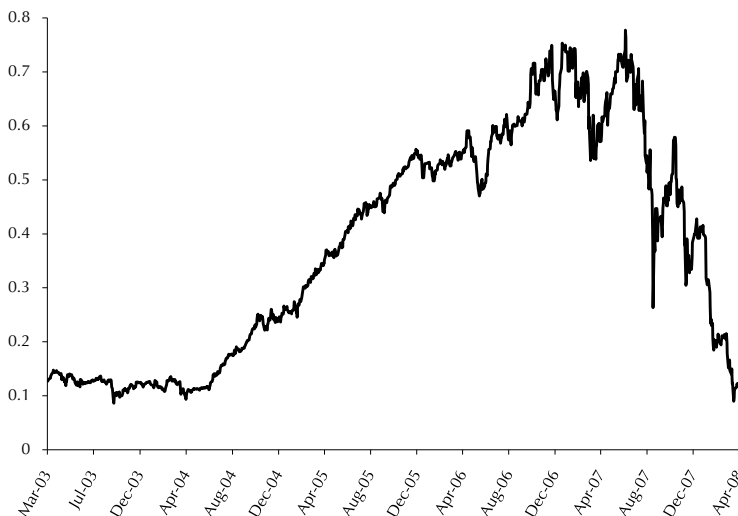
3.1.3 Evidence of increased risk taking

We discuss in this section examples of risk-trading that reached significant volumes before the turmoil started. Among these, the so-called carry trades were particularly popular. A carry trade is a long position in a higher-yielding asset coupled with a short position in a lower-yielding asset. The risk of the trade arises from potential changes in the relative price of the two assets.

Of all carry trades, the foreign exchange carry trade was arguably the most important, and involves borrowing in lower-yielding currencies and investing in high-yielding currencies. In the run-up to the crisis, strategies that involved borrowing in yen or Swiss francs and investing in Australian and New Zealand dollars were popular. Even households engaged in similar transactions involving considerable foreign exchange risk, as evidenced by the rapid growth of mortgages denominated in Swiss francs and euros in the Baltic countries and in Eastern Europe, and by the size of Japanese households' purchases of bonds denominated in Australian and New Zealand dollars.

An example of risk-taking through carry trades is provided in Figure 3.4, which plots the ratio of the interest rate differential between the US dollar and the Japanese yen to the implied volatility of the bilateral exchange rate, both for a three-month maturity. This ratio, which indicates the attractiveness of carry trades, increased steadily from mid-2004, providing incentives for risk taking that were reversed after the onset of the financial turmoil in the summer of 2007.

Figure 3.4 Interest rate differential over foreign exchange volatility



(a) Defined as the three-month interest rate differential divided by the implied volatility derived from three-month at-the-money exchange rate options.

Source: Datastream

Borrowing at short maturities to invest in longer ones is another common form of a carry trade that many banks and other financial institutions engaged in. The carry is the differential in yield between long and short interest rates. It is conceivable that the flattening of yield curves observed from the summer of 2004 to the spring of 2007, with the spread between the two-year and ten-year Treasury bills falling from 2% to zero, was at least in part the result of increased volumes of this kind of trade. In turn, these increased volumes may have been caused by the greater willingness of investors to take risk. This mechanism might at least partly account for the ‘conundrum’ of persistently low long interest rates stressed by Greenspan (2005). A compounding factor is that banks resorted increasingly to wholesale financing since in the low yield environment deposits were relatively unattractive and capital markets funding was cheap. Banks used these resources to make loans, in housing markets for instance, and to invest in ‘high yielding’ security products. While maturity mismatch is an inherent feature of banks’ business model, its magnitude became much larger. In addition, short-term wholesale financing was extensively used by financial institutions, making them vulnerable to liquidity runs (as discussed in Chapter 4). While this problem has long been recognized in the case of depository institutions, the regulation and/or supervision of other institutions was much lighter or even non-existent.

Another indicator of risk exposure is the ratio of Credit Default Swaps outstanding to commercial bank assets (Figure 3.5) which increased markedly since the second half of 2003. Moreover, the high level of counterparty risk in the OTC derivatives markets, arising from the fact that more than 80% of the derivatives were traded through just ten banks, should be noted.

A third indicator of risk taking is the ratio of outstanding credit derivatives to cash bonds, which shows a significant increase in the degree of leverage in the financial system up to the end of 2007 (Figure 3.6). While credit derivative products are intended to permit the hedging of risks, they can also be used to take leveraged bets on the prospects of the issuer. The sharp rise in the volume of credit derivatives, well above the value of underlying debt, indicates a use that well exceeded any standard hedging need.

A thorough illustration of heightened risk taking in bank credit in the presence of low interest rates is provided by Jiménez et al. (2007). Using a large and detailed dataset on individual bank loans, they show that a reduction in policy interest rates is a double-edged sword. Its immediate impact is beneficial as debtors are less likely to default thanks to lower interest payments, as this lowers the cost of servicing their debt. This impact is however gradually undone by heightened risk taking on the part of banks, especially small ones, through loosened lending standards in order to boost returns. Loans granted under the less stringent conditions are more likely to prove problematic later on, with an adverse effect on banks’ risk exposure.

These findings show that perceptions of risk decline in economic upswings and lead to investors assuming a disproportionate amount of risk.⁷⁶ It is easy to see how powerful this effect might have been in the run-up to the crisis. The economic environment – characterized by strong and more stable real growth, rising asset prices, falling default rates and a generalized compression of risk spreads – was very favorable for a number of years. Furthermore, until the financial markets turmoil started in August 2007, a full decade had passed since the Asian financial

Figure 3.5 Credit default swaps over commercial bank assets

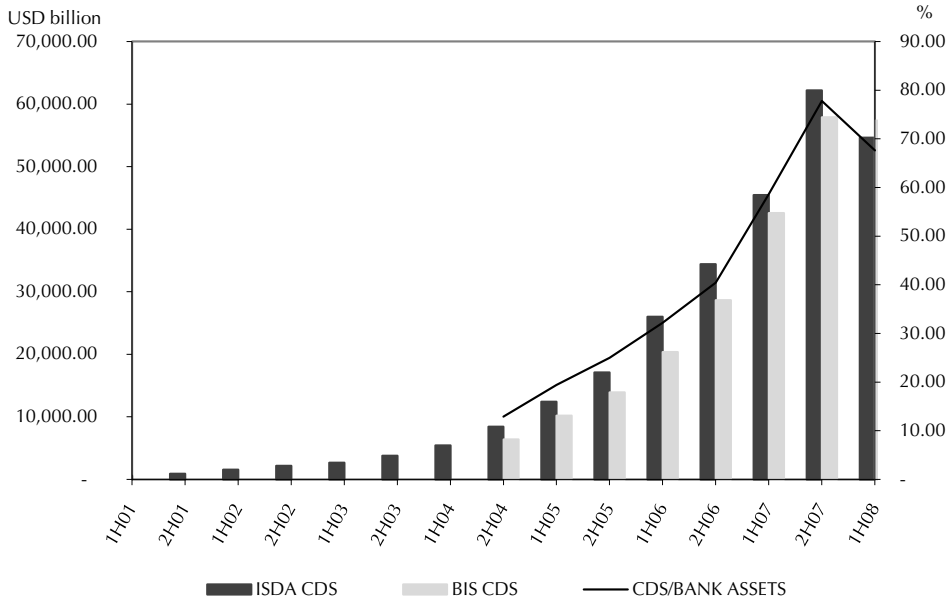
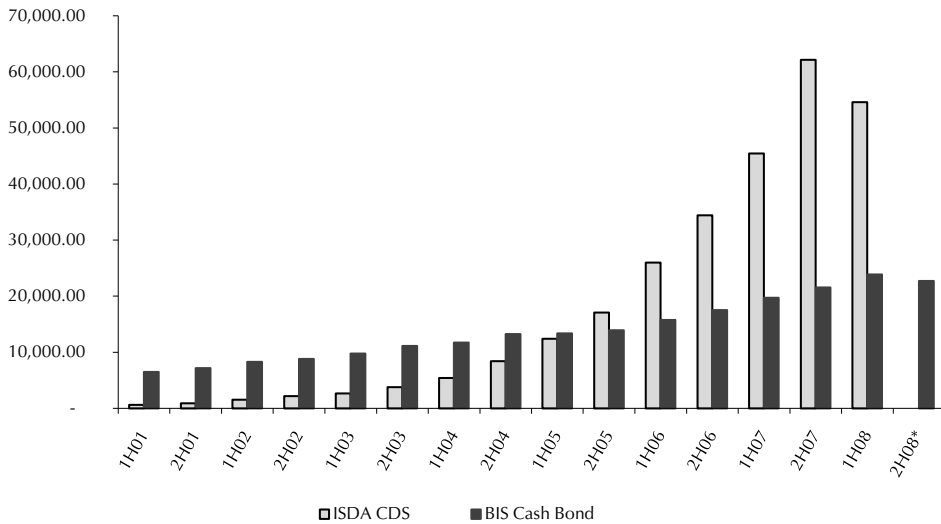


Figure 3.6 Credit Derivatives versus underlying debt



* from September 2008

Source: ISDA and BIS

crisis and the Russian default of 1997–1998, testifying to the resilience of the new financial landscape. And to the extent shocks had happened – such as the brief closing of US financial market in the wake of 11 September 2001 – these were very effectively dealt with by central banks, and as a result did not produce lasting damage to economic activity. Overall, this led to over-optimism in the financial sector.

These developments can be self reinforcing, as investors' greater willingness to hold risky assets depressed risk spreads and thus attracted further inflows. Moreover, as Rajan (2005) and others have noted with respect to the recent experience and as Darity (1985) did with respect to the 1980s Latin American debt crisis, whenever intermediaries sell to other financial actors credit that they originate (as in the case of securitization, and before, in the case of arrangers of loan syndications), the economic incentives of the originators diverge from those of the final takers, and can lead to inappropriate behaviour, such as systematic underestimation of credit risks represented to buyers as well as 'loan pushing' (the term used by Darity).

3.2 Consequences for the structure of financial markets

The decline in returns generated a demand for higher-yielding financial assets. In response, financial institutions promoted a range of more complex, and for them profitable, products. In essence, risky assets were securitized and repackaged in such a way as to generate an entire spectrum of risk/return levels, from investment-grade securities to 'toxic waste.' We next discuss how this change affected the functioning of financial markets, focusing on three aspects: heightened complexity and the impact thereof on liquidity; incentives for financial intermediaries; and the nature of risk, along with the ability of the system to cope with different types of shocks.⁷⁷

Before discussing the financial markets challenges brought by these changes, we should not overlook the benefits in principle associated with them. In particular, financial engineering does allow for a finer slicing of the various dimensions of risk, permitting different investors to take different exposures to the various sources of risk matching their specific appetites. Furthermore, the broad dispersion of risk is likely to support systemic stability, at least to small shocks. But at the same time, the dispersion of risk implies that if shocks occur, it may become difficult if not impossible to determine the size and location of losses, casting the shadow of credit risk across a broad range of counterparties and making markets susceptible to a drying up of liquidity. Moreover, as shown by recent events, the degree to which risks had been diversified was in practice much lower than was thought as many of the risks that were supposedly shifted outside the banking system came back to banks when the turmoil started.

3.2.1 The complexity of financial markets

One important consequence of financial innovation has been the development of financial products that are finely tailored to the specific needs of different investors. While this entails a clear benefit in the same way as a broadened choice

across a large array of various brands of consumer goods benefits consumers, the recent experiences have shown that these markets are opaque and can be hard to understand for non-specialists, making them are extremely susceptible to illiquidity in periods of stress. Financial innovation thus led to a change in the structure of financial intermediation, away from a few large 'traditional' markets to narrower 'niche' markets with highly complex products. These couldn't easily be compared across markets and their risk and return profiles were difficult to understand for investors. The market for structured products is a case in point.

The complexity of investment products was compounded by a limited transparency in the exposure of financial intermediaries. For instance, banks made extensive use of structured investment vehicles and other off-balance sheet entities to take positions in derivative markets. This, along with similar investments by non-depository financial intermediaries, established what has been labeled a 'shadow banking system', where these vehicles engaged in maturity and liquidity transformation and took leverage outside regulatory and supervisory scrutiny.

A consequence of the limited size of specific markets is a dry up of liquidity in a period of stress, through liquidity loops.⁷⁸ Consider a situation where an investor needs to raise a given amount of cash by selling some of his holdings. When she operates in a large market, there is a large number of other investors who can take the other side of the trade, limiting its impact on prices. When she is a dominant player in a small market however, the limited number of counterparties implies that her sales drive the price down. This has two consequences. First, the investor needs to sell a larger *quantity* of securities to raise a given *value* of funds. Second, the pressure on prices can trigger a second round of sales as other investors liquidate their positions. This loop is magnified in the presence of high leverage.

The limited liquidity of niche markets can be magnified by information problems. Consider a case where an investor that is recognized to be well-informed about a particular market sells her holdings to raise cash. Other investors do not know whether the sale is prompted by a need for funds or indicates that the specialized investor has private information of adverse future returns on that market. They will then be unwilling to purchase the assets without a substantial discount.⁷⁹ This is how illiquidity arises endogenously.

The risk of liquidity dry ups in niche markets hinders the ability of the financial system to efficiently channel funds, as this relies on the smooth flow of information about the creditworthiness of borrowers and counterparties.⁸⁰ Any disruption of the information flow – or the realization on the part of lenders that information they have is wrong or incomplete – risks draining markets of liquidity and, if extreme, can cause them to seize up. In turn, a lack of liquidity impairs market participants' ability to hedge positions in a continuous way in response to price movements, and may lead to one-sided markets and large price falls as investors seek to close positions before liquidity evaporates. Thus, the disruption of the free flow of information, or investors' reassessment of the value of past information, and the associated uncertainty about the creditworthiness of counterparties risks leading to market illiquidity and can thus trigger financial instability.

The potential for an inaccurate assessment of niche markets by investors has been increased by the growing use of models to value portfolios ('mark-to-model'). These models often assume that individual investors are small enough to have

only a negligible impact on asset prices, and therefore treat asset prices as exogenous to the investment strategy. The assumption that markets are perfectly liquid is disputable in the case of niche markets. The reliance on fundamental valuation models thus carries the risk that investors do not accurately incorporate the possibility of triggering adverse price dynamics where their decision to sell a position has a non-negligible impact on the asset price. Failing to take account of this liquidity risk can lead the investor to conclude that a position is safer than it truly is.

3.2.2 Incentives for liquidity providers

Banks, both commercial banks and investment banks, considerably expanded their activities during the golden years of central banking, which was reflected in large increases in their balance sheets. Given that these institutions have been at the center of the current financial crisis – as will be explained in Chapter 4 – shouldering huge losses that have amounted to large fractions of their market capitalization, it is important to understand how they function. Of particular relevance is the ‘originate-to-distribute’ model that subsequently caused so much trouble not only to the banks and investment banks heavily using it but also to other banks through the drying up of the wholesale capital markets, on which they relied to finance part of their lending activities.

While financial intermediation takes many institutional forms, it is useful to distinguish between ‘client business’, which consists of providing access to financial markets to third parties and advice, and their ‘proprietary trading’, which entails investment of the intermediaries’ own resources.

A firm conducting client business has a fundamental interest in well-working markets: the traditional label for that business, in the securities market, is ‘broker-dealer’. To attract customers a broker-dealer typically wants to provide services that help clients to value the underlying assets. A broker-dealer has the interests of its clients at the top. By contrast, a proprietary trading business wants to use potentially valuable information for the sake of the profitability of its own portfolio, and not for anybody else. For example, it wants to keep any quality research for itself, to use any information on significant market flows to time its own trading activity, and to anticipate liquidity needs in the marketplace. A proprietary trading business, like a hedge fund, can profit when the market does not have enough information.

It is evident that proprietary trading and client business are fundamentally inconsistent. Global financial firms, which emerged during the last decade, combine both lines of business and are subject to multiple, and often conflicting, incentives. Proprietary traders have incentives to use information on customer flows to trade, thus generating conditions adverse to clients without their knowledge. In addition, proprietary traders in large financial institutions may believe that they have access to contingent capital, to allow them to sustain significant losses. Infrequent financial reporting and the perception of contingent capital may be powerful incentives to take risks that far exceed those that free-standing leveraged investment entities like hedge funds can afford to take.

Combining these fundamental divergences of interests within the same institutions with the well-known intricacies of managing and controlling hundreds of highly motivated professionals simultaneously trading complex instruments in a

multiplicity of markets may explain the dislocation of recent months, which has been concentrated in large banks and investment banks.

3.2.3 Changes in the nature of risk

In addition to the issues discussed so far, the emergence of finely-tailored financial products during the golden years of central banking has had a major impact on the functioning of financial markets. Under the old structure of a relatively limited number of plain vanilla assets, financial markets displayed a fair amount of volatility even in normal times, with this volatility rising around recessions and in times of stress.

We hypothesize that the emergence of niche markets has affected the nature of risk. In normal times, the availability of a broad array of finely-tuned products serves its purpose of disentangling different sources of risk and spreading them to investors that are willing to bear them. This sophisticated diversification is at the core of the reduction in the volatility of returns across a broad range of assets during the golden years of central banking.⁸¹

This benefit in normal times, however, comes at a cost of a higher risk of disruption when unforeseen events occur. First, and as mentioned above, these sophisticated financial products rely heavily on the smooth flow of information amongst investors, and a disruption of this flow may set in motion powerful feedback mechanisms that can exert pressure on prices in periods of stress. A sudden lack of information in a market for highly complex products can lead uninformed investors to fear the worst and effectively withdraw from the market, depressing liquidity and exacerbating asset price dynamics.

Second, lending standards were eroded by the shift towards securitization and the originate-to-distribute business model and the switch towards arm's length transactions with a large number of counterparties. While this development enables originators and securitizers to earn handsome issuance and arrangement fees, it may not provide them with adequate incentives to ensure the long-run performance of the resulting securities, thus leading to the gradual erosion of underwriting standards. The adverse consequences of this erosion were hidden and were only revealed when the US subprime crisis started and the economy was exposed to an adverse shock.

Third, the use of leverage has reduced the ability of markets to cope with crisis episodes. Any strategy which optimizes on capital usage, as for example with dynamic replication or leverage, implies selling risky assets in increasing volumes into falling markets. In addition, as discussed in Rajan (2005), investors facing margin calls can sell their holdings only at discounted prices, given the issues of liquidity and information asymmetries discussed above, leading to mutually reinforcing liquidity and margin spirals.⁸²

Fourth, the extensive degree of asymmetric information in niche markets makes it nearly impossible to predict or identify where the financial bottlenecks are going to be and which institutions are going to be affected in times of stress. As a result, the rational behaviour of risk-averse portfolio managers is to hedge against the worst scenario whenever large shocks impact on the market. Such behaviour, induced by insufficient information, can lead to overshooting, which in turn produces excess volatility (or fat tails).

Overall, the improved ability of sophisticated niche markets in spreading risk in normal times comes at the cost of a limited ability to handle situations that were not foreseen by investors, leading even moderate shocks to cause substantial disruptions. Markets may have become much better at handling risk, but less apt at handling uncertainty.

Such a change in the nature of risk raises two challenges. First, it can lead to excessive risk taking when fund managers are the agents of other investors (Rajan 2005). In particular, managers may assume too much ‘tail risk’, that is, risks that rarely materialize – and therefore are difficult to assess, particularly on the basis of a short span of data – but do so severely in times of crisis. As markets can be expected to remain stable for an extended period of time, taking a large amount of ‘tail risk’ generates returns that look quite attractive given the low volatility of assets in normal times. Underestimation of tail risk spells trouble for a fund manager, and the dynamics that we have described above makes the occurrence of extreme events at the tails much more likely than in ‘normal’ markets. The increased use of capital-saving techniques, that rely on dynamic hedging (selling in falling markets, buying in rallying markets), tends to generate nonlinear price dynamics, and is therefore a powerful factor explaining an increase in tail risk.

Another aspect is that statistical models of risk become much harder to estimate and may therefore become highly misleading. Modeling the behaviour of investment vehicles which have not been in existence for long was always bound to be difficult. In addition, if analysts can only rely on data gathered in normal times when volatility was low, their inferences are likely to be poor predictors of the performance of assets in times of stress.

This problem has been experienced by rating agencies during the crisis. While one can build a model for the behaviour of asset returns in normal and crisis times, its validity is only proved when it is put to the test. Under the earlier nature of risk, episodes of large asset price movements that still fell short of a crisis were regular enough for one to test the ability of the model to account for them. Under the new structure, the assumptions of the model for the behaviour of financial markets in crisis episodes remain untested for a long time, and can only be assessed when a crisis actually hits. Should the model then prove inaccurate, for instance as a result of underlying correlations increasing unexpectedly and sharply in times of stress, market participants could have severe difficulties pricing the asset in question, leading market liquidity to dry up.

A similar problem is faced by regulatory agencies who devise strategies to cope with financial stress. Such strategies cannot be put to the test in normal times, leaving policy-makers with little reassurance that they will prove fully up to the task during a crisis. This points to the need to use sophisticated valuation tools with caution. Models that perform well when their underlying assumptions are valid can lose their usefulness when these assumptions prove inaccurate.

3.3 Were the financial infrastructure and the regulatory and supervisory framework adequate?

We now consider whether the market infrastructure and monitoring systems kept pace with the profound transformation of financial markets. We focus on four ele-

ments: clearing systems, valuation standards, risk-management systems, and the regulatory and supervisory framework.

First, the back-office infrastructure has been hard-pressed to follow the speed of innovation. This was most clearly illustrated by a substantial backlog in the recording and clearing of transactions in over-the-counter derivative markets in the United States. This aspect was fortunately addressed by a substantial effort by regulators and industry participants before the current crisis. Nonetheless, the very nature of over-the-counter markets raises the issue of counterparty risk which can significantly hinder their functioning in times of stress. The efforts to bring the credit default swap market onto a clearinghouse platform are a direct response to this issue.

Second, the valuation standards for complex assets proved inadequate. Investors handled the complexity of the new products by relying extensively – and in many cases excessively – on credit ratings. The rating of complex products is, however, subjected to several problems. As discussed above, the modeling of the pricing of complex products depends crucially on the quality of the data available. In addition, similar ratings were not necessarily comparable across different products. For instance, ratings failed to distinguish between the risk of downgrading in traditional products and in structured products. Investors didn't realize that an AAA rating of a structured product could be downgraded much more rapidly and thus was more risky. Another misunderstanding concerned the nature of risk that the rating focuses on. An AAA rating only means that the probability of default is very small, but says nothing about other risks (market risk, liquidity risk, etc.). Many investors mistakenly thought that an AAA rating implies very little risk overall. As a consequence, risk was not necessarily shifted to those most able to bear it, but to those who understood it the least. Rating agencies were also subject to conflicts of interest between their role as 'valuators' and 'consultants' to issuers. The limited reliability of ratings is most likely to be revealed following an adverse shock, which hinders the crucial flow of information and can turn a moderate shock in a full-blown crisis.

Third, financial intermediaries lagged behind in strengthening their internal risk controls. In situations where taking full advantage of complex products, often through a substantial leveraging of the balance sheet, leads to steady and large returns, there is little incentive to ask hard questions about the sustainability of the situation. There is then a natural tendency to overlook the need to strengthen the internal risk management. This can be magnified by poor risk governance structures. In profitable times, a risk manager that vetoes an investment project will always be in a relatively weak position against traders with a record of generating profits. Absent a strong commitment to independent risk assessment by the firm's top management, the search for profits is likely to result in hidden exposures whose importance only becomes apparent in periods of stress.

Finally, financial regulators and supervisors have not kept pace with the transformation of the financial sector. Given the complexity and rapidly changing nature of markets, there has been a tendency towards self-regulation or 'light regulation', leaving the monitoring to market participants that were deemed better informed than the authorities. These participants all too often have more to gain by letting the market grow, thereby generating higher trading volumes and commissions, than by focusing attention on making it more resilient. Furthermore,

supervision was also lacking even in cases where there was adequate regulation in place. In addition, financial regulation and supervision remained largely conducted in a micro-stability framework that focuses on the situation of individual actors without properly taking into account the systemic implications, a point which we discuss in Chapter 5.

3.4 Conclusions

Our analysis of the developments in financial markets during the golden years of central banking leads us to five main conclusions.

First, lower risk-free interest rates, reduced volatility in financial markets, financial innovation and globalization interacted to provide both the incentive and opportunity for investors to reach for yield into newer investment products, at a time when the return on standard assets was durably reduced.

Second, this search for yield led to a great proliferation of new, highly complex and increasingly opaque financial instruments. While the markets for these grew rapidly, they were inherently small and therefore susceptible to a drying up of liquidity and to adverse asset price movements in periods of stress.

Third, the consolidation of client business and proprietary trading in the same institutions set the stage for significant conflicts of interest, given the fundamentally conflicting nature of these lines of business.

Fourth, the transformation of financial markets towards a large number of niche markets improved the ability of the financial sector to spread risk in normal times. This, however, reduced its capacity to handle unforeseen events, as the flows of information, which play a more central role in arms-length transactions than in traditional bank transactions, were disrupted. As a result, we moved towards a financial system capable of delivering much lower volatility during prolonged periods of time but prone to lead to significantly more severe disruptions at times of stress.

Finally, financial market infrastructure lagged behind. The sheer complexity of the products made it difficult for financial intermediaries and market participants to understand them, which may explain why insufficient attention was paid to the underlying risks by investors. It also made regulatory oversight considerably more difficult.

Given the vulnerabilities in financial markets that we have described, it is not surprising – at least in retrospect – that their development set the stage for the current crisis. In the next chapter we explain the factors that interrupted the long period of economic bonanza and increased financial market activity that had characterized the golden years of central banking.

4 The Great Unraveling

In this chapter we discuss the ‘great unraveling’. By this we mean the end of the golden years of central banking as a result of the eruption of the international financial crisis in the summer of 2007 and the gyrations in world commodity prices. Indeed, as a consequence of these new developments the world economy has experienced a financial paralysis which has increasingly led to fears of a depression. Also, the initial inflationary threat posed by surging commodity prices has since the summer of 2008 been followed by concerns about deflation as commodity prices have come down significantly and the economic slump has intensified.

After more than 18 months of major financial disruption, the times of low and stable inflation, tight risk spreads and growing globalization of trade and financial portfolios seems quite distant. This unraveling has presented central banks with challenges of such severity that were almost unimaginable before they started, and have led to a rethink of the lessons that monetary policy-makers should draw from the prior placid period.

The international financial crisis was initially triggered by adverse developments in US subprime markets. With subprime mortgages sliced and diced and serving as backing for a broad range of securities which were sold to investors from near and far, the crisis spread rapidly across financial markets, across financial institutions, and from the United States across the world. By its sheer magnitude – in terms of the number of institutions and markets affected, its severity and duration – the extreme turmoil in financial markets has recently led many advanced economies to slip into recession and also significantly dented growth rates in emerging markets. These unfavorable effects on the global economy are in turn magnifying the dislocation in the financial sector through a perverse real-financial vicious circle.

This severe financial crisis has unearthed many examples of excessive risk taking, ineffective risk management and a certain *laissez-faire* – if not complacent – attitude among financial institutions, whose management must bear the primary responsibility for ensuring the financial viability of their institutions. But it has also raised the question of whether regulation and supervision were lagging too far behind financial market developments, and how they could have been better designed and enforced more actively. Questions have also been asked about whether the conduct of monetary policy contributed to the conditions that triggered the crisis.

The second component of the unraveling was the rapid rise in oil, food and other commodity prices which started in the fall of 2007 and quickly led to rising

inflationary pressures globally and to a generalized overshooting of inflation objectives. Commodity price shocks bring a challenging trade-off for central banks and lead to a classic policy dilemma. They push up headline inflation and raise the likelihood of higher wage demands and other second-round effects, which would require a tighter monetary policy, but also reduce real economic activity, suggesting that central banks should relax monetary policy. While this tension makes managing monetary policy a challenge in the best of times, it is all the more complicated when it takes place against a background of severe financial market disruption. In these circumstances, higher interest rates may amplify a disorganized process of deleveraging and thus exacerbate the drop in real activity, while tensions in money markets reduce central banks' ability to control short-term interest rates, and financial sector dislocations may cause the monetary transmission mechanism to become unstable.

In the summer of 2008, inflationary pressures eased rapidly as commodity prices started falling sharply in response to the widespread weakening of economic conditions and the resulting drastic moderation of the global demand for commodities. As a consequence, the tension between the need for higher interest rates to prevent inflation from rising and the need for lower interest rates to support economic activity disappeared. Indeed, there is now a not insignificant likelihood that inflation will reach zero – or turn negative during some months at least – in a number of countries in 2009. Thus, in a time span of two years central banks have gone from seeking to prevent a sharp increase in inflation to managing monetary policy in an environment in which, in some countries, deflation could take hold and interest rates reach the zero lower bound.

What lessons shall we draw from these developments? One common view is that while the financial markets crisis has revealed shortcomings in the regulation and supervision of individual financial institutions and markets, including rating agencies, monetary policy was broadly correct and had little to do with the financial markets crisis. According to this view, the run-up in commodity prices and inflation were largely due to a series of unfortunate events that could not have been predicted. In sum, while there may be plenty of lessons to learn from the events of the last years, this is not necessarily the case for monetary policy-makers.

The competing view is that these developments may at least partially reflect shortcomings in the ways in which many central banks conducted monetary policy. Thus, while there are a number of readily apparent regulatory and supervision issues that are now scrutinized closely in different forums, according to this view interest rates were kept too low for too long in a number of key countries and set the stage for the financial crisis and the surge in world commodity prices. Also, this view would like to reconsider whether the years of low and stable inflation and of an unprecedented contraction of risk spreads were largely due to better central banking, as was believed at the time, or whether the low rate of inflation and contraction of risk premiums hid other developments that magnified the dynamics of the crisis when it started.

In this chapter we first discuss the disruption in financial markets and review the recent rise and fall of inflation and its causes. In particular, we ask whether monetary policy was too loose in the period before the crisis, creating incentives for risk taking. We also inquire into whether central banks' design of their monetary policy frameworks – which, although oriented towards price stability, in

many cases tended to downplay or disregard asset prices, credit aggregates and measures of financial sector leverage – played a role in setting the stage for the financial crisis. Finally, we consider central banks' policy responses during the great unraveling.

4.1 Financial market crisis

While many observers had expected house prices in the United States to stabilize eventually or decline to levels closer to the historical experience, few predicted that developments in the relatively small subprime market would trigger a chain reaction that would ultimately spread throughout the global financial system, leading to large asset price falls, markets to seize up and become illiquid, and causing major financial institutions to sustain large and very serious losses. Indeed, the crisis was initially seen as a localized problem in US mortgage markets of at most limited importance to the broader US financial system. Moreover, with the bulk of US mortgage-backed assets being held domestically, the developments appeared at first to be of little significance to the global financial system. But the financial tensions came to spread rapidly across markets, institutions and borders, and within a year and a half led large parts of the international financial system to become dysfunctional.

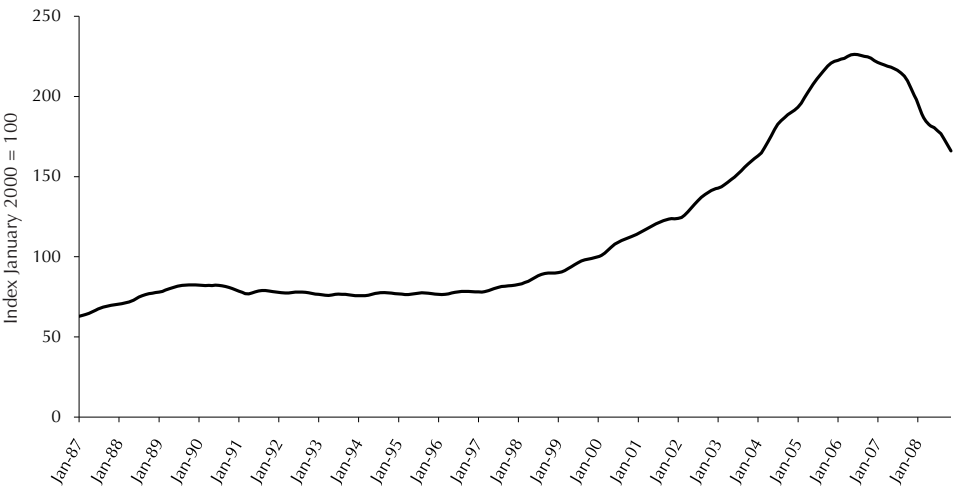
We start by offering a brief review of the recent events. As several contributions provide an extensive description of the timeline and the specifics of the crisis,⁸³ we focus on what we regard as the major turning points.

4.1.1 The subprime crisis

The initial spark that triggered the episode of global financial instability was the adverse developments in the US subprime mortgage market. After several years of rising house prices and low default rates, house prices started to fall towards the end of 2006, as illustrated by Figure 4.1. The softening of the housing market took place in the context of the substantial tightening of monetary policy in the United States between 2004 and 2006, during which the federal funds rate rose by a cumulative 425 basis points to 5.25% as depicted in Figure 4.2. This episode of rising interest rates, which is arguably best thought of as representing a normalization of US monetary policy after the period of very low interest rates introduced during the near brush with deflation in 2002, appears to have been largely unexpected by many house buyers and led to large increases in subprime mortgage defaults.⁸⁴ In turn, these developments triggered uncertainty about the extent and nature of credit exposures of a large number of holders of mortgage-backed debt. As a result, ABX spreads – which measure the cost of insuring a basket of mortgages of a certain quality against default – rose sharply in January and February 2007 (see Figure 4.3).

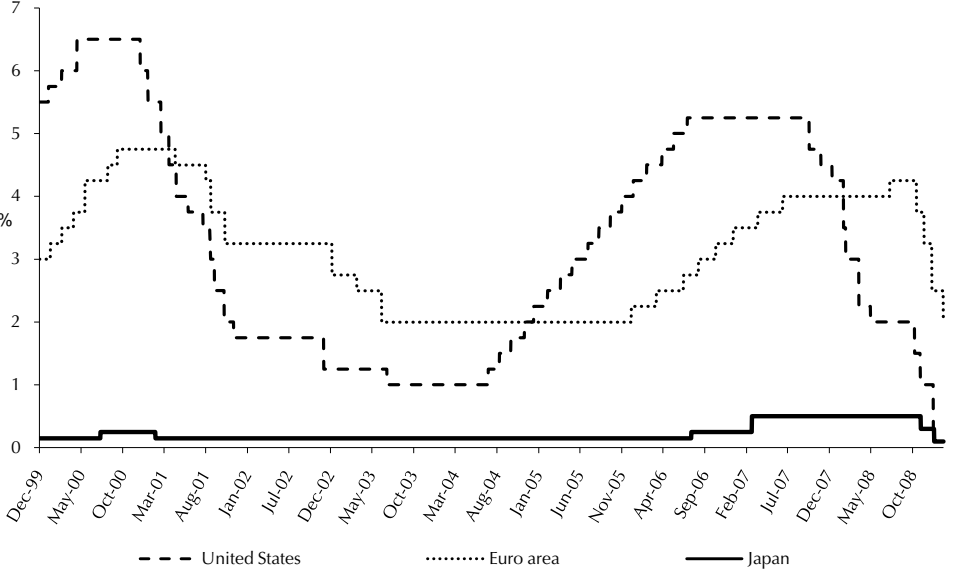
While this initial episode of crisis was short-lived and peaked in early March 2007, the turbulence was by no means over as subprime lenders continued to experience substantial difficulties, most visible being the bankruptcy of New Century Financial Corporation (the second largest subprime mortgage lender in the US) in April.⁸⁵ The damage spread beyond firms specialized in the subprime mortgage market: UBS closed its internal Dillon Read hedge fund in May, and two

Figure 4.1 US home prices (Case-Shiller index)

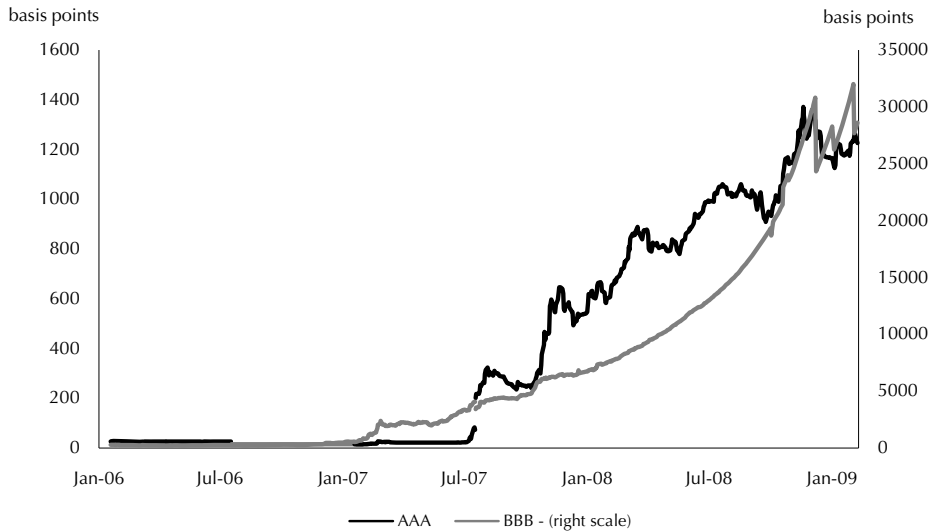


Source: Standard & Poor's

Figure 4.2 Official interest rates



Source: Datastream

Figure 4.3 ABX indices

Source: JP Morgan

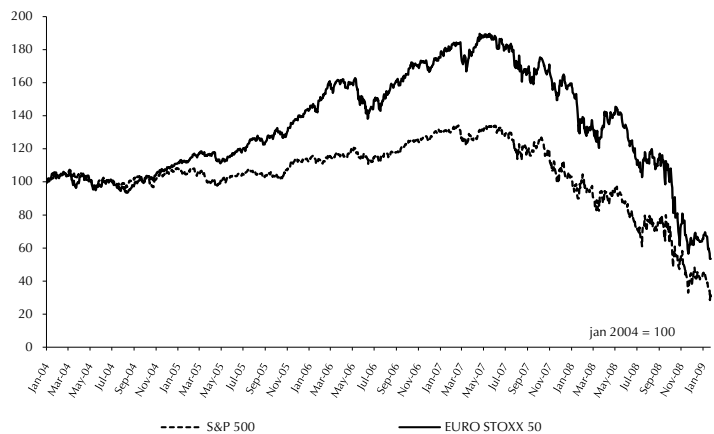
hedge funds managed by Bear Stearns had to be bailed out in mid-June following large losses. Moody's in turn downgraded a number of asset-backed securities and put others under review for downgrading, fuelling tensions in the subprime market. Further downgrades from Moody's, Standard & Poor's and Fitch followed in July. This triggered widespread concerns about the reliability of the ratings of a number of structured products well beyond subprime mortgages, leading investors to seek to withdraw from these markets.

With financial institutions and other firms with close links to the US housing sector reporting large losses, concerns grew that the losses might proliferate across the financial system and affect a broad range of institutions. With investors increasingly worried about credit and counterparty risk, market liquidity eroded rapidly. To reduce risk, investors started to curtail leverage, resulting in fire sales of assets, tumbling asset prices and risk spreads widening sharply across a number of markets. Figure 4.4 shows how financial stocks came down, and spreads widened in 2007. Similarly, foreign exchange markets experienced substantial volatility (Figure 4.5).

4.1.2 Money market tensions

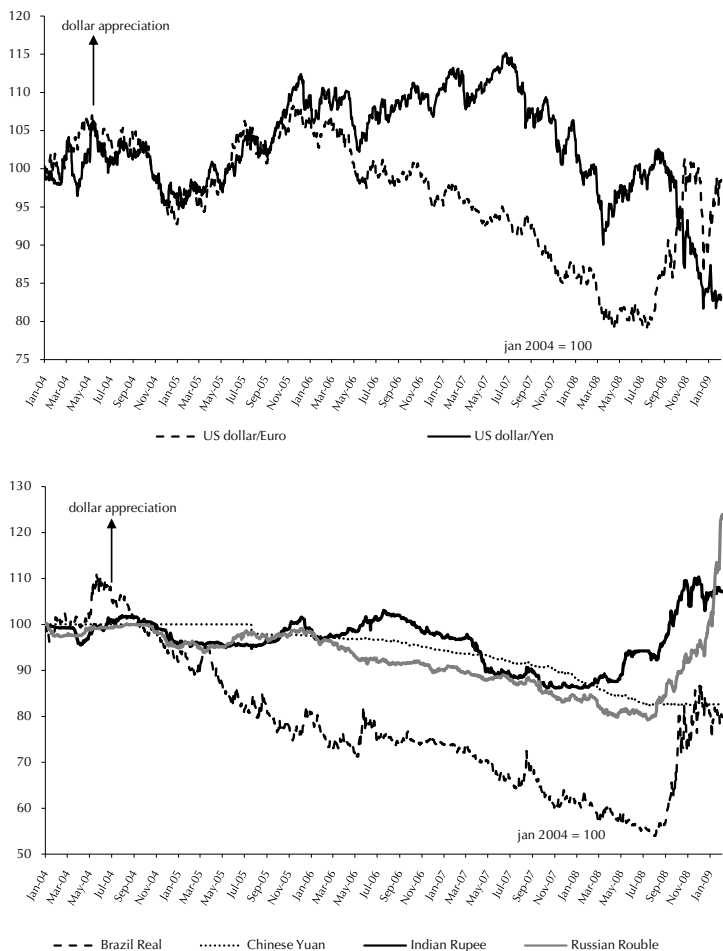
The situation turned from bad to worse over the summer of 2007. Many financial institutions held large amounts of mortgage-backed securities in off-balance sheet special investment vehicles (SIV) and conduits, which allowed them to take large positions that were not counted towards their regulatory capital requirements. These holdings were funded through short-term borrowing in the form of asset-

Figure 4.4 Stock market indices for the financial sector



Source: Datastream

Figure 4.5 Dollar exchange rates



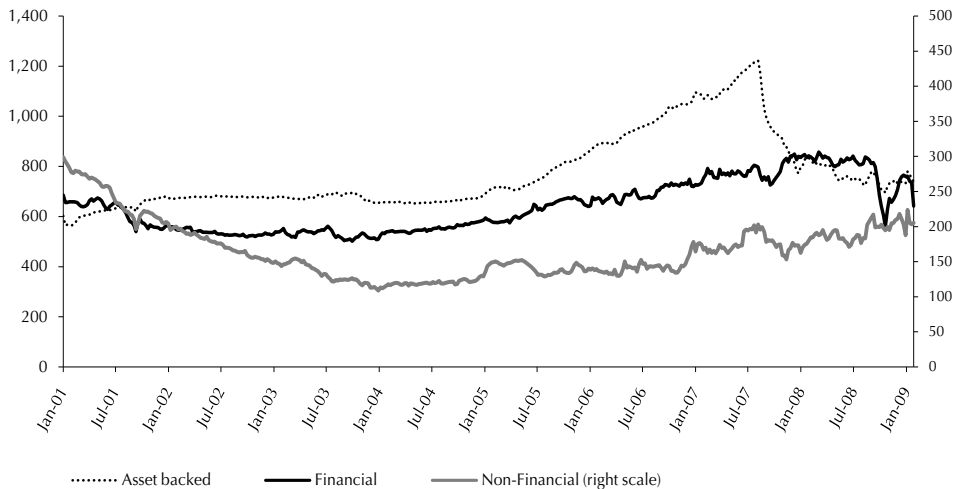
Source: Datastream

backed commercial paper (ABCP), a market that experienced rising volumes in the mid-2000s. With the value of mortgage-backed securities held by these vehicles increasingly in doubt, investors refused to provide continued financing by rolling over the stock of ABCP, and outstanding volumes promptly collapsed (Figure 4.6). Financial institutions were left scrambling for funds, and in short order liquidity in interbank markets became subject to extreme strains in August. A parallel phenomenon was the difficulty in obtaining prices for some of the asset-backed assets, which led, for example, BNP Paribas to suspend the net asset value calculation for some of its money-market mutual funds.

Since many non-US financial institutions had been active participants in the US market for mortgage-backed assets, the drying up of funding for the SIVs and conduits left them in difficulty. They faced two alternatives. They could let these vehicles fail or rescue them by absorbing them back on their balance sheets. Since the first option might have had devastating reputational costs by raising concerns about their own creditworthiness, potentially leading them to be frozen out of a number of markets, most chose the latter option. This, however, immediately boosted their own funding needs, triggered a surge in the demand for liquidity and a sharp increase in money market rates. In response, the ECB interjected 95 billion euros and the Federal Reserve 24 billion dollars in interbank markets on 9 August 2007. These were to be the first interventions of many by a range of central banks.

The unexpected integration of SIVs and conduits of dubious viability back onto banks' balance sheets also put to rest the notion that they were insulated from

Figure 4.6 Commercial paper outstanding (billion \$)

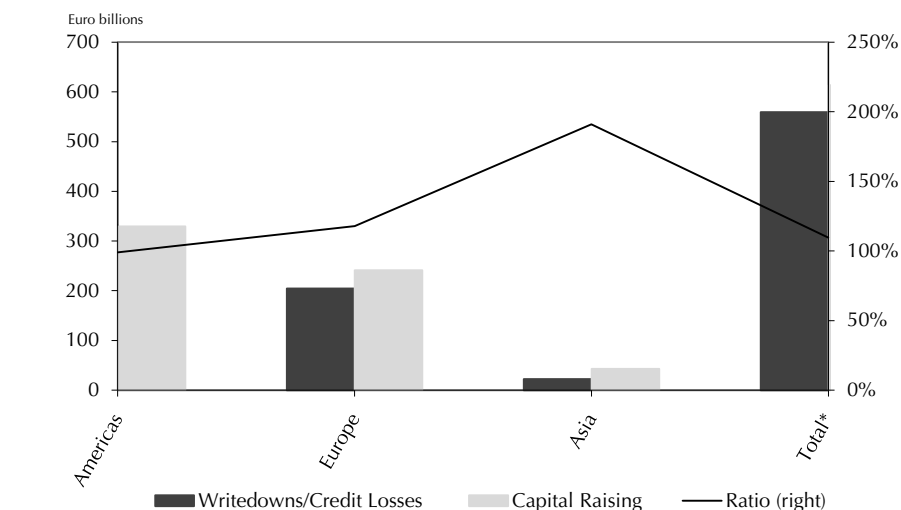


Source: Datastream

these vehicles, and raised concerns about the riskiness of major financial institutions. This development, which introduced a severe perception of counterparty risk in interbank markets, along with the sharp increase in the demand for liquidity, pushed term interbank rates markedly above the very short-term rates that central banks seek to influence in conducting policy, implying an effective tightening of monetary conditions. In turn, this increased banks' funding costs and shortened the maturity structure of their borrowing, which increased the maturity mismatch in banks' balance sheets and put some of them in a very fragile position. Combined with doubts about the quality of their assets, these financial troubles led to bank runs, whose most well-known example is that of Northern Rock in the United Kingdom.

The sharp fall in the prices of assets whose values were linked, directly or indirectly, to the health of the housing market led to a substantial deterioration in major banks' balance sheets through the use of mark-to-market valuations, thereby reducing their capital ratios. In those cases where assets were valued according to mark-to-model techniques, there were also major uncertainties concerning the value of those assets as the assumptions behind many of the models used for valuation collapsed. This raised fears regarding the size of potential losses and cast doubts on the adequacy of capital to accommodate them. Initially, banks responded by raising additional equity, most notably from sovereign wealth funds, and started to shrink their balance sheets through the so-called deleveraging process, which planted the seeds of an increasingly strong negative feedback loop between the financial sector and the macro economy. The efforts to reduce exposures to the US housing sector thus resulted in a relatively short time in a generalized process of retrenchment and asset price collapses, with losses cascading and spreading across the financial system both in the United States and internationally (Figure 4.7).

Figure 4.7 Credit losses/capital raising global banks



* Worldwide

Source: Datastream

The process was amplified by several factors. One of these was the generalized uncertainty about the potential size and location of future credit losses of financial institutions. No one knew about the exposure of other actors – or even their own – with any certainty, leading to widespread concerns about counterparty risk. In turn, this translated into a fall in the market value of major financial institutions, which weakened their financial position and hampered the normal functioning of the financial system. One case in point were monoline insurers, which specialize in writing insurance on highly rated bonds and structured financial products that were increasingly exposed to mortgage-related losses. With their financial positions exposed and with downgrades of their credit ratings in prospect, the value of the credit insurance they had provided to banks became dubious, putting further pressure on banks' share prices.

Before long, the mounting tensions in financial markets claimed a major victim. In March 2008 Bear Stearns, one of the pillars of Wall Street, collapsed and was quickly taken over by JP Morgan with the backing of the Federal Reserve. This development marked a turning point for two reasons. First, it showed that even the largest and most sophisticated actors in the financial markets were not immune to the crisis. Second, the Federal Reserve demonstrated that it was willing to take a broad view of its responsibilities and step in to prevent the failure of a systematically important institution, even one that did not directly fall under its supervisory mandate. Another important signal of this attitude was the decision to allow access to the discount window by non-banking institutions, namely, securities houses.

4.1.3 The crisis deepens⁸⁶

During the summer of 2008, financial markets remained strained but continued to function, and hopes formed that with the passage of time, market functioning would improve and credit risks recede. However, matters turned much for the worse in September. The US authorities had to intervene to address the serious problems facing Fanny Mae and Freddy Mac, and – most importantly – Lehman Brothers, a major investment bank, was unable to find a buyer and filed for bankruptcy. While concerns initially focused on its role as a broker and counterparty in markets for credit default swaps, the collapse of Lehman led it to default on short-term securities held by money market mutual funds, traditionally thought of as among the safest investment vehicles. This triggered exceptional redemptions of money market funds, forcing fund managers to liquidate assets in markets under extreme stress.

The rapid contraction of money market funds, which had played an active role as buyers of commercial paper, led this market to contract (Figure 4.6), impairing firms' access to financing and forcing the Fed to introduce a new facility through which it could purchase commercial paper.

It also led to a renewed global surge in the demand for interbank liquidity, pushing up market interest rates across the world. With the collapse of Lehmann indicating that no firm was too large – or too interconnected – to fail and that credit and counterparty risk was everywhere, banks in a range of countries started to experience a withdrawal of deposits and problems funding themselves in interbank markets. As a consequence, a number of banks and financial intermediaries

were rescued by the authorities before the end of September. To mention but a few, the US authorities took over Washington Mutual and rescued AIG; the UK nationalized Bradford and Bingley; Fortis and Dexia received an infusion of equity capital from the governments of Belgium, Luxembourg and the Netherlands; and Hypo Real Estate secured credit lines guaranteed by the German government.

But while the authorities so far had managed problems in individual financial institutions on a case-by-case basis, this approach proved increasingly untenable. With the risks of bank runs by depositors or in markets for short-term funds growing by the day, large-scale and system-wide government intervention in the banking sector became necessary to avoid a financial meltdown with dramatic economic and social consequences.

That intervention had two objectives, and took four different forms.⁸⁷ The first purpose was to improve banks' access to funding. By their very nature, borrowing short and lending long, banks are susceptible to funding disruptions. Historically these have taken the form of bank runs, as indeed happened in the United Kingdom in 2007 in the case of Northern Rock mentioned before. The modern incarnation of such runs is the inability of a bank to obtain short-term credit in interbank and other markets. By expanding retail deposit insurance and by announcing guarantees for various forms of bank liabilities, governments hoped to enhance banks' access to funding and to reduce risk spreads between interbank and other rates.

The second objective was to strengthen bank solvency by injecting public capital. With many systematically important institutions having endured massive losses, banks' capital bases had shrunk and leverage had risen to high levels. This raised the riskiness of banks and put strong pressure on them to reduce leverage by engaging in large-scale asset sales and for reducing credit supply. While desirable for an individual bank, if banks in the aggregate were to do so, the effect would be the collapse of the prices of the assets in question and/or the drying up of bank credit to the economy. Given banks' difficulties to raise equity capital in the market, governments aimed to reduce the need for asset fire sales and to raise banks' creditworthiness by injecting public capital into banks' balance sheets. This, it was hoped, would facilitate bank funding in wholesale markets. Moreover, governments considered supporting banks by purchasing toxic assets, as originally intended by the Paulson Plan. While the difficulty in determining the appropriate prices for these assets and the greater effect on credit expansion of capital injections may explain why this approach was not widely used initially, the continuing bank losses and the widespread lack of confidence in the health of banks despite the public recapitalizations have recently led a number of governments to start using this avenue through either the direct purchase of bank assets (i.e. the creation of a bad bank) or the extension of guarantees to cap bank losses in extreme events (as in the new UK plan).

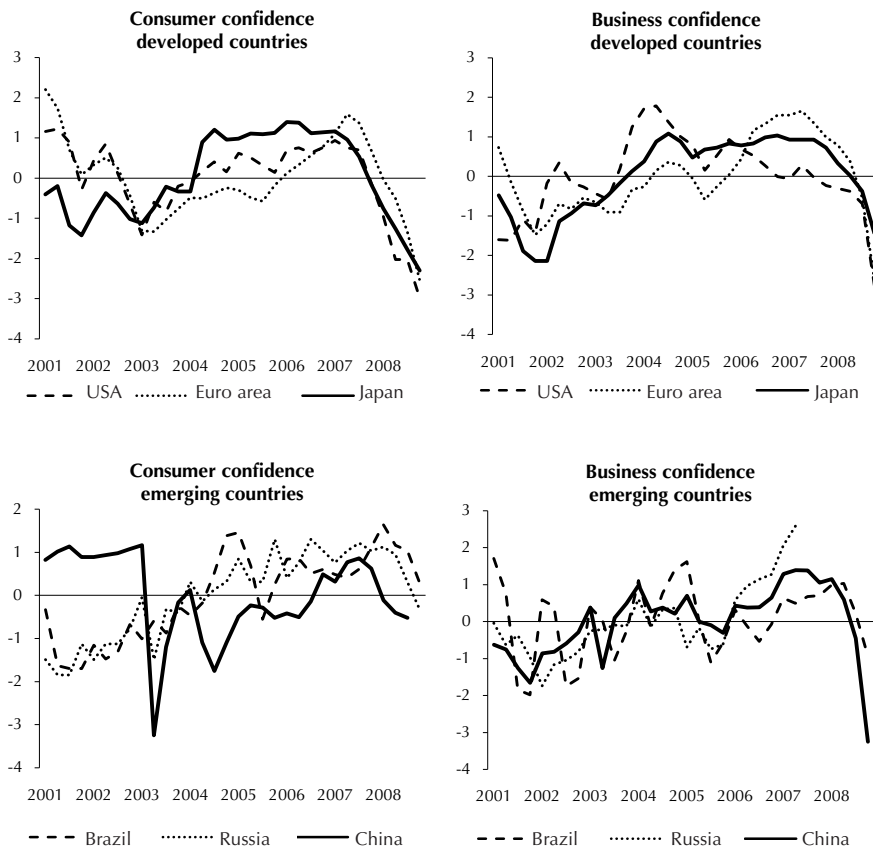
4.1.4 Spillovers to the real economy

What had started as a localized problem in US subprime markets thus quickly turned into a problem impacting on financial markets and institutions across the world. Yet, before early 2008, the situation appeared largely contained to the financial sector, with only a moderate slowdown in the broader economy. During the spring and summer, however, macroeconomic prospects continued to worsen

and consumer and business sentiment in and outside the United States fell continuously (Figure 4.8) as growth prospects were revised downward (Figure 4.9). The collapse of Lehman Brothers in September and the resulting increased strains in financial markets – in particular the large falls in equity prices and the close brush with a full-blown banking crisis in a number of countries – had a very negative impact on economic sentiment and led to sharp declines of stock markets across the world (Figure 4.10). With weak incoming macroeconomic data, widespread concerns that the world economy was slipping into recession took hold and the deterioration of confidence was reflected also in Libor-OIS spreads, which peaked both in the United States and in Europe.

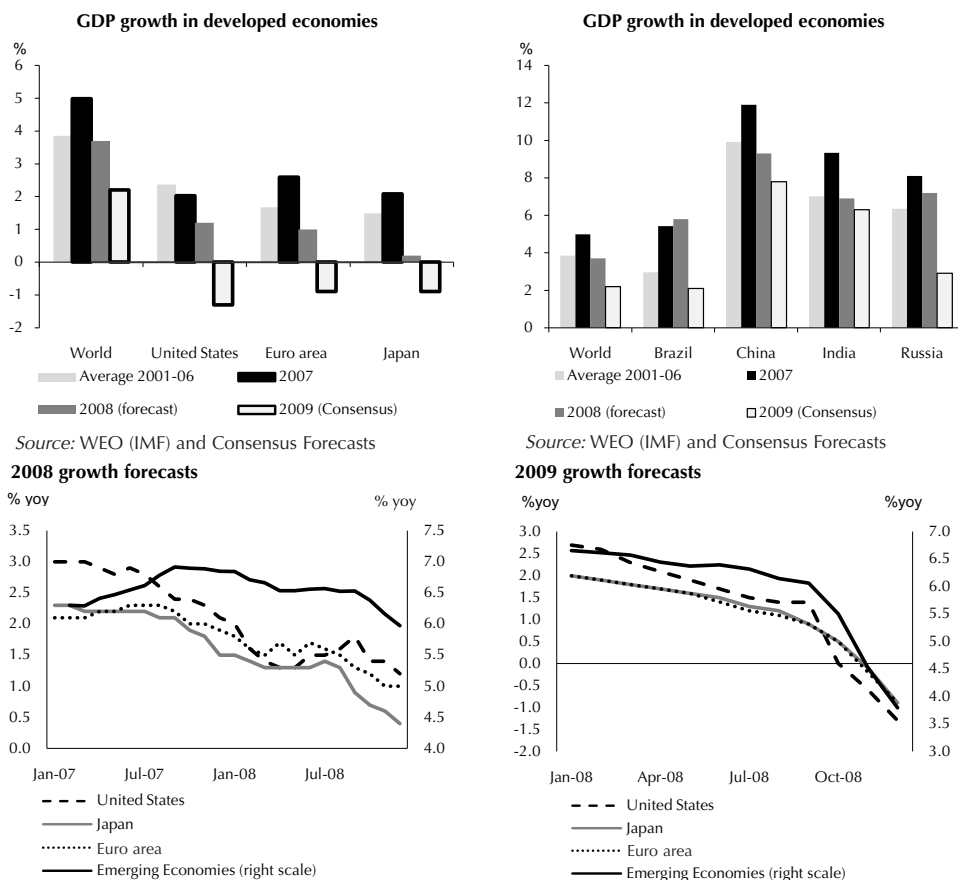
The financial tensions spread to the broader economy through several mechanisms. Most obviously, falling property prices reduced the profitability of new housing construction and therefore depressed residential investment. Falling property prices also impacted on the value of assets used as collateral for loans, and falling asset prices reduced net worth of firms in – and outside – the financial sector, leading to a generalized squeeze in the availability of credit and triggering

Figure 4.8 Measures of confidence



Difference between the indicator and its average in 2001–2008 in points of standard deviation.

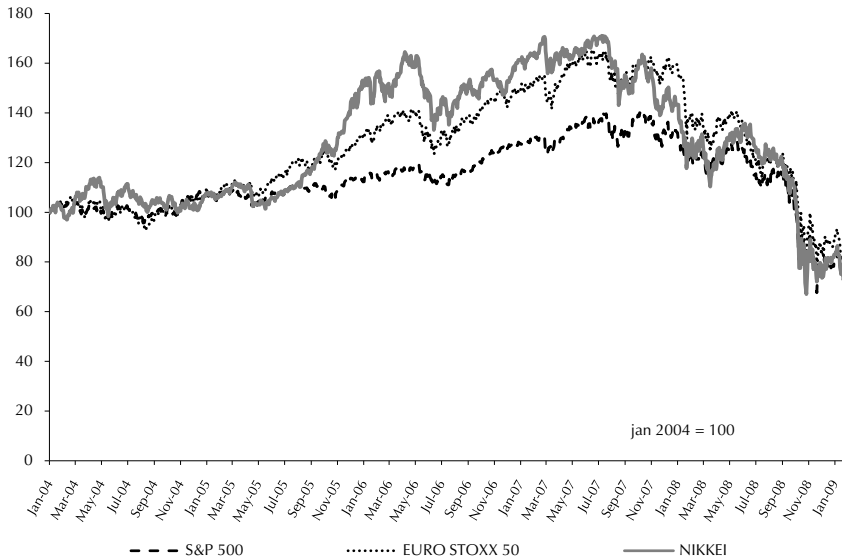
Source: National Statistics

Figure 4.9 GDP growth

Source: Consensus Forecasts

firms and households to cut back on investment and consumption spending in order to strengthen their balance sheets. Moreover, declines in property and equity prices also reduced household wealth, depressing consumption further.

In addition to reducing the demand for loans, the financial tensions in wholesale markets and the perception of higher economic risk led banks to significantly tighten credit standards, curtailing the availability of credit beyond the safest borrowers. This led to a sharp contraction in the sectors most sensitive to credit conditions, such as housing and durable consumer goods including automobiles. Since financial markets are highly integrated globally, the financial strains were quickly transmitted internationally, and thus set the stage for an abrupt slowdown in economic growth in many economies in the fall of 2008, with most advanced economies experiencing negative growth rates in the second part of the year and emerging markets decelerating sharply.

Figure 4.10 Stock market indices for developed countries

Source: Datastream

4.1.5 What went wrong?

The financial crisis spread across so many different markets and so rapidly that the question naturally arises: what factors explain its severity? Moreover, should central banks have spotted them earlier? Did their interest rate decisions – or indeed the design of the framework under which they conduct monetary policy – play a role? With the crisis ongoing, it is too early to draw any definitive conclusions. But it is nevertheless useful to ponder what went wrong and to consider whether central banks as monetary policy-makers may have contributed to the bubble.

At the microeconomic level, a number of mechanisms have been identified that made financial institutions take far too much risk.⁸⁸ Most obviously, and to start as close as possible to the spark that triggered the crisis, the *originate-to-distribute* model had extremely unfortunate incentive effects. With newly extended mortgages being almost immediately resold for securitization, originators had little, if any, incentive to perform serious credit analysis and to ensure that the loans would be properly serviced during their life time. This lack of appropriate incentives meant that the subprime mortgages, upon which the entire superstructure of mortgage-backed securities was built, were compromised from the outset.

Banks that purchased these longer-term asset-backed securities indirectly through SIVs appear to have underestimated the potential problems, in particular the consequences of the maturity mismatch that would arise when funding them short-term in wholesale markets. Moreover, the assumption that, if funding proved to become problematic, the assets could be liquidated swiftly at little cost in deep and well-functioning markets, seems not to have been challenged. And the risk, if illiquidity proved to be a problem, that reputational concerns would

require the sponsoring banks to migrate these off-balance sheet vehicles on to their own balance sheets seems likewise to have been disregarded.

One common theme that these devastating errors of judgment share is that they involved the failure to distinguish between idiosyncratic shocks that impact on only one or a few institutions, and aggregate shocks that impact on all. Clearly, if only one or a few institutions had been affected, none of these complications would have amounted to much. But the fact that so many institutions found themselves in exactly the same predicament made it so much more difficult to overcome the resulting problems.

But the problems went well beyond these. In particular, much criticism has been directed at the market for structured financial products whose risk-return tradeoffs proved to be highly complex and opaque. Moreover, in valuing these products, investors appear to have relied excessively on ratings, as opposed to due diligence, despite the fact that the rating agencies were paid by those whose products they rated, raising clear conflicts of interests. Finally, the statistical models used by rating agencies were estimated over short and generally benign sample periods and thus were potentially uninformative about the likelihood of more turbulent economic conditions.

Another weakness of the financial system was compensation schemes.⁸⁹ Typically, these awarded bonuses when strategies generated short-term profits but insignificant downside (through vesting schemes) when they did not (or generated future losses). This effect is reinforced by two phenomena: the facts that successful managers tend to attract more capital and that managers' compensation depends on capital allocation; and the tendency for managers to copy other managers' strategies, so that if returns were high, so too would be compensation, and if returns were low, then at least there was safety in claiming that everyone had erred together. Compensation schemes also provide incentives to take tail risk – that is, risks that are highly unlikely to materialize but when they do they produce large losses – that are difficult to monitor. A textbook example of such a strategy is to write credit insurance or write far-out-of-the-money options, which produce generally small positive returns and, very rarely, catastrophic losses. These potentially perverse incentives are of course well known and widespread in the financial industry. Nevertheless, they appeared to have been at work especially in large and complex banks and investment banks, where monitoring becomes a daunting task and, *ex post*, has appeared to be especially poor.

Furthermore, with managers' compensation typically depending on a combination of capital allocation and returns, the decline in interest rates provided strong incentives for risk taking, as discussed in Chapter 3.

Overall, it is undeniable that microeconomic shortcomings played an important role in creating the conditions that led to the onset and extent of the crisis. Many of these pertain to the regulation and supervision of individual agents in the financial sector that frequently are not under central banks' remit. This raises the issue of what central banks in their role of monetary policy-makers could have done.

4.1.6 Did monetary policy contribute to the crisis?

Some observers have argued that the fact that inflation was low and stable in the years preceding the eruption of the financial crisis led central banks to run too

expansionary monetary policies. This resulted for many countries in an excessive expansion in financial sector activity, a sharp increase in credit, a run up of asset prices and a compression of risk spreads. Had interest rates been higher, the argument continues, particularly in the economies in which leverage increased the most, the likelihood of the turmoil that we are now experiencing would have been much reduced. In sum, central banks should have been 'leaning against the wind' in the sense of tightening monetary policy as the asset bubble started to grow. In what follows we review the main reasons why central banks hesitated to do so.

Monetary policy seeks to achieve a desirable combination of inflation and economic activity, with the relative weights depending on the specific central bank's mandate, over the next few years. Increases in credit and asset prices that influence the central bank's forecast of future economic conditions will thus elicit a monetary policy response. But raising interest rates over and above what the forecasts suggest is desirable runs the risk of pushing inflation and real economic activity below the desirable levels.⁹¹ Moreover, to tighten monetary policy in response to an asset price bubble central banks must be able to spot it early when it is still small, since tightening monetary policy to pop a large bubble risks triggering exactly the adverse financial conditions that we are now experiencing.

Furthermore, the short-term interest rates that central banks control or influence may also not have much of an impact on the demand for housing, which played a key role in the bubble. In most countries, mortgage interest rates depend on the expected future path of short-term real interest rates during the life of the mortgage, on which monetary policy can impact at best imperfectly. Finally, the run-up in property prices before the crisis was due to falling underwriting standards, breakdowns in lending oversight by investors and rating agencies, excessive reliance on complicated and opaque financial products, and developments in housing finance that made it easier for borrowers to find funding than in the past, leading to excessive leverage and risk taking.⁹² This suggests that regulatory and supervisory policy, rather than monetary policy, should be the focus when trying to forestall asset price bubbles.

The above reasons are important in understanding why central banks acted as they did. Nevertheless, it must be recognized that the consequences of the crisis would have been smaller if central banks had been more concerned about the building up of financial imbalances that were most directly reflected in developments of credit aggregates and asset prices as the bubble was forming. But, of course, that would have required these developments to impact on central banks' forecasts of future inflation and output. It is, from that perspective, unfortunate that central banks' forecasting models and methods frequently fail to satisfactorily incorporate the type of financial variables that played a role in the boom that preceded the crisis, such as measures of mortgage lending and of overall indebtedness in the economy. One potential reason for this omission may be that the financial system evolves so rapidly over time that it is difficult to obtain clear estimates of how financial sector developments impact on macroeconomic conditions and future inflation. Another is the absence of a broadly accepted theoretical model that satisfactorily incorporates financial sector variables and that can be used to forecast inflation.

Thus, one contributing factor to the crisis may have been the fact that many – although not all – monetary policy-makers tended to disregard, or attach too lit-

tle weight to, important financial sector developments because they did not appear prominently in the central banks' forecasting models. Such models capture the state of economic thinking at a given point in time and evolve in response to new research findings. Factors – such as credit aggregates, overall indebtedness and asset prices – that are not incorporated in current models may nevertheless be important and thus warrant attention.

Overall, the recent experience shows that financial imbalances can build up even under price stability, implying that regulation and supervision are essential tools for the pursuit of financial stability. However, monetary policy-makers should also take financial stability considerations more fully into account when setting policy aimed at delivering price stability. Indeed, if the horizon for price stability is sufficiently long (i.e. truly medium-term), monetary policy must take the risk of financial imbalances into account because the bursting of a bubble risks depressing inflation below the central bank's objective over that horizon. While somewhat higher interest rates than otherwise may lead to somewhat lower inflation than desired say, next year, they may lower the risk of an eruption of financial problems and deflation later on, and thus help maintaining price stability over the medium term.⁹³

4.2 The inflation surge

The second component of the great unraveling was the generalized rise in inflation which started early in the fall of 2007. As we discussed in Chapter 2, inflation fell from the early 1990s across the world, prompting concerns in the early 2000s that economies could slip into deflation (as, in fact, Japan did in the 1990s). Monetary policy was relaxed globally in 2001, particularly in the United States, in response to the weakening of economic activity and a sharp recession in the United States and fears of deflation. These policies led to a sustained period of low and stable inflation, with world-wide inflation standing at around 2% in 2006.

However, from the third quarter of 2007, that is, just after US subprime tensions had started to spread to financial markets more broadly, inflation rates rose across the world to levels not seen since the 1990s. Thus, after having managed inflation pressures skillfully for a decade or more, central banks suddenly faced dramatic price increases at the same time as financial instability raised the prospect of a global downturn.

4.2.1 Rising commodity prices

The underlying factor triggering the increase in inflation rates was the rise in commodity prices, in particular oil and food prices, which started in 2007 and became increasingly pronounced during the year (Figure 1.3).

This sharp rise led to an active debate about the underlying causes of the price increases. Commodities are traded, and their prices are set, on internationally integrated markets, and consequently reflect developments in the global economy. A large part of the rise in prices simply reflected the rapid growth in income and industrial activity, which is more commodity-intensive in emerging markets and developing economies, which are playing a growing role in the global econo-

my. Another contributing factor was generally low inventory levels, which are themselves an indication of a period of sustained demand pressures. Furthermore, the lack of spare capacity to raise production after a long period of limited investment in production facilities appears to have played a role. With little spare supply, demand shocks lead to larger movements in prices.

The notion that commodity prices were rising as a consequence of speculation, as opposed to industrial demand, was much debated in the press. While the presence of speculators in commodities futures markets is undeniable, the evidence does not seem to support the view that they were the so-called marginal investor, determining the equilibrium price. In order to raise prices, speculators must take delivery of the commodities purchased and withhold them from the market. However, inventory levels of oil and other commodities were not high as the speculation hypothesis would suggest. In addition, commodity prices did not rise more in those cases where future markets existed, thus casting doubts on the speculative hypothesis. While it thus seems unlikely that speculators fuelled the rise in prices, it is by contrast eminently plausible that speculators speeded up the price discovery process. Thus, by buying (selling) in advance of expected price increases (decreases) and by closing their positions once prices had moved, speculators may have made prices respond more rapidly to new information and in this way made markets more efficient. In a period in which most changes in supply and demand conditions pointed in the direction of higher prices, it is easy to imagine why speculation – which has mostly been reflected in higher price volatility – may have been misinterpreted as playing a causal role for price increases.

That said, low interest rates expand aggregate demand and reduce the cost of holding inventories, which both increase the demand for commodities. At the same time, low rates increase the incentives not to extract oil and other non-renewable resources, thus reducing market supply. They may also be associated with more financial activity, leading again to a situation in which observers may incorrectly associate greater speculative activity in financial markets with rising commodity prices.

Other factors also played a role in exacerbating the price increases for food, such as adverse weather conditions and rapid increases in the production of bio-fuel in response to higher oil prices. Higher fuel and fertilizer prices also had a direct effect on production costs, particularly in the emerging markets, as well as on transportation costs. Finally, export restrictions on food in a number of areas also appear to have been important by restricting supply at the global level.

4.2.2 Impact on inflation

How did the commodity price shock impact on inflation, and what role did monetary policy play in that context? While a jump in commodity prices clearly has a direct impact on inflation (Figure 1.2), this remains a one-off shock with no implications for future inflation rates unless central banks change their inflation objectives. It is difficult to imagine that, after devoting ten or fifteen years to enhancing the credibility of monetary strategies aimed at achieving low inflation, central banks would change course and aim for higher inflation. This is particularly so since there is no reason to believe that aiming for a higher rate of inflation would raise economic activity and reduce unemployment in a lasting way – quite the contrary.

Thus, to us the shock to commodity prices represents a shock to relative prices which has at most a temporary impact on inflation. Of course, had the increase in commodity prices led to second-round effects on wages and other prices, the overall impact on inflation might have been protracted and thus would have complicated central banks' attempts to restore price stability. But barring that, one would have expected the impact of the shocks on inflation to dissipate, as indeed they did by the fall of 2008.

The direct effects of commodity price shocks on consumer price inflation depend on two factors. The first is the weight of energy and food prices in the consumer price basket, a channel that can be sizable. As an illustration, energy accounts for nearly 10% of the harmonized index of consumer prices (HICP) for the euro area, also affecting transport (with a weight of 6.1%), and housing (with a weight of 16.1%) through heating costs. Food accounts directly for an additional 19.5% of the HICP index, but there are large differences between advanced countries, with the weight varying from 10% in the United Kingdom to 26% in Japan.⁹⁴ Food prices also play a much greater role in emerging economies (e.g. Argentina 31.3%, or Russia 40.2%) and a still greater role in developing economies (e.g. Bolivia 49.1%, and São Tomé 71.9%). A second factor that plays a role is the presence of subsidies and taxes. On balance, taxes (and, in some case, the reduction of subsidies) has tended to accentuate the impact of higher oil prices on inflation in advanced countries as measured by the consumer price index (CPI). By contrast, in emerging and less developed economies, subsidies have tended to reduce the impact on prices at the expense of public budgets.

As noted above, in addition to these direct effects, commodity price shocks can impact on inflation through second-round effects. This happens when relative price changes trigger further price adjustments to offset the effects of the initial shock. Most obviously, a primary concern for central banks across the world in a context of rising commodity prices is the risk of sharp increases in wage demands. This risk is greater in economies where the weight on commodities in the CPI is relatively large, such as emerging market and developing countries, and if the economy is already overheating and there are pressures on wages to rise.

Risk is also greater when the central bank has a history of not taking firm measures to offset shocks to inflation and the credibility of monetary policy is thus not yet fully established. In this situation workers may fear that the initial increase in inflation will last some time and continue to erode real wages, which may lead them to demand compensation not only for the initial rise in consumer prices but also for the expected further increases during the life of the wage agreement.

Of course, a lack of central bank credibility is also worrisome because it may lead employers to expect that inflation will remain high after a commodity price shock, eroding real labour costs and making it easier for them to raise prices. This may make them more willing to agree to relatively large wage increases, with obvious implications for inflation. In sum and as the experiences of so many countries in the 1970s demonstrate, the combination of commodity price shocks and a lack of credibility in monetary policy can provide a fertile environment for inflation.

To see better the crucial importance of credibility when conducting monetary policy, suppose that the public believes that, no matter what it takes, the central bank will return inflation promptly to the desired level if a shock occurs. With long-run inflation expectations well anchored, there is no risk of second-round

effects and the central bank may even be able to temporarily *reduce* interest rates to deal with the contractionary impact on activity of the commodity price shock. By contrast, when commodity price shocks occur and the central bank has little credibility, the necessity of preventing long-term inflation expectations from rising and triggering second-round effects requires a strong monetary policy response. In such case, the central banks' ability to cushion the real side effects of the shock is consequently limited.

4.2.3 A false alert?

While at the time commodity prices seemed to be following a sharply rising trend, we now know that they peaked in the summer of 2008 and declined sharply as large parts of the world economy slipped into recession. With low growth expected to persist for some time, the increase in inflation in 2007 and 2008 proved to be temporary and thus of little significance for monetary policy.

We think nonetheless that the episode was an important test for central banks. Even those that had a long record of delivering stable and low inflation faced questions about their ability to ensure price stability, as inflation in many countries increased rather sharply. However, in advanced economies the increase in core inflation was more limited and inflation expectations overall remained rather stable, suggesting that the public came to see the pick-up in inflation as a transitory phenomenon of little or no medium-run significance (Figure 4.11). Nevertheless, the episode suggests that central banks cannot take their credibility for granted, something that particularly applies to many in emerging markets economies whose track record in delivering low inflation is much more recent.

Inflation rates have significantly fallen since the summer of 2008 (Figure 1.2) following the sharp drop in oil, food and other commodity prices that has taken place since against the background of the severe downturn in the world economy. In fact, fears of stagflation have been replaced by serious concerns about the global economy falling in a depression with non-negligible risks of deflation in certain areas (Figure 4.12). This poses new, important challenges for central banks that are examined in Chapter 5. In particular, they need inflation expectations to remain well anchored, which would reflect the confidence by the public that monetary policy will guard against deflation as effectively as it has guarded against inflation in the past.

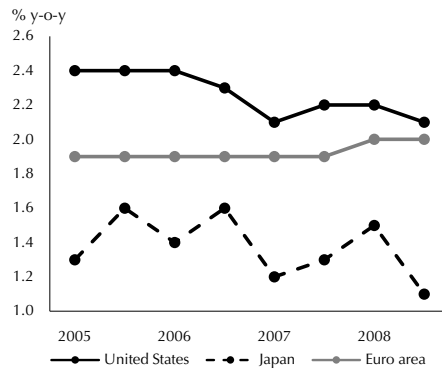
4.3 The conduct of policy by central banks during the great unraveling

Having reviewed the two major challenges faced by central banks in 2007–8, we now examine how they formulated and implemented policy in this period.

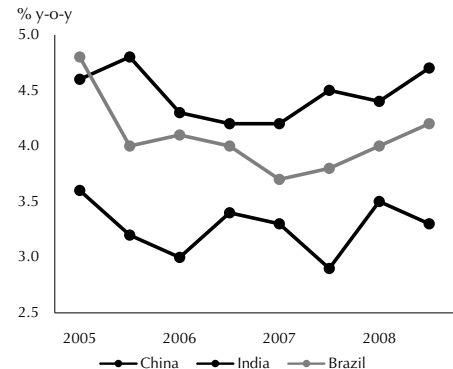
The first challenge central banks faced was to restore normality in the money markets and, in particular, to ensure that short-term interest rates remained at the desired level in an environment of surging liquidity needs and generalized malfunctioning of interbank markets. This raised a large number of issues regarding, *inter alia*, the determination of collateral requirements, the selection of counter-

Figure 4.11 Long term inflation forecasts

**Long term inflation forecasts (a)
Developed countries**



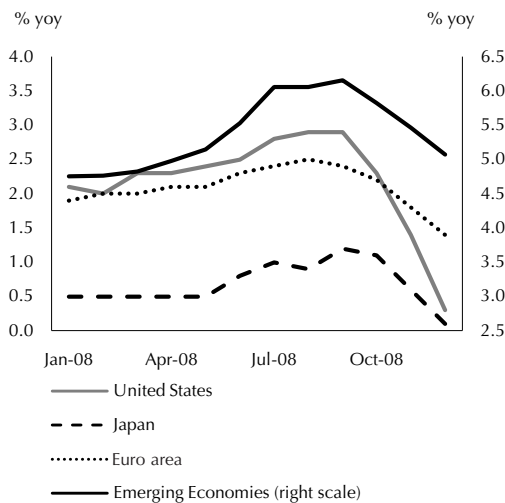
**Long term inflation forecasts (a)
Developing countries**



(a) Average of 6 to 10 years ahead. Forecasts made twice a year.

Source: Consensus Economics

Figure 4.12 2009 Inflation forecasts



Source: Consensus Economics

parties, the design of standing facilities, and the maturity and frequency of money market operations.

The second problem, which central banks struggled with until the summer of 2008, was how to determine the appropriate stance of monetary policy in a situation with headline inflation rising sharply in response to higher commodity prices, economic activity slowing mainly as a consequence of increasingly severe financial sector problems, and with severe financial sector tensions impacting on the interest rate transmission channel and in this way complicating monetary policy. As mentioned, the subsequent fall in inflation in an environment of sharply deteriorating activity and depression fears, has raised new and formidable challenges for central banks and other policy-makers.

4.3.1 Liquidity management

Central banks faced intense difficulties during the crisis in ensuring that short-term money market rates remained close to the level deemed appropriate from a macroeconomic perspective as large wedges between policy rates and short-term money market rates developed. In principle, controlling short-term rates is not a difficult issue: the central bank simply provides or drains liquidity until the point at which market-determined rates are close to the intended level. In practice, however, several factors profoundly complicated liquidity management in 2007–8.⁹⁵

First, in order to obtain liquidity from the central bank, commercial banks must be able to post collateral of acceptable quality. Given the surge in the demand for liquidity, the number of potential counterparties and the deteriorating quality of collateral, some banks were unable to obtain the necessary funds in this way. While collateral regulations can be – and in many cases were – made more flexible, when the liquidity problems were initially felt in August 2007 and interbank rates rose sharply, central banks struggled to bring short-term rates back to the desired level.

A second factor complicating liquidity management was the fact that central banks only control the aggregate level of liquidity in the banking system, not its distribution. With banks uncertain about their future liquidity needs and the financial condition of counterparties, many naturally preferred to hoard surplus funds rather than lend them to each other in the interbank market, except for the shortest of terms. Thus, both liquidity and credit risk concerns led interbank markets to segment and dry up and caused a situation in which some banks had inadequate access to funds even though the banking system in the aggregate may have had ample funds available.⁹⁶ In some cases, central banks sought to circumvent this problem by establishing new facilities targeted at financial institutions that in the past had not been counterparties in their liquidity providing operations, the Fed injections of liquidity beyond the primary dealer institutions being a prominent example.

A third consideration was the fact that commercial banks did not want the ‘traditional’ form of liquidity, that is, overnight funds. The resurgence of credit risk led interbank markets to grind to a halt, triggering a sharp increase in term interest rates in particular, which play a key role as a reference for the pricing of a broad range of financial instruments. In response, banks turned to central banks for extra liquidity to replace the funding they would otherwise have obtained in these markets.

This presented a problem since central banks typically define policy in terms of a very short-term interest rate – the federal funds rate in case of the Federal Reserve. While term rates in principle could be brought back to their original level by reducing policy rates, this would run the serious risk of confusing liquidity management with monetary policy in the eyes of the public. With inflation rising sharply at that time and markets volatile, a precipitous drop in policy rates could have been interpreted as central banks losing control of the situation, triggering further tensions in the markets.⁹⁷ In response to the rapidly rising demand for liquidity, central banks responded by increasing the frequency and maturity of their operations, extending the number of counterparties as well as by broadening the eligibility criteria for collateral.

A fourth complicating factor concerned banks' unwillingness to obtain liquidity using central banks' standing facilities. These are available in order to prevent market rates from rising or falling too far from central banks' targets for interest rates. However, with borrowing subject to penal rates, the use of the facilities carried a stigma as a bank using them could be seen as having problems funding itself in the interbank market, thus increasing perceptions of counterparty risk. Although central banks do not identify which banks make use of the standing facilities, the reputational considerations involved gave those that did not use the facilities strong reasons to make that known, making it easy to identify those that did. Since the use of the facilities could lead banks to be shunned as counterparties in a range of markets, calling their very survival into question, banks were willing to pay large premiums in the interbank market in order to avoid having to turn to the central bank's credit facilities. This kept interbank rates far above central banks' policy rates.

A fifth complication was the need for foreign currency, in particular for US dollars, by globally active banks. These could access central bank funds in a number of jurisdictions through local subsidiaries or branches and thus were able to access funds from several central banks. Facing large-scale borrowing from domestic subsidiaries or branches of foreign institutions constituted a challenge for central banks which, for obvious reasons, have a much better understanding of the state of domestic banks (particularly *vis-à-vis* branches) and their need for funding. Understanding the causes and patterns of this borrowing was facilitated by increasingly close cooperation by central banks as the crisis unfolded. Moreover, to simplify commercial banks' access to foreign currency funds, central banks expanded existing, and established a number of new, swap arrangements of increasing size (as those arranged, for example, between the Federal Reserve and major foreign central banks, such as the Bank of England, the European Central Bank and the Swiss National Bank), which permitted commercial banks to obtain foreign currency from national central banks against domestic currency collateral.

As a result of all the factors discussed, the balance sheets of central banks experienced an important increase, as shown in Figure 4.13. Specifically, from January 2007 to December 2008 the balance sheet of the Fed grew by a factor of 2.7 and that of the Bank of England by a factor of 2.8.

Figure 4.13 Total Assets Central Banks

Source: Consensus Economics

4.3.2 Monetary policy responses

But central banks also responded more directly with interest rate changes to the turmoil in the financial sector and to accumulating evidence that inflation pressures were abating and economic activity was slowing. Most notably, the Fed started reducing the federal funds target from 5.25% in September 2007 – a little more than a month after the tensions in the interbank markets started – and reached a little more than a year later a target of 0–0.25% (Figure 1.4). The reduction of US official rates was particularly rapid in early 2008 as the financial turmoil continued unabatedly and the outlook for economic activity weakened.

Initially, other central banks continued to tighten policy for a while in light of domestic conditions. For instance, the Bank of England ended the cycle of interest rate increases after raising rates in July 2007 to 5.75%. It subsequently held rates constant until December 2007, when it started relaxing monetary policy gradually – and then more aggressively – in response to financial markets developments and their implications for the outlook for inflation, bringing the official rate to 1.00%. The ECB also initially tightened monetary policy amid risks of second-round effects on inflation, with the last increase in interest rates as late as in July 2008, bringing the official rate to 4.25%. However, from October 2008 onwards, the ECB cut rates significantly from 4.25% to, at the time of writing this report, 2% in light of the quick improvement in the outlook for inflation resulting from falling commodity prices and the rapid cooling of the economy in the euro area.

Two factors may explain the different speeds at which central banks cut interest rates during the crisis. The first factor is the intensity of the shock. Since the crisis started in the US, it is not surprising that the Fed relaxed monetary policy

earlier and more rapidly. Similarly, with the shock progressively affecting the financial sphere of many other advanced economies, central banks operating in countries with large financial markets also felt a need to adjust policy more intensively as price and output prospects worsened.

The second factor is the mandate of the central bank concerning monetary policy. Central banks – such as the Bank of England or the ECB – that have price stability as their overriding monetary policy goal faced the tension between the need to raise interest rates to prevent the rapid rise in headline inflation in the fall of 2007 from becoming embedded in inflation expectations and triggering second-round effects, and the possibility that the financial turmoil would over time impact on the real economy and reduce inflation pressures. As the financial crisis took an increasing toll on global business prospects and as oil and other commodity prices started falling in the summer of 2008, actual and forecasted inflation decreased significantly. As a consequence, these central banks also eased rates, taking larger steps than in other periods. In particular, the ECB lowered rates in steps of 50 and 75 basis points, and the Bank of England in steps of 50, 100 and even 150 basis points.

4.3.3 Some monetary policy issues

As discussed above, the surge in the demand for liquidity was particularly pronounced beyond the overnight maturity, as banks' ability to attract term funding in the market was seriously impaired. Since central banks' market operations were typically focused on the shortest maturities, this mismatch between the supply and demand for liquidity led initially to a situation in which term money market rates were seen by central banks as too high, while overnight rates often tended to fall below the level seen as appropriate by policy-makers.

Such a reduction in overnight rates risked being misunderstood by market participants and the public more broadly as an unannounced easing of monetary policy. In a period of rising commodity prices, this carried the risk of severely damaging the central banks' credibility as guardians of price stability and of leaving them seen as catering excessively to the desires of financial markets. Indeed, critical voices through 2008 asserted that some central banks were too close to financial markets and lost sight of their mandate of keeping inflation low and stable.⁹⁸ Even though central banks communicated forecasts that inflationary pressures were likely to be short-lived, this remained a debatable conjecture, at least until the summer of 2008 when oil and other commodity prices started to decline.

The financial distress also complicated the management of monetary policy by raising the level of uncertainty. Monetary policy operates primarily by providing market participants with a clear understanding of the path that short-term interest rates are likely to follow, thereby influencing long-term interest rates. While this is a difficult task even in normal times as future economic conditions are inherently uncertain, in times of crisis it becomes a daunting challenge. As many beliefs that had previously been seen as certain – such as that the volatility in financial markets would remain low or inflation would remain firmly anchored at a low level – were called into question, the public suddenly faced great uncertainty about how monetary policy might evolve over time. This made long-run projections much more uncertain than previously and put a premium on guiding long-run expectations by enhancing central bank communications with the market.

A final challenge in setting policy interest rates is to ensure that conditions that are appropriate in a time of crisis do not have adverse consequences at a later stage. While a major policy easing can be warranted in a situation in which financial markets do not function properly, it could lead to expectations that central banks would always be willing to adopt very low interest rates if need be, and may thus raise moral hazard. Moreover, unless offset at a later stage, this policy could trigger a rise in inflation when markets start to function normally. The central bank thus needs to be careful to steer a course that sustains the functioning of financial markets without setting the stage for future problems, an issue which we come back to in Chapter 5.

4.4 Conclusions

In this chapter we have reviewed how, suddenly, the period of very placid macroeconomic and financial conditions came to an end. We stressed two themes.

The first was the financial crisis that started in the summer of 2007 and which was due to an interaction of two factors. One factor resided in financial markets, including a widespread weakening of underwriting standards, poor credit analysis by lenders, excessive reliance on ratings (that turned out to be less accurate than expected), and widespread use of complex and opaque financial products that were poorly understood by many investors. The other factor was the decline in real and nominal interest rates that was triggered by the great moderation, global imbalances and the advent of low and stable inflation, and which led to a search for yield and to the perception that risk had declined.

But more fundamentally, of course, it appears that the regulation and, in particular, supervision of financial markets and institutions was simply too lax. While this was plainly true of US subprime markets, these problems were present, to varying extents, across the financial system. When interest rates came down – due to the decline in long real interest rates and as central banks adjusted policy for cyclical, macroeconomic reasons – and leverage rose, the financial system became stretched to the breaking point and highly vulnerable to adverse developments, which came in the form of the turn of the housing cycle in the US and its impact on subprime borrowers.

The second theme was the sharp rise in inflation in 2007 and until the autumn of 2008, which was caused by a pronounced rise in commodity prices, in particular, oil and food. Initially, there was considerable concern that these price increases would continue and, even if they didn't, that they would trigger second-round effects. In the end, the price rise proved temporary and was indeed followed by very rapid declines in inflation as commodity prices started falling precipitously once global growth slowed in response to the financial crisis. Moreover, inflation expectations remained rather stable in the advanced economies as inflation rose, which reflects the credibility of monetary policy.

In sum, the recent aggravation of the financial crisis is having an increasingly severe impact on the world economy, raising the risk of a global recession and triggering fears of deflation in some major economies. This very difficult environment poses a number of challenges for central banks which we review in the next chapter.

5 The Growing Challenges for Central Banks

The current financial crisis has presented central banks with formidable challenges. Gone are the days when central bankers were seen as infallible and seemingly able to deliver strong growth and low and stable inflation.

In this chapter, we review the difficulties faced by central banks in setting policy in recent years. We proceed in five steps. We start with two challenges that have long been identified in the literature on monetary policy: determining the duration and nature of shocks that affect the economy, and facing changes in the sensitivity of inflation to growth (as captured by the slope of the Phillips curve). In the second step we review an issue that, while not new, has become more relevant in the current crisis, namely dealing with the inability to bring interest rates below zero.

In the third step we consider four challenges that have assumed larger relevance as a consequence of the current financial crisis: conducting monetary policy when heightened uncertainty impairs the transmission mechanism; preventing short-run policy from influencing long-run inflation expectations; improving financial regulation and supervision; and taking account of the interactions between monetary stability and financial stability. In the fourth step, we review the principles that in our view policy-makers should follow in adapting their policy frameworks to the profound changes in financial markets in recent years. We summarize the main lessons of our analysis in the final concluding section.

5.1 Two traditional challenges

5.1.1 Handling different types of shocks

Temporary versus permanent shocks

The first standard challenge faced by central banks is to determine whether the shocks affecting the economy are likely to be short-lived or persistent. The distinction between temporary and permanent shocks is an important issue when conducting monetary policy, since different shocks can have very different policy implications.

In the medium run the aim of monetary policy is to deliver price stability in the form of low and stable inflation. The short-run response of the economy to shocks is impaired by the fact that prices adjust only with delay. The focus of monetary

policy is then to bring the economy as close as possible to the efficient allocation of growth and inflation – the allocation that would prevail if all prices were fully flexible.⁹⁹ The central bank should set the nominal policy interest rate in such a way that the expected real interest rate is as close as possible to the real interest rate that would prevail in the absence of price rigidities – the so-called ‘natural’ or ‘Wicksellian’ interest rate. An accurate assessment of this natural interest rate is thus a central element of a successful monetary policy.

Different shocks impact on the natural interest rate in different ways. This is more clearly seen in the case of supply shocks. Consider first a temporary increase in the growth rate of productivity, implying that the cost of producing goods is expected to rise. The efficient response to this shock is increased output in the short run, to take advantage of the higher productivity of the economy, followed by a subsequent reduction towards the long-run natural growth rate, as productivity reverts back to its initial level. This is the adjustment that would naturally prevail if prices could adjust freely, with the economy experiencing a temporary boom pushing output growth above its long-run growth path followed by a sustained slowdown as the shock fades away and output growth declines towards its long-run growth path. The efficient dynamic response therefore calls for growth to temporarily exceed its long-run path. This intertemporal shift of production translates into a temporary reduction in the natural real interest rate. Intuitively, a temporarily low interest rate induces agents to shift aggregate demand from the future to the present when productivity is relatively high. In the presence of price rigidities, this adjustment requires an intervention by the central bank. Specifically, the central bank delivers the efficient reduction in the real interest rate by temporarily lowering the nominal interest rate.

A permanent increase in the growth rate of productivity by contrast has diametrically opposed implications. It raises the potential growth rate of the economy in all future periods, which translates into a higher natural real interest rate. Holding inflation stable in this environment then calls for the central bank to deliver the higher real interest rate through a tightening of monetary policy. The need for higher interest rates can be magnified by a possible mismatch between current demand and supply. The permanent productivity gains boost the return on capital, hence investment. In the presence of frictions in the adjustment of capital, this also leads to a rise in asset prices through the standard Tobin’s *q* effect, which in turn boosts consumption through a wealth effect. There is then a short-run tension between higher demand and a relatively tight supply, as most of the productivity increase is yet to come. This overheating tension fuels inflationary pressures, leading policy-makers to raise the interest rate even further.

The distinction between temporary and permanent shocks is not a mere theoretical concern, but is of substantial relevance for the conduct of policy in the real world. The need for higher interest rates in a fast-growing economy has led some observers to conclude that the stance of monetary policy may not have been appropriate throughout the 1990s, as policy-makers, notably the Federal Reserve, kept interest rates low. That choice was motivated by the possibility of letting the economy grow faster before tightening policy, as discussed in Greenspan (2007):

But what if this wasn’t a normal business cycle? What if the technology revolution had, temporarily at least, increased the economy’s ability to expand? If that was the case, raising rates would be a mistake. (p. 171)

In the presence of both temporary and permanent shocks, gauging the appropriate stance of monetary policy and communicating it to the public is a challenging exercise.¹⁰⁰ Suppose, for instance, that the economy experiences both a permanent increase in the trend growth rate of productivity and a temporary increase above this new trend. Even if the central bank assesses the situation perfectly, its policy would be difficult to communicate. Initially, the increase in productivity is dominated by the temporary shock. Therefore, productivity will experience an initial peak before falling back, calling for a reduction of interest rates for the reasons mentioned above. As time passes, the permanent shock will become the dominant feature, calling for a higher interest rate, again for the reasons discussed earlier. Depending on the relative importance of the shocks, it is thus possible that optimal policy would lead to an initial easing of monetary policy followed by a tightening, and potentially leading the public to mistakenly infer that the central bank is uncertain about the appropriate policy.

An additional challenge is that correctly assessing whether a shock is temporary or permanent takes time. The implications for the level of interest rates are however not straightforward. Consider a central bank that fails to identify a permanent increase in trend productivity growth. While one may expect that it would set the interest rate at a sub-optimally low level, this need not be the case. It is true that the central bank's mistaken inference *per se* leads it to set an interest rate that is too low. This however translates into inflationary pressures, which the central bank offsets subsequently through a tight monetary policy. Comparing the equilibrium policy of a well-informed central bank and a mistaken one shows that the later ends up facing a higher inflation and setting a higher nominal interest rate.

Trade-offs between inflation and output

Our discussion in the previous section focuses on productivity shocks. While relevant, such shocks are not associated with a policy trade-off between inflation and economic activity, because they reduce inflation and raise potential output. The central bank can then cut interest rates to expand demand without triggering inflation.

The situation is different if we consider 'cost push' shocks which directly raise inflation. The central bank then faces a trade-off, and the optimal response involves accepting some temporary inflation and a slowdown in economic activity. While the difficulties of dealing with cost-push shocks are well known since the oil price increases in the 1970s, the surge in commodity prices in the fall of 2007 and the first half of 2008 presented central banks with a challenge of substantial magnitude and with a pronounced increase in inflation across the world.

5.1.2 Dealing with changes in the Phillips curve

The second well-known challenge faced by monetary policy-makers is that developments in the world economy, such as globalization, may have altered the sensitivity of inflation to developments in the output gap. This is captured by the slope of the Phillips curve, a relation that reflects the pricing decisions of firms. Current inflation is affected by the output gap, as a higher level of activity raises the cost of production and induces firms to set higher prices.¹⁰¹ The slope of the Phillips curve reflects the impact of the output gap on inflation, with a flatter

curve indicating a relatively moderate impact as inflation responds little to cost pressures. In addition, theory predicts that an increase in expected future inflation leads to higher current inflation. This is because firms aim at keeping their prices in line with those of their competitors. As a firm that can choose a new price today may not be able to adjust it tomorrow, it finds it optimal to increase its own price today if it expects competitors to set higher prices tomorrow. This ensures that even if the firm cannot adjust its price tomorrow, it is close enough to that of its competitors.

A flatter Phillips curve complicates the management of monetary policy. At first this may seem an odd conclusion: after all the central bank does not need to worry too much about fluctuations in economic activity as in this case they have a limited impact on inflation. The 'flip side' of this however is that mistakes are more costly to revert. If the central bank lets inflation pick up, it will subsequently need to resort to tighter monetary policy than otherwise to bring inflation back to the desired level.

The drivers of the inflation–output trade-off

The slope of the Phillips curve depends on several factors. We focus on two that have received substantial attention in the debate, namely the improved conduct of monetary policy and globalization.

Better monetary policy translates into low and stable (hence more predictable) inflation. Since it anchors inflation expectations more firmly, the private sector expects the central bank to prevent temporary shocks from being accommodated and cause a permanent or persistent increase in inflation. This reduces the pressure on firms and workers to adjust prices and wages at frequent intervals, thus increasing the inertia in prices and wages. The Phillips curve is then flatter as inflation is less responsive to the output gap.¹⁰² Consider for instance an increase in the output gap that leads to higher wages. If price setters expect that monetary policy will quickly react and future inflation will be unaffected, current inflation increases only because of the direct impact of the output gap in the Phillips curve. If however the central bank is less credible, price setters expect that the central bank will accommodate the shock and thus let future inflation increase, leading them to increase prices today. Current inflation then rises both because of the direct impact of the output gap and because of higher expected inflation. Since inflation expectations are hard to measure, a statistician measuring the linkage between the current output gap and current inflation will find a stronger effect in the second case where expectations are affected. An improved monetary policy would stabilize expectations and reduce the statistician's estimate of the linkage between inflation and the output gap, leading to a seemingly flatter Phillips curve.¹⁰³

Globalization can also affect the slope of the Phillips curve through its impact on competition between firms. Specifically, globalization exposes domestic firms to foreign competition. While the link is not straightforward from a theoretical point of view, as shown in Box 5.2, in general we can expect competition to flatten the Phillips curve.¹⁰⁴ Globalization can also matter through its impact on competition in factor markets. For instance, sizable immigration flows can alter the dynamics in the labour market when immigrants' labour supply differs from that of locals. Suppose for instance that migrants are willing to increase their labour supply for a smaller wage increase than locals. Any increase in aggregate demand

can then be met by firms with only a limited increase in marginal costs, requiring only a moderate increase in prices. Inflation then becomes less sensitive to aggregate demand shocks. However the effect could prove temporary. Once the labour supply of immigrants becomes similar to that of locals, the Phillips curve may revert to its original (steeper) slope. Finally, globalization could matter through offshoring. Technological advances allow the decomposition of the production process in various tasks, some of which can be offshored to countries with lower labour costs. This potential threat would constitute a disciplining factor on domestic wage behaviour, thus lessening the impact of changes on the output gap on inflation. In sum, there are a number of reasons why globalization might affect the slope of the Phillips curve.

Empirical evidence

Given the relevance of the slope of the Phillips curve to the conduct of monetary policy, a growing literature has examined whether and how it has changed.¹⁰⁵ While the results are somewhat sensitive to the countries included and the samples studied, two broad points emerge. First, it generally appears that the Phillips curve has become flatter. Second, the sensitivity of inflation to movements in exchange rates and energy prices has fallen.¹⁰⁶ In addition, there is some evidence that domestic inflation has become more sensitive to global output gaps, suggesting that global aggregate demand is now more important – relative to domestic demand – as a determinant of domestic inflation.¹⁰⁷

We complement the literature review by estimating a standard Phillips curve over a broad sample of 19 countries since the mid-1980s.¹⁰⁸ Our analysis first confirms the reduction in inflation persistence documented in Chapter 2, and we also find a smaller role for oil prices as a determinant of inflation. We assess changes in the slope of the Phillips curve by computing estimates on two subsamples (1985Q1 – 1992Q4 and 1993Q1 – 2008Q1). Our analysis confirms the broad findings of a flattening of the curve, with the sensitivity of inflation to the domestic output gap falling by about half between the two subsamples. We assess the role of globalization by including different measures of the global output gap, in addition to the domestic output gap. We find no evidence that global factors play a role. While we detect a role for the US output gap, this merely reflects the fact that it is a leading indicator for the domestic gap, as the US business cycle tends to lead the cycle in other countries.

While merely illustrative, our finding of a role for the US output gap in the Phillips curve of other countries stresses the central role of forward-looking elements, as the US output gap simply acts as a leading indicator of the domestic business cycle in these countries. This is relevant as the impact of better monetary policy would operate primarily through such a channel. Our findings are in line with substantial evidence that inflation expectations have been reduced and have become more stable, likely in response to the more intense response of central banks to shocks.¹⁰⁹

In terms of the impact of international migration, there is evidence that the sizeable immigration experienced by countries such as Spain in recent years played a substantial role in the observed flattening of the Phillips curve. However, Spain absorbed immigration flows that were substantially larger than those of other countries and it is not clear that immigration has affected the Phillips curve elsewhere.¹¹⁰

Overall, we take our empirical analysis as an indication that the flattening of the Phillips curve is more likely to reflect improvements in the conduct of monetary policy, including through a stronger anchoring of inflation expectations.

5.2 Conducting monetary policy at low interest rates

5.2.1 Relevance of the issue

Another well-known complication for monetary policy that has attracted renewed interest in the current crisis is the inability of central banks to push nominal interest rates below zero; the so-called ‘zero lower bound’ (hereinafter ZLB).¹¹¹ The primary concern is that the ZLB could limit the central bank’s ability to respond to an adverse shock that warrants a reduction of the real interest rate.

This issue has received substantial attention since the mid-1990s, as the Bank of Japan faced this constraint during the last decade following the ‘bursting of the bubble’ in the early 1990s. Following the sharp slowdown of growth in the early 1990s, inflation fell substantially and the Bank of Japan lowered the overnight interest rate all the way from 8% in 1992 to zero in 1999. At that time the economy entered an episode of deflation, from which it has yet to firmly emerge. The Bank of Japan responded by keeping the interest rate at zero for seven years (but for a short-lived increase in 2001), before raising it in early 2006.

The financial crisis has given the issue renewed prominence. While central banks in industrialized economies have not moved in step in the earlier stages of the crisis (until the end of the summer 2008, with the Federal Reserve cutting rate more aggressively than the European Central Bank for instance), most have since engaged in sharp reductions in policy interest rates, as shown in Figure 1.4. Indeed the Federal Reserve has *de facto* reached the ZLB, with the Federal Funds rate at 0.0–0.25% and the effective Federal Funds rate barely above zero at the time of writing. Policy rates have also been brought down to very low levels in Japan (0.10%) and Switzerland (0.50%). In the euro area – with the official rate at 2% – and the United Kingdom – at 1.0% – central banks retain some room for further reduction of policy rates, but have nevertheless moved closer to the ZLB.

While the ZLB previously was seen by many to be of largely academic interest, the serious current global economic downturn indicates that it is of relevance to policy-makers. As a preliminary, we note that the odds of reaching the ZLB can be substantially reduced by having the central bank set its inflation objective sufficiently above zero. Consider a central bank aiming for an inflation rate of around 2%, in line with the actual targets or objectives of most central banks. A simple analysis based on the Taylor rule indicates that with such an inflation objective, the ZLB is only likely to be reached if inflation falls to zero and the economy is experiencing a very deep recession.¹¹² Still, low odds of facing the ZLB do not imply that central banks should ignore the issue. As discussed before, it proved highly relevant in the case of Japan. Furthermore, the sharp deterioration of the macroeconomic outlook since September 2008 has led central banks to substantially cut interest rates, as described above.

5.2.2 Policy challenges

While monetary policy does not become ineffective once the ZLB is reached, it still faces challenges from this constraint. A main challenge is that the conduct of monetary policy at the ZLB hinges on the ability of the central bank to steer interest rate expectations. This is because monetary policy operates primarily through agents' expectations of *future* short-term interest rates, which feed into *current* long-term rates, as opposed to the current short-term interest rate. This is the case in normal times as well as when the central bank faces the ZLB, although in the present financial crisis term interest rates are more disconnected from policy rates due to adverse confidence factors. The effectiveness of policy then depends on the central bank's credibility. In particular, it must earn a reputation during 'normal' times for being concerned not only by inflation but also deflation. Needless to say, this may be difficult to achieve given the paucity of episodes in which inflation has fallen close to zero.

While policy operates through the management of expectations at all times, the exercise is facilitated in normal times by the ability of the central bank to provide a concrete signal through movements in the policy rate. That ability is lost at the ZLB, although the central bank can use other signaling devices. For example, the central bank can adopt a looser policy stance than it would otherwise, thereby raising inflation expectations and lowering the real interest rate. This can take the form of responding more aggressively to shocks when the economy nears the ZLB – so as to avoid actually arriving there – or, if the ZLB is reached, committing to keep interest rates low for a relatively long period even when the economy recovers or using the exchange rate as an anchor for expectations (although this may raise problems if regarded as a 'beggar-thy-neighbor' policy).¹¹³ Indeed, the statement released by the Federal Reserve, motivating the reduction of the federal fund rate to (nearly) zero on 16 December 2008, specifically discusses the convenience of undertaking a more aggressive and prolonged lowering of official interest rates.

In addition to a commitment to keeping the short-term policy rate at zero over a sustained period, the central bank can directly sell and purchase bonds with long maturities whose interest rates are likely to remain positive when overnight interest rates reach zero. For instance, at the present stage with the policy rate in Japan being 0.1%, ten-year yields are around 1.25%. In the United States, where it currently is the Federal Reserve's intention to keep the federal funds rate in the interval 0–0.25%, ten-year yields are around 2.5%. By purchasing long-term government bonds, central banks can reduce their yields and depress other interest rates priced off them. Furthermore, even if all government bond yields have declined to zero, yields on private debt instruments will typically be positive. Central banks can then stimulate the economy by purchasing these securities, driving their yields towards zero. Finally, the central bank can directly step in when financial intermediaries remain on the sidelines, for instance by purchasing bonds backed by receivable consumer credit (such as credit card or car loans) to support consumption.

The strategies outlined above have been put in practice in episodes when the ZLB became an issue. Starting in the fall of 2001, the Bank of Japan engaged in a quantitative easing policy, with the monetary base increasing by 59% between January 2001 and January 2004. While the effectiveness of this move remains unclear, this could reflect the fact that it was not accompanied by a clear commitment to letting inflation rise. Indeed, the policy was reversed very quickly in

the spring of 2006. At the same time, the Japanese case shows that in circumstances where the financial system is not functioning smoothly, injections of liquidity by central banks can be relatively ineffective if they do not find their way beyond the banking sector to the real economy. This occurs when losses on banks' portfolios have brought their equity to dangerously low levels. Banks are then focused on reducing their balance sheets and are reluctant to engage in new lending. As a result, the liquidity injection by the central bank is kept as private banks' reserves at the central bank, without fuelling the money multiplier. In Japan this was reflected in the fact that broad money aggregates remained stable despite the large increase in the monetary base under the quantitative easing policy described above.

One can also interpret the experience of the United States in the early 2000s from the perspective of generating inflation expectations at a time of low interest rates. By the end of 2003 the Federal Fund rate reached a historical low of 1%, raising concerns that the ZLB would soon be binding. In its regular statements, the Federal Reserve stressed that monetary policy would remain accommodative for a 'sustained period.' This was interpreted by many observers as signaling a commitment to maintain a loose monetary policy, a choice that has received subsequent criticism. More strikingly and as discussed earlier, the Federal Reserve has responded to the deterioration of economic activity since the summer of 2008 by undertaking an unprecedented increase of its balance sheet. Specifically, the Fed has been using additional tools which, contrary to the quantitative easing policy pursued by Japan in the 1990s, do not rely on the liability side of the central bank's balance sheet and therefore it is not easily summarized simply by the amount of bank reserves. Rather, in the Fed's approach, defined by its Chairman as 'credit easing',¹¹⁴ the asset side of the balance sheet is used to support the financial system and the economy. There are three main tools: lending to financial institutions through various channels to provide short-term liquidity; the provision of liquidity to specific segments of the credit markets (e.g. commercial paper market and money market mutual funds); and the purchase of longer-term securities (e.g. Government Sponsored Enterprises – GSE – mortgage debt). This, along with the possibility of direct intervention further along the yield curve,¹¹⁵ can be seen as actions to affect inflation expectations despite the ZLB.

Thus, while the ZLB raises important challenges for monetary policy, there is still scope for central banks to use a variety of other tools to stimulate the economy and prevent it from falling into a depression. Yet these alternative tools entail several challenges. First, the sheer magnitude of the problem may require the efforts of monetary policy to be supported by fiscal policy and by direct interventions to restore the health of the banking system. Among the latter, the most important typically have been guaranteeing banks' debt, injecting public capital, purchasing bank assets or issuing protection for exceptional losses on certain assets. Second, monetary policy at the ZLB operates through variables, such as the size and composition of the central bank's balance sheet, that differ from the variables that the private sector is used to focus on when forming expectations. The management of expectations could then become more complicated than when operating through interest rates.

In addition, influencing expectations can also be more difficult when economic conditions are more uncertain, for instance because of disturbances that impact

on the health of financial intermediaries and threaten to destabilize the transmission mechanism of monetary policy. While these uncertainties may be of limited significance in normal times, in crisis times they can have much greater effects, a point to which we return below. With the future becoming much more uncertain, the effective horizons of the actors in the economy may shorten and central banks' ability to guide expectations could be substantially smaller than in normal times. This makes communication about the future path of monetary policy even more important but considerably more difficult.

5.3 New challenges for central banks

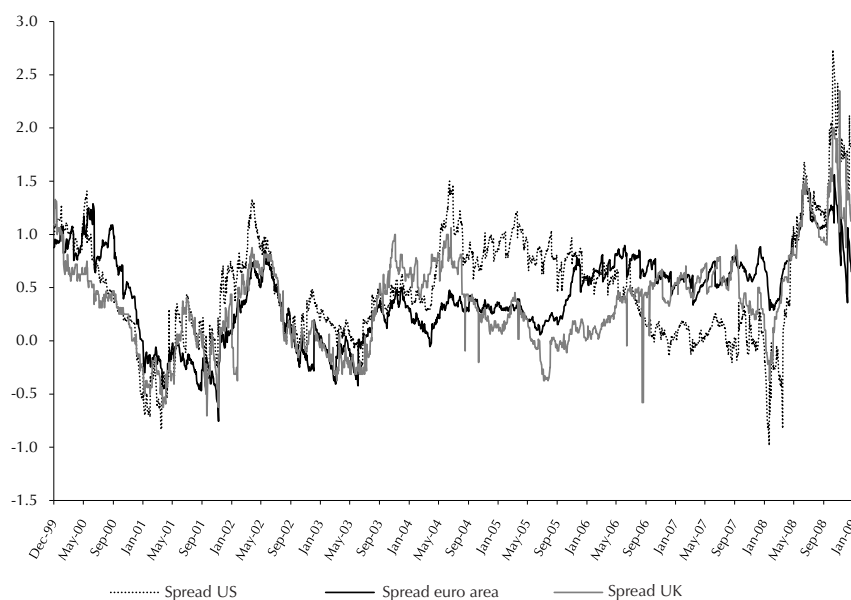
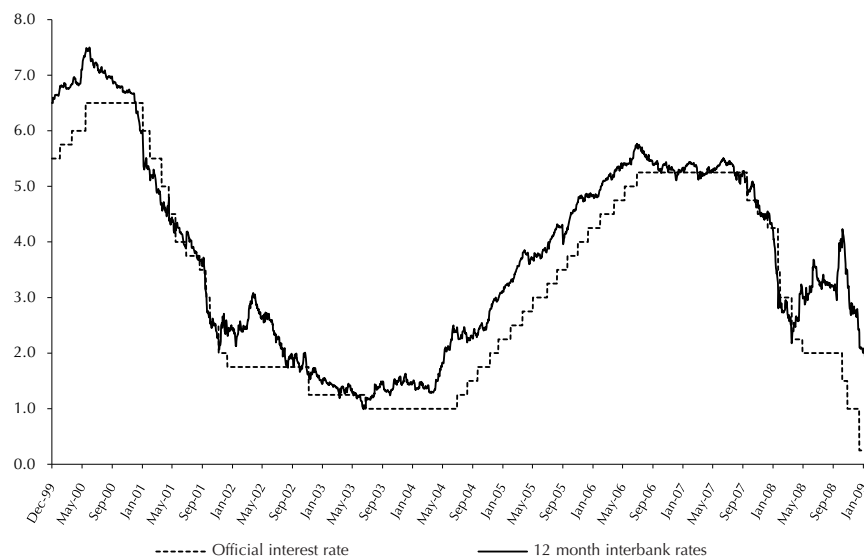
The changing nature of financial markets has generated additional challenges for monetary and financial policy, in addition to those reviewed at the beginning of this chapter. First, policy-makers must operate in an environment of greater uncertainty about economic prospects and a weakened transmission mechanism. Second, central banks should not lose sight of the need to sustain their credibility on the inflation front. Third, financial regulation and supervision have lagged behind market developments. Finally, monetary and financial policies have become more tightly interlinked and shouldn't be conducted in isolation.

5.3.1 Monetary transmission under heightened uncertainty

The sudden change in environment brought about by the crisis has led agents to view any assessment of future prospects with substantial caution, and even skepticism. The most striking manifestation of this heightened uncertainty has been the freezing of short-term unsecured financial markets, such as interbank lending, that were usually among the most liquid. Given the uncertainties about the state in which financial institutions could find themselves in a few weeks' time, market participants showed little willingness to extend unsecured credit beyond a couple of days.¹¹⁶

The increased uncertainty has had a direct impact on the transmission mechanism of monetary policy, both in terms of its ability to deliver an immediate stimulus and its ability to affect expectations. In normal times, cuts in central banks' policy rates are first reflected in lower interest rates for short-term unsecured lending, such as the Euribor and Libor, which in turn boosts the flow of credit by making borrowing cheaper, raising the value of borrower's collateral, and reducing banks' funding costs.

In the current crisis, both steps of this chain have been affected. First, there has been a disconnect between policy interest rates and term interbank rates, in sharp contrast to past experience. Figure 5.1 shows the spreads between the 12 months interbank rate and the policy rate in the United States, the euro area and the UK. While this spread is usually positive, since the end of 2007 it has reached levels well in excess of those in the previous decade. Looking at the actual interest rates in the United States (Figure 5.2) we observe that while the interbank rate initially followed the easing of monetary policy in 2007, a persistent gap has since emerged with the interbank rate actually increasing until recently, despite substantial cuts in the policy rate. The pattern in the euro area (Figure 5.3) shows that the interbank rate surged substantially above the policy rate in 2008, and has only recent-

Figure 5.1 Spread between 12 month interbank rate and official rate**Figure 5.2** Interest rates in the United States

ly declined. A similar pattern is apparent in the United Kingdom (Figure 5.4). This does not mean that, other things equal, interbank rates are not affected by official rates. The problem is that they have remained quite elevated relative to their normal behaviour as a result of confidence factors that have imposed risk premiums.

A simple way to measure these confidence factors is through the difference between the secured (repo) and unsecured (depo) rates in term interbank markets,

Figure 5.3 Interest rates in the euro area

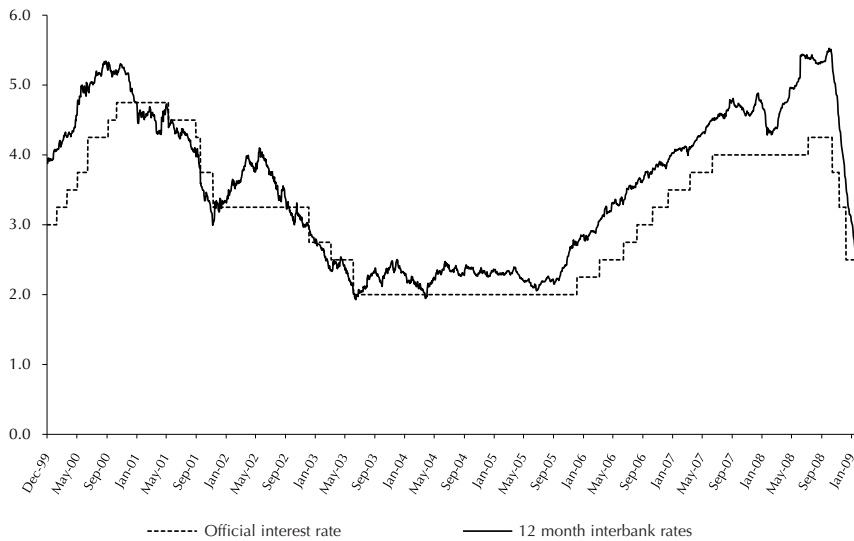
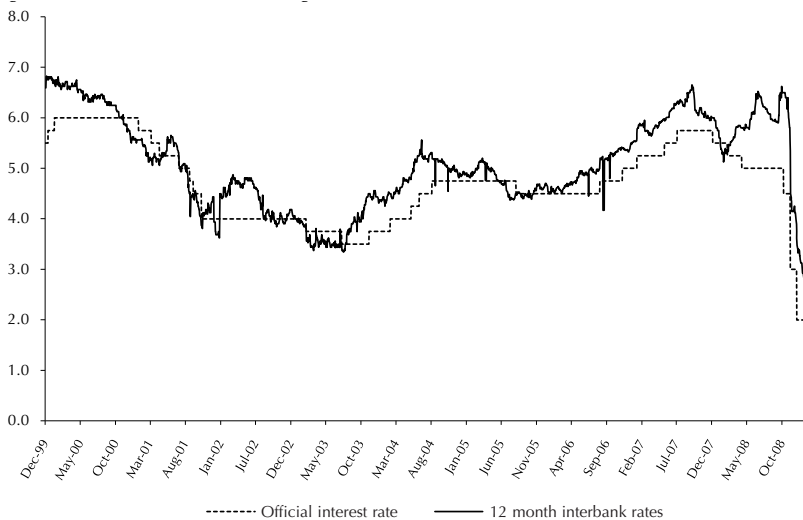
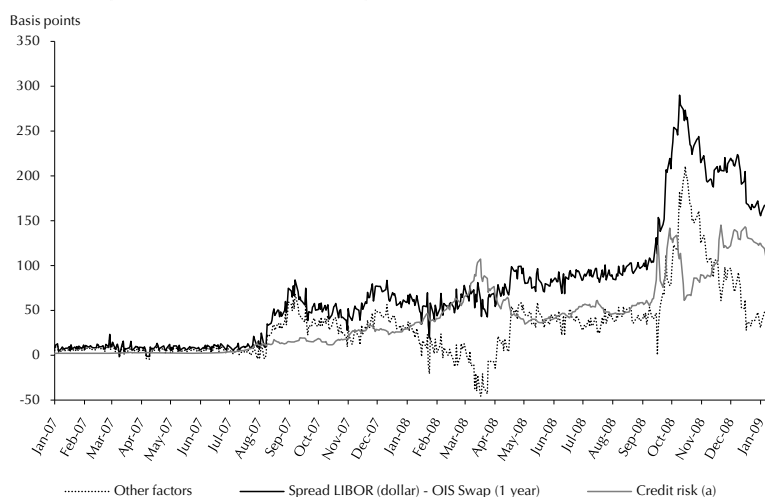


Figure 5.4 Interest rates in the United Kingdom

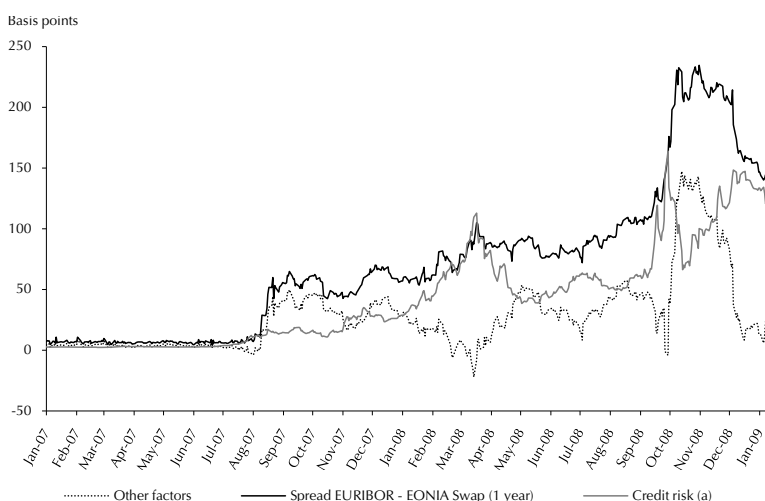


as is done in detail in Box 5.5. This spread, in turn, can be split between credit risk (estimated using the premium on credit default swaps for banks) and other factors (the residual), which are a proxy for liquidity risk. As can be seen, in the cases of the United States (Figure 5.5), the euro area (Figure 5.6) and the United Kingdom (Figure 5.7), the spread has more and more primarily reflected the higher credit risk. The sharp increase in perceived risk in financial markets is also evident in direct measures from other markets as shown in Figures 3.1 to 3.3.

Figure 5.5 Decomposition of interbank one-year differential in the United States

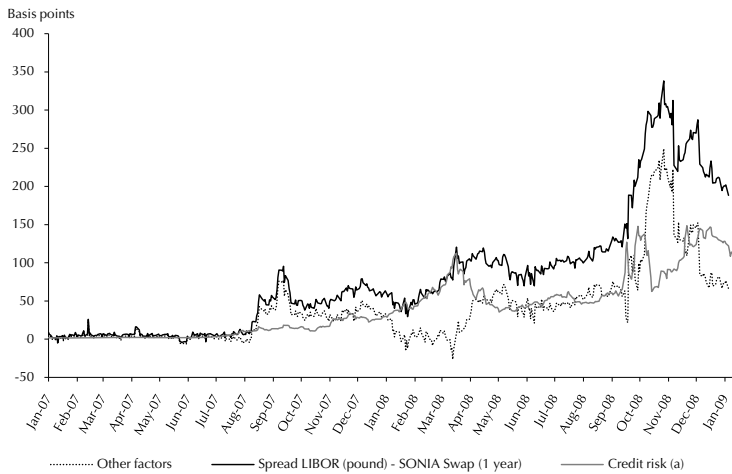
(a) Average premium of 1-year CDS of banks used to determine LIBOR (dollar)

Source: Bloomberg and Datastream

Figure 5.6 Decomposition of interbank one-year differential in the euro area

(a) Average premium of 1-year CDS of banks used to determine EURIBOR

Second, financial markets in general, and the banking sector in particular, did not channel the vast amount of liquidity injected by policy-makers towards new lending. Following the collapse of Lehman Brothers, banks' concerns about counterparty credit risk were so intense as to shut down unsecured lending at even short maturities. Banks also held on to their liquidity for fear of not being able to access short-term borrowing from wholesale markets should they face difficulties. Finally, banks reduced leverage, a process that involved substantial asset sales that put further pressure on the value of banks' assets.¹¹⁷ The reduced ability of finan-

Figure 5.7 Decomposition of interbank one-year differential in the United Kingdom

(a) Average premium of 1-year CDS of banks used to determine LIBOR (pound)

Source: Bloomberg and Datastream

cial markets to intermediate lending is a direct cause of the massive expansion of central banks' balance sheets discussed above.¹¹⁸

The reduced effectiveness of the transmission mechanism has several implications for the conduct of policy. First, policy-makers should address the core issue underlying the freezing of financial markets, namely the uncertainties regarding the solvency of market participants. In the short run this has taken the form of capital injections and guarantees, as mentioned already, a strategy that entails risks as the government could face substantial liabilities should a key actor fail. A more permanent solution, once the dust settles, will be to establish a clearer picture of agents' exposures. A supervisory authority is best suited to this task given its ability to obtain confidential information from individual market participants and answer the systemic dimension of the problem. Still, doing so remains a challenge given the heightened complexity of markets. The weakening of the transmission mechanism can also call for more decisive actions from the central bank. While a series of moderate interest rate reductions is appropriate when the transmission mechanism operates smoothly, 'front-loading' the overall policy move into fewer, larger and more immediate reductions could be called for in a crisis environment. Other policy instruments, such as fiscal policy, may also need to be brought to bear to support monetary policy when its effectiveness is limited.

Uncertainties regarding the functioning of the economy, including the transmission of monetary policy, limit the ability of the central bank to influence expectations even when interest rates are above the ZLB. While this may not be a major issue in normal times, as the central banks and private agents have a reasonably precise sense of the functioning of the main economic mechanism, it becomes an issue in crisis times when old certainties prove fragile. As agents heavily discount medium-run projections, this effectively shortens the horizon of the economy and makes it harder for the central bank to alter inflation expectations beyond that horizon.

Consider for instance a simple case where the central bank reduces its policy rate by 1 percentage point over the next 12 months, followed by an additional cut

of 1 percentage point 12 months from now. When investors expect this, the interest rate for a two-year loan can be expected to fall by 1.5 percentage points in short order. If investors regard developments beyond a year as highly uncertain, they are likely to charge a higher risk premium beyond that horizon, and the interest rate on a two-year loan would be reduced by less than 1.5 percentage points. In addition, the linkage between the policy interest rate and an unsecured interest rate – which we implicitly assume to be tight in our example – could prove uncertain thereby making it less likely that future reductions in the policy interest rate would impact on the current long interest rate. The implication from this simple example is that in this case monetary policy should put more weight on the near future, for instance reducing the policy interest rate by 150 basis points this year and 50 points a year later. Of course, this represents a challenge if the current interest rate is at the ZLB, in which case a clear communication of the future policy stance becomes a more relevant, albeit delicate, exercise. When agents are highly uncertain about the prospects over the next month, influencing their expectations at a horizon of one or two years, which is the standard operating horizon of monetary policy, becomes a more challenging task. We recognize that the possibility of an effective shortening of the expectation horizon remains a tentative hypothesis of ours and has yet to be rigorously explored.

The current crisis also has implications for the modeling tools used in central banks. Recent years have witnessed substantial advances in the sophistication of economic models. While this is a clear improvement, central bankers should retain some perspective. As mentioned above, a heavy reliance on imperfect pricing models was a factor underlying the heightened fragility of financial markets. Care should be taken that no similar developments take place in the conduct of monetary policy. For instance, modeling tools that abstract from a shorter expectation horizon at a time of crisis could provide policy prescriptions with too much emphasis on the management of expectations at relatively long horizons. More importantly in our opinion, the economic models in use in central banks typically do not capture well the type of financial factors and processes that have played such a central role in the turmoil of the last two years, arguably rendering them less than suitable for analyzing these events. While imperfections in financial markets, such as so-called ‘financial accelerator’ mechanisms where economic shocks impact on agents’ net worth and their borrowing ability, are being introduced in macroeconomic models, this remains very much work in progress. For instance these models are hard-pressed to capture the freezing of short-term financial markets observed in late 2008. This by no means calls for formal models to be discarded, but including financial markets in an appropriate form is an urgent task. In the meantime, central bankers should strike a delicate balance between the messages from formal models and a less structured assessment of financial market conditions.

5.3.2 Maintaining the medium-run focus on price stability

A second challenge faced by central banks in the current crisis is to ensure that their response to financial market stress is not misinterpreted as indicating a relaxation of their medium-run focus on maintaining price stability, which would permit inflation expectations to drift. While we could hardly fault policy-makers in taking a short-run focus in seeking to prevent additional financial markets turmoil

and the onset of a large recession, central banks' credibility on the inflation front should not be taken for granted.

A first potential problem emerged early in the crisis when central banks were faced with both distress in financial markets and inflationary pressures. Monetary relaxation could then be seen as posing risks from the point of view of price stability if it raises medium-term inflation expectations. While this concern has become moot since September 2008 with the drop in commodity prices and the recession sharply reducing inflation, the earlier episode should not be forgotten.

A second potential problem relates to the exit strategy from the current stance of monetary policy. As described above, central banks have recently aggressively cut interest rates, and delivered strong signals that monetary policy will remain accommodative over a sustained period. This has been accompanied by a large increase in central banks' balance sheets, including direct intervention in selected financial markets, such as those closely tied to consumer spending. While this substantial and sustained monetary easing is appropriate in the current situation, a balance must be struck between keeping monetary conditions loose temporarily, in order to generate the inflation expectations needed to lower current real interest rates, and ultimately bringing inflation back to the central banks' medium-run objective. Exiting the current crisis will therefore involve the difficult issue of finding the right timing for reversing the monetary easing: it should not be too prompt, otherwise central banks would face an undershooting of inflation expectations, nor too delayed, in which case it could be seen as stepping away from medium-run price stability. This constitutes a delicate exercise, entailing substantial communication challenges for central banks. They will need to convince the public that the easing will be withdrawn in a way timely enough to be consistent with price stability.

Furthermore, central banks will also need to bring back their balance sheets to more normal sizes once the crisis is over. This is an important issue as they have taken up in some cases significant amounts of risks as a result of their liquidity operations. Given the undesirable consequences that having a financially fragile position poses for a central bank both as regards its financial and political independence and its anti-inflationary credibility, this is another exit that must be successfully executed in a timely fashion.

The fiscal expansion represents another challenge for central banks. Policy-makers are currently considering substantial fiscal stimulus packages financed through public debt which adds to the debt issued to help solve the problems of the banking system. This debt will eventually have to be paid through a combination of higher taxes and lower spending, none of which will prove popular. Governments could then be tempted to lower the value of the debt through inflation. While the institutional arrangements for central banks in industrialized countries quite explicitly prohibit such a monetization of public debt, clarifying this commitment to the public would be important.

As discussed in Chapter 2, our assessment is that improvements in the conduct of monetary policy played a central role in the reductions of the level, volatility and persistence of inflation that we witnessed since the 1980s. The focus on price stability also provided a stronger anchoring of inflation expectations, thus limiting the transmission of shocks in economic activity to inflation. Yet central banks should not infer that the fight against inflation has been definitively won. In the second half of 2007 and the first half of 2008, inflation picked up substantially

across both industrialized economies and emerging markets. While most of this reflected higher prices of food and energy, the return of high inflation was at the center of economic debate until the weakening of global growth reduced inflationary pressures. Several commentators took the view that the pickup of inflation was a sign that the golden age of central banking was a result of good luck, and that a sustained higher level of inflation through a wage-price spiral couldn't be ruled out. Our view is that these concerns were too alarmist, as measures of core inflation and inflation expectations remained well contained. Still, the active debate must have come as a shock to many central bankers, as the prior sustained period of low inflation had if anything fuelled to public perceptions of central banks as being omnipotent.

A potential risk in this regard is that the public demand for low inflation discussed in Chapter 2 could prove relatively weak, even though the supply of low inflation remains solid. Had the recession not ended inflationary pressures, would this demand have remained strong? Furthermore, could it weaken in the future when the public will face the cost of paying for the current fiscal stimulus? Maintaining the consensus for low inflation is then likely to require continued communication efforts by central banks. Great care should be taken not to let the legitimate focus on short-term emergencies overshadow the need for a robust anchoring of medium-run inflation expectations. Central bank credibility is never set in stone, and years of painstaking efforts to achieve such a precious public good should not be wasted.

5.3.3 Regulating and supervising an evolving financial sector

It has long been recognized that financial intermediaries are vulnerable to crises because of the perverse interaction of two essential ingredients: leverage and liquidity transformation. Banks, the traditional financial intermediaries, employ both devices. First, they are highly leveraged: with a minimum regulatory capital ratio around 8%, their risk-weighted assets are typically 12.5 times capital. It is much larger – up to 40 to 50 times – if total, rather than risk-weighted assets, are used. Second, their very essence entails a maturity and liquidity mismatch between long-run illiquid assets and short-run liquid liabilities (deposits). Leverage and liquidity transformation raise the possibility of self-fulfilling liquidity crises, with possible 'panic' or 'bank-run' equilibria.¹¹⁹ A systemic crisis is the occurrence of a 'bad' equilibrium on a large scale, when the wholesale liquidation requests occur in a number of institutions at the same time, as the debits/credits that link them together become a channel for contagion.

The potential for systemic crises has long been recognized, and the authorities in charge of financial stability, including central banks, have addressed them through a number of *ex ante* mechanisms. These included deposit insurance, capital requirements and bank supervision. *Ex post* measures included the management of the discount window or standing credit facilities and temporary suspensions of activity (traditionally, bank holidays). In addition, the authorities were able to influence banks' behaviour in an attempt to provide additional safeguards, including by discouraging against excessive risk taking. It was with accurate knowledge of the impact of their actions that central bankers could, in the past, 'take away the punch bowl when the party gets going' (as William McChesney Martin, chairman of the Federal Reserve between 1951–70, famously

said). Without enough knowledge, bold action aimed at curtailing speculation in financial markets becomes much more risky.

Recent events have suggested that the description of financial markets and the role of central banks presented above needs to be rethought in a number of important respects. The financial system has become much more developed, extending the range of financial intermediaries that undertake both leverage and maturity transformation well beyond traditional banks into what has been called the 'shadow banking system'. For instance, broker-dealers employ both leverage and liquidity transformation in the securities space; the same is done by hedge funds. In addition, the recent experience has highlighted the quantitative significance of special investment vehicles, which also held relatively illiquid securities and often financed them by rolling over short-dated commercial paper. This structure of financing has led to run-like phenomena affecting even money market mutual funds. It must therefore be recognized that the exposure of the financial system to liquidity crises today spreads well beyond banks, even though banks have been at the centre of the recent market turbulence.

Assessing systemic risk has become considerably more difficult for two reasons. First, banks have become more complex and less transparent. Second, leverage and liquidity transformation have spread widely in the financial system, across the whole spectrum of financial structures and institutions. Given the substantial complexity of many products, financial actors have an incentive to assume worst-case scenarios in periods of stress, due to limited information, and behave in a way that amplifies the original shock. As a result, while the financial system carries out its main functions (allocation of capital to its more productive users, risk trading and risk sharing) effectively in normal times, it is more vulnerable when under stress.

In this new environment, the task of authorities in charge of financial stability, including central banks, has become more complex and challenging. We stress two aspects. First, the financial landscape requires the authorities to follow a much wider range of actors and entities, as well as to have better information about the institutions they traditionally supervise, like banks. Financial regulation should thus move from a *de jure* approach, where it is focused on intermediaries meeting specific institutional criteria – such as being deposit-taking institutions – towards a *de facto* approach, where it covers any financial actor engaged in maturity transformation or taking up significant risk.

Second, the information asymmetry between financial regulators and investors raises the issue of strategic behaviour. Specifically, investors faced with adverse prospects for their portfolios have an incentive to exaggerate the systemic nature of the problem (or, for their own ignorance, may exaggerate systemic risks in good faith), hoping that this will prompt authorities to come to their rescue. While authorities are not bound to assist individual investors, they are expected to intervene in the presence of system-wide problems in order to prevent a freezing of financial markets that could have dire consequences for the functioning of the broader economy. While this problem is limited in a simple system with few types of actors, it becomes an issue in the presence of many different actors with complex exposures. In an environment with insufficient information, authorities can be induced to act in a risk-averse fashion. The immediate cost of supporting financial markets where only a handful of investors are truly under stress is limited. By contrast, failing to address a true systemic crisis entails a large cost through broad disruptions in

the economy. The asymmetric nature of payoffs, combined with a possible bias in the assessment of financial conditions, can lead to biased actions, with potential adverse consequences for the long-run stability of the financial system.

The behaviour of the US authorities in the Bear Stearns and Lehman Brothers cases suggests that the authorities were aware of the risks of such strategic behaviour. In the case of Bear Stearns, the rescue package envisioned a virtual wipe-out of shareholders' equity, so as to convey the message that the bailout was for creditors and not for equity holders. The case of Lehman Brothers, of course, is a manifestation of a more radical attitude to these issues, which at the time was interpreted as sending a clear message that no institution is too big or too interconnected to fail. In hindsight, the experience of the past year suggests that the rapid unfolding and contagion of the financial crisis led, not surprisingly, to instances of apparently inconsistent behaviour on the part of the authorities such as rescuing some institutions but not others, which may have been due to the ever-increasing flow of bad news. The discussion in the previous paragraph suggests that institutions might have had the upper hand in inducing authorities into injecting more support into the system than was needed; we have not observed that. Rather, the responses of the authorities appeared as variable as the events that developed. We think this experience will help clarify and better design the appropriate policy reactions to financial crises in (unavoidable) conditions of partial information. While insufficient information of authorities and regulators did not lead, in the end, to excessive support, we think one can make the case that more information would have led to less variable responses.

5.3.4 Monetary policy and financial stability

A significant challenge for policy-makers is to maintain monetary and financial stability at the same time. This challenge is made harder by the interactions between the macroeconomic situation, which is the usual focus of monetary policy, and financial stability, which is the purview of financial policy (by which we understand regulatory and supervisory policies aimed at ensuring the stability of the financial system).

First, a central bank can be faced with mandates implying a short-term tradeoff between price stability and financial stability. While price stability is the overriding objective of monetary policy, central banks also seek to contribute to the smooth functioning of financial markets. As we explained in Chapter 4, this does not necessarily represent a conflict. The sharp decline in growth since September 2008 has removed earlier concerns about inflation pressures – if anything concerns about the risk of deflation have emerged – and the optimal response by central banks has been to ease monetary policy. Such reductions in policy rates were also called for to facilitate the functioning of financial markets. Nonetheless, macroeconomic and financial stability concerns could generate a tension. This is illustrated by the situation between the eruption of the financial crisis in the summer of 2007 until the end of the summer 2008, which saw a combination of inflationary pressures – calling for a tightening of monetary policy to prevent cost-push shocks from fuelling inflation – and of stress in financial markets – calling for lower interest rates to stabilize the financial system. Steering a course for monetary policy in such an environment is a major challenge.

The second challenge is to determine the appropriate stance of financial and monetary policy, taking their linkages into account, and to avoid conducting them in isolation. This involves a policy of financial supervision and regulation with a macro-prudential focus; that is, a focus on the financial system as a whole in addition to the situation of specific institutions. When assessing the resilience of banks to potential shocks, it is important to conduct both an assessment of idiosyncratic resilience, where the bank is the only one affected, and an assessment of systemic resilience, where the linkages between the various financial actors are taken into account.

Even a systemic approach to financial policy needs to keep an eye towards macroeconomic conditions. A policy maker focusing solely on restoring the health of the banking system could implement policies, such as balance sheet consolidation and de-leveraging, that, while perfectly reasonable from his perspective, entail macroeconomic costs. For instance, a tightening of lending standards aimed at restoring bank profitability can be highly procyclical, leading to a credit-crunch and a recession. The recession would in turn adversely affect the solvency of debtors, leading to a further deterioration of the financial sector profitability.

Finally, financial policies must take into account the systemic consequences of monetary policy actions such as, for example, the higher risk taking and increased leverage resulting from a period of low nominal and real interest rates in a low inflation environment, like the one that preceded the current crisis. This macro-prudential focus would help contain the financial imbalances and the systemic risks that otherwise may arise, thus preventing the onset of a financial crisis or, at least, reducing its impact.¹²⁰

Similarly, the consequences on the financial sector should in principle be considered when contemplating alternative monetary policy decisions. Consider for instance a policy that responds to the ZLB on interest rates, described above, by committing to keeping interest rates low for a sustained period. While this policy is justified on macroeconomic grounds, it entails the risk of fuelling future excesses in financial markets. Indeed, the prolonged period of low interest rates in the United States by the Federal Reserve in the first half of the 2000s was likely one of many contributing factors in driving the search for yield in financial markets.¹²¹ By raising the incentives of financial intermediaries to make extensive use of leverage, this policy could carry the seeds of future troubles, with financial markets being in a vulnerable position when the policy of low interest rates comes to an end. Thus, unless financial policy is adjusted to offset the incentive effects of low interest rates, monetary policy-makers may also have to consider more clearly the financial stability consequences when setting interest rates.

This aspect is especially relevant in the current period, as central banks in industrialized countries have engaged in massive interest rate cuts and liquidity injections. We do not question the appropriateness of these policies given the unprecedented extent of financial sector disruptions. Nonetheless, central banks will face a challenging task in preventing those relaxed monetary conditions from fueling future financial excesses once the current crisis has come to an end. This raises the delicate issue of adequately exiting from the present policies at a certain time in the future, as discussed earlier in the chapter.

A related aspect is the role that asset prices and other financial variables (like leverage or indebtedness) should play in the conduct of monetary policy. While

this remains the object of considerable debate, we support a policy approach along the following lines.¹²² First, central banks should not target specific asset price levels, but should remain focused on inflation in the price of goods and services. This is because they are ill equipped to judge the appropriate relationship between asset prices and their fundamental valuations. Second, nevertheless, developments in asset prices could be leading indicators of vulnerability in financial markets and thus of potential future macro-financial disruptions. This is especially likely when rising asset prices are accompanied by large increases in the volume of credit and, in general, of indebtedness. Central banks should therefore consider developments in financial markets by 'leaning against the wind' in forming their interest rate policies when financial imbalances in the form of increased indebtedness, higher asset prices and external deficits start building up. This means that official interest rates would need to be somewhat higher than otherwise in order to prevent those imbalances from adversely impacting on the economy (or at least to reduce their size so that the future negative consequences are diminished) and thus on price stability, over the medium term. This 'leaning against the wind' can be justified as a 'pragmatic' adjustment to traditional monetary policy so as to better take into account the sort of financial interactions that the current crisis has brought out very clearly but which are only imperfectly incorporated into the models and structures guiding monetary policy decisions.

Third, in spite of the above, the interest rate policy of central banks cannot be the main – and even less the only – tool to addressing financial imbalances, since that would be not only ineffective but also damaging for the overall economy. For instance, a central bank aiming at containing sharp increases in asset prices, such as equity prices in the late 1990s or real estate prices more recently, would have to set monetary policy at such a restrictive level that it would have pushed the economy into a damaging recession. Instead, concerns about financial imbalances are best addressed through other more suitable instruments, among which financial regulation and supervision with a macro-prudential dimension should play a central role. For instance, among other measures, regulators could require financial intermediaries to maintain stricter standards, such as through a cap on borrowers' leverage, countercyclical capital ratios and Spanish-type forward-looking provisions, which help build up cushions in good times to be used in bad times, thus helping to lessen procyclicality.¹²³ Of course, these types of measures are likely to be most effective when financial regulation has a broad reach, preventing restrictions on some intermediaries (i.e. banks) from being easily avoided through other intermediaries (i.e. non-banks).

5.4 Potential regulatory remedies

At a time when global forums and public bodies are working full time to produce the basis for an appropriate official response to the recent financial turmoil it would seem pretentious for us to offer our own recipe.¹²⁴ Also, as many observers have correctly pointed out, this is not a time for hasty regulatory measures. It is important that there be sufficient analysis and sharing of diagnoses of the current financial problems before effective regulatory initiatives are undertaken. In addition, it is important to identify the right balance between damage reparation and

preserving genuine innovations that markets have developed in the last decades and that are important for the functioning of the financial system.

The reports by the FSF (2008), the IMF (2008b) and the Department of the Treasury (2008) highlight a number of problems that led to the present turmoil and which were associated with the inadequate incentives for lenders, distributors of financial products, credit rating agencies and investors to take proper account of risks. A number of recommendations are being put forward with the aim of enhancing prudential oversight and improving the behaviour of financial institutions so as to make the financial system more resilient. For instance, the G20 summit of 15 November, 2008, outlined common principles for reform of financial markets. The communiqué stressed the need for international cooperation in both the design of common standards for financial markets and their consistent implementation. The G20 pointed to the need for more transparency from financial institutions, including through a standardization of accounting rules, as well as stronger protection for investors and consumers. It also identified a need to strengthen multilateral institutions such as the IMF and FSF and improve their mutual collaboration. In addition to outlining general principles, the communiqué listed a series of explicit steps to be undertaken in the short run (namely by end of March 2009) and beyond.

The most important of these relate to improvements in transparency and disclosure by financial institutions; enhanced internal risk management systems with particular attention being paid to liquidity risks and stress testing; guidance on fair value accounting (especially for complex financial products in times of stress); better information provided by credit rating agencies which should also reduce possible conflicts of interest; enhanced prudential oversight of capital, liquidity and risk management; and, last but certainly not least, improved international cooperation among supervisors.

In a much more modest way, and complementary to other proposals for enhancing the resilience of the financial system, we put forward a few propositions that flow from the analysis that we offered in this chapter. These propositions concern the job of central banks under the assumption that they are responsible for the stability of the financial system.

A first proposition is that since all entities that have leverage and liquidity mismatches are vulnerable to 'multiple-equilibria' risk, which may cause systemic crises, it would be logical for supervisors to receive adequate information about the portfolios of all such institutions (including broker-dealers and hedge funds). This information, in turn, should be provided in adequately aggregate form to central banks (whenever they are not also supervisors) in order to identify the risks for the system as a whole. Such information requires cooperation by all supervisors active in financial centres.

A second proposition is that prudential regulations should in principle apply to all institutions that have access to central-bank emergency liquidity facilities. This condition is warranted in order to avoid moral hazard.

A third proposition is that conflicts of interest need to be tackled firmly. Institutions should be prevented from running conflicting businesses, especially if such conflicts give rise to distortions in risk taking and difficult-to-manage internal risk controls.

These propositions suggest several potential approaches to regulation. An avenue to improve the information set of the authorities – including central banks

– is to enhance their ability to gather information. Different countries have different regulatory institutions in charge of different functions. Without prejudice to national traditions, it is important that entities charged with the task of intervening in the marketplace to preserve stability are in possession of the information they need to do so effectively. This can be achieved through appropriate coordination with all the entities that are responsible for directly gathering such information.

Furthermore, information needs to reflect better the uncertainty that is inherent in any financial instrument. While ratings of financial instruments by specialized agencies have the advantage of offering a standardized yardstick, their record in the recent turmoil has been substandard. Complications arise when fundamental credit risk mixes with liquidity risk, and when insufficient information amplifies the negative impact of shocks. Studying ways to combine liquidity risk and fundamental credit risk in rating may improve investors' ability to estimate the riskiness of their portfolios. This is an avenue rating agencies are now considering following.

One potential way to resolve issues of conflicts of interest and to raise simplicity and transparency in the financial sector is to distinguish clearly in regulation between financial intermediaries that are client *service providers* and those that are *capital managers*.¹²⁵ Service providers – broker-dealers – sell access to primary and secondary markets, that is, both capital raising and brokerage, and ancillary activities such as research and advice on capital raising and on mergers and acquisitions. They also lend and borrow cash and securities to fulfill client requests. By contrast, capital managers – who are primarily banks, investment banks and hedge funds – provide services to clients in the hope of increasing the value of the firm and thus the wealth of its shareholders, whose funds they invest in a leveraged or unleveraged way.

While they may take similar positions in the markets, the objectives and risk profiles of service providers and capital managers are completely different. This suggests that firms should be regulated on the basis of the functions they perform and not the labels attached to them. Under current practices, however, that is not the case as firms that perform similar roles can be regulated in very different ways (in the case of hedge funds, very lightly).

Thus, a regulatory regime that distinguishes clearly between these two types of intermediaries – under the motto of 'let banks be banks, and let investors be investors' – but makes no distinction between firms within each group would be attractive. Such regulation should do four things: it should recognize that the same function is performed by very different institutions and should provide a consistent framework and a level playing field for all entities involved in the same functions; it should realize that tight capital constraints are the most reliable way to avoid excessive risk taking; it should acknowledge that a sound financial system needs more disclosure to authorities by all capital managers than is currently the case; and it should address the distortions caused by conflicts of interest arising from the coexistence of capital management and broker-dealer businesses.

5.5 Conclusions

The task of central banks has always been characterized by substantial challenges. Some, such as the need to accurately assess the horizons of shocks, are well

known. Others, such as how to conduct monetary policy at low or zero interest rates, have found a renewed relevance in the present situation. The transformation of financial markets during the golden years of central banking and the current crisis have added a new set of challenges. Our assessment is that the main lessons can be summarized along four main lines.

First, the framework of financial regulation and supervision needs to catch up with developments in financial markets. In particular, we view a streamlining of supervision along *de facto* lines as highly desirable. All entities that engage in maturity mismatch and can be potential recipients of central bank liquidity need to provide the authorities with detailed and timely information. Regulation should also tackle the conflicts of interests that, while always present in financial markets, have been magnified by the coexistence of different business lines in the same institutions.

Second, different aspects of policy cannot be conducted in isolation. There are strong linkages between monetary policy and the regulation and supervision of financial markets. For instance, the sustained period of low interest rates fuelled higher leverage as financial actors reached for yield, which in turn led to the costly de-leveraging episode currently under way. This means that financial regulations should automatically become tighter, for instance through countercyclical capital ratios or forward-looking provisions, when monetary policy is accommodative, in order to prevent the buildup of imbalances. Should such an arrangement not prove feasible or completely effective, the central bank ought to consider the risk of financial imbalances when setting interest rates. This does not mean that central banks should target any specific asset price or level, but rather that they should be more willing than many might have been in the past to lean against large increases in credit and leverage. Consequently, this would not involve adding another objective or lessening the primacy of price stability as the goal of monetary policy but rather help the latter be more effectively pursued over the medium term.

Third, financial stress can limit the effectiveness of the transmission mechanism of monetary policy. On the one hand, term money market interest rates can become disconnected from the policy rate and lower market rates could fail to spur lending when banks are focused on reducing their leverage. On the other hand, central banks may be less able to manage the public's inflation expectations during crises. The second aspect is especially important when interest rates have been brought all the way to zero, as interest rate policy then works solely through expectations.

Fourth, while an expansionary monetary policy is clearly warranted at present, it should remain consistent with its primary goal of ensuring price stability over the medium term. Of particular concern is the exit strategy from the current situation, as a delay in unwinding the very large policy expansion could fuel inflation. Central banks are thus likely to face a delicate exercise both in restoring more normal monetary conditions and in adequately communicating their actions so as to steer expectations in the right direction. While the inflationary dangers that existed in 2007 and during the first half of 2008 have now dissipated, the episode is a reminder that the public perception of central banks' commitment to price stability is not set in stone.

BOX 5.1: The interest rate in the New Keynesian Model

We consider the determination of the interest rate in a workhorse New Keynesian model presented in Galí (2008, chapter 3).¹²⁶ Focusing on productivity shocks, the natural levels of the real interest rate and output (the levels prevailing under flexible prices) are:

$$r_t^n = -\ln \beta + E_t(a_{t+1} - a_t) \quad y_t^n = -\ln \mu + a_t \quad (\text{A.1})$$

where β is the discount factor, a is the log of the productivity level, and is a term that reflects the steady state markup of prices over marginal cost. The natural real interest rate reflects the future expected growth of productivity, while the natural output level reflects the current productivity level.

Under sticky prices, the model boils down to the forward-looking New Keynesian Phillips curve, the Euler relation and the monetary policy rule:

$$\begin{aligned} \pi_t &= \beta E_t \pi_{t+1} + \kappa(y_t - y_t^n) \\ y_t - y_t^n &= E_t(y_{t+1} - y_{t+1}^n) - (i_t - E_t \pi_{t+1} - r_t^n) \\ i_t &= r_t^* + \phi_\pi \pi_t + \phi_y (y_t - y_t^n) \end{aligned} \quad (\text{A.2})$$

where π is the rate of inflation,¹²⁷ i the nominal interest rate set by the central bank and r^* is the target real interest rate of the central bank, that is the real interest rate when inflation is at its long-run value and actual output is at the natural level. Output enters the system (A.2) only in terms of deviations from its natural level in (A.1), i.e the output gap.

We assume that the economy is at a steady state until time t with constant productivity. At time t productivity starts growing at a trend rate g . In addition, productivity is characterized by an autoregressive shock around the trend. Specifically we write for $s \geq 0$:

$$\bar{a}_{t+s+1} = \bar{a}_{t+s} + g \quad a_{t+s+1} - \bar{a}_{t+s+1} = \rho_a(a_{t+s} - \bar{a}_{t+s}) + \varepsilon_{t+s} \quad (\text{A.3})$$

where \bar{a} is the level of productivity along the new trend and ε is a shock. Following these shocks, the long-run natural real interest rate becomes $r_t^n = 1n\beta + g$, and the constant term r^* in the Taylor rule needs to be brought to that value.

We consider the case where the central bank does not immediately raise r^* by g but instead does so gradually

$$r_{t+s}^* = -\ln \beta + g - g(1 - \gamma)^{s+1} \quad (\text{A.4})$$

where γ is between zero and one and reflects the speed at which the central bank adjusts the constant term in the Taylor rule.

We illustrate the model through a numerical example, following the parameterization of Galí (2008, chapter 3), contrasting various cases in Figures 5.8–5.10 (the periods are quarters). In each figure, we present the path of productivity (Panel A), the natural real interest rate in equation (A.1) (Panel B), inflation and the output gap (Panel C), and the

nominal interest rate (Panel D). The impact of a temporary increase in productivity (a positive ε_t in equation (A.3), while g remains equal to zero) is presented in Figure 5.8.

Productivity reverts to its initial level. This subsequent reduction in productivity translates into a negative natural real interest rate. The actual real interest rate (not shown for brevity) is negative, but still exceeds the natural rate, leading to a temporary reduction in inflation and a negative output gap. With low inflation, the decrease in the real interest rate is achieved by a decrease in the nominal interest rate.

Consider now the response to a permanent increase in the growth rate of productivity (a positive g in equation (A.3)). With productivity on a new increasing trend, the natural real interest rate is higher. If the central bank recognizes the new situation ($\gamma = 1$ in equation (A.4)), it adjusts its long-run target for the real interest rate, leading to a higher nominal interest rate. Such an immediate adjustment keeps both inflation and the output gap at zero.

As temporary and permanent productivity shocks have opposite implications for interest rates, we turn to a combination of the shocks. We assume that the economy is affected both by a temporary productivity increase, and an increase in the trend g in equation (A.3). The temporary shock leads to an immediate increase in productivity (Figure 5.9). This is first followed by a decrease, as the unwinding of the temporary shock dominates the higher trend growth, after which the trend component dominates and productivity increases at a steady pace. The relative influence of the two shocks feeds into the natural real interest rate which is first negative, reflecting the unwinding of the temporary shock, and then positive, reflecting the new trend. If the central bank immediately adjusts to the new trend g ($\gamma = 1$ in equation (A.4)), the economy experiences a temporary spell of negative inflation and output gap. The nominal interest rate then initially decreases, to generate the temporary reduction in the real interest rate, and subsequently increases to reflect the new trend in productivity.

What happens if the central bank is slow to recognize the new trend g ? Specifically, we consider a case where it takes 3 years for the central bank to adjust its target half-way (Figure 5.10). While inflation initially falls, it does so by less than when the central bank immediately recognizes the new long-run equilibrium. In addition, the initial reduction in inflation is followed by several years of positive inflation. Moreover, the nominal interest rate initially declines by less, and subsequently increases towards its new long-run value at a faster pace, than when the central bank immediately recognizes the new long-run equilibrium. Intuitively, the delayed reaction by the central bank to the new long-run equilibrium leads to an excessively accommodative policy that pushes inflation up. The inflationary pressures are countered through a higher interest rate.

Figure 5.8 Temporary productivity shock

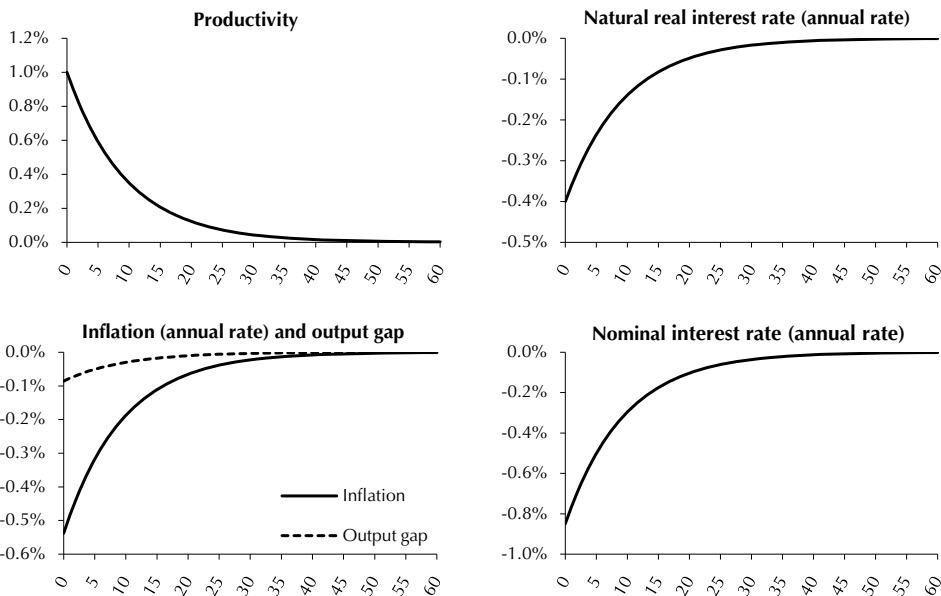


Figure 5.9 Temporary productivity shock and trend shift

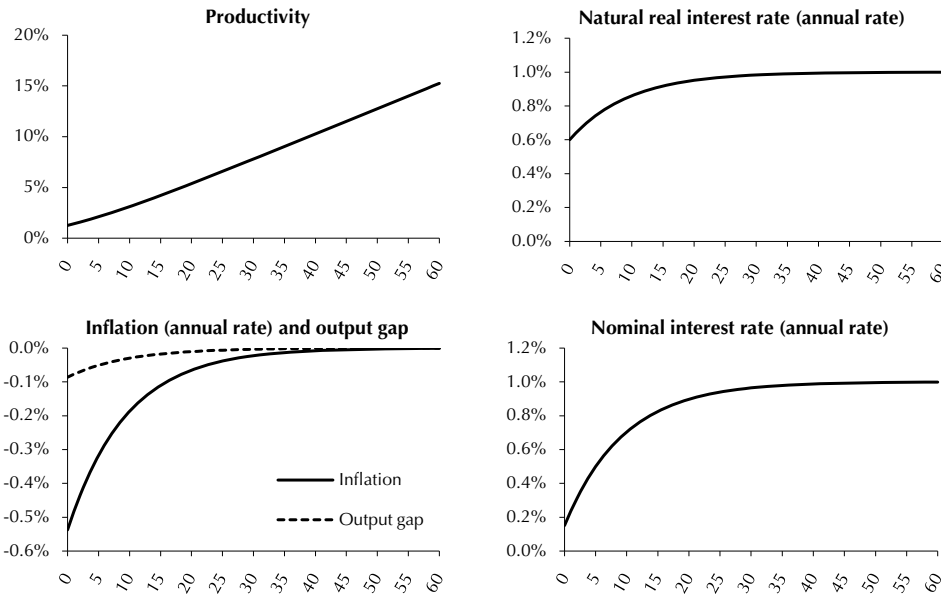
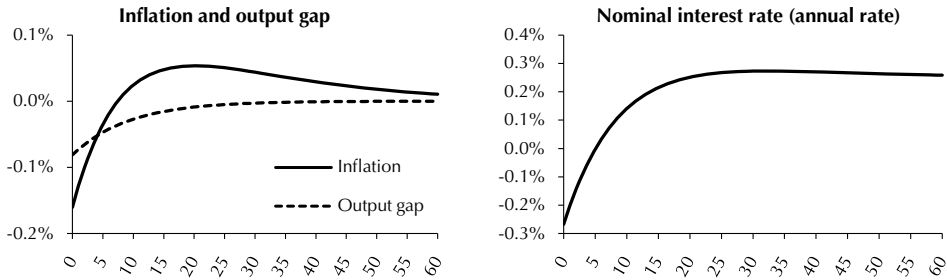


Figure 5.10 Temporary productivity shock and small trend shift (delayed reaction)**BOX 5.2** Competition and the slope of the Phillips curve

The New Keynesian models that are the core of modern monetary economics do not have clear cut implications for the link between the degree of competition faced by firms and the slope of the Phillips curve.

Specifically, the exact nature of restrictions to price adjustment plays a central role. Assume that firms face a constant elasticity of demand given by ε , with an increase in competition raising the value of this elasticity. The standard assumption on the nature of price stickiness considers a Calvo-type setup, described in details in Galí (2008). Each period, firms are allowed to reset its price with probability $1 - \theta$, so θ can be interpreted as a measure of nominal rigidities. Firms produce using a constant return to scale technology in labour. Galí (2008, chapter 3) shows that the Phillips curve is written as:

$$\pi_t = \beta E_t \pi_{t+1} + \frac{(1-\theta)(1-\beta\theta)}{\theta} \frac{1-\alpha}{1-\alpha+\alpha\varepsilon} \left(\sigma + \frac{\varphi+\alpha}{1-\alpha} \right) y_t$$

where β is the discount rate, y is the output gap, α measures the degree of returns to scale ($\alpha = 0$ corresponds to constant returns to scale), σ is the curvature of the utility of consumption and φ is the convexity of the cost of effort. The Phillips curve is flatter when prices are less flexible (θ is high) and when firms have little monopoly power (ε is high). The elasticity of demand matters only when firms face decreasing returns to scale, as fluctuations in output then raise the average marginal cost.

An alternative specification allows firms to change their price at any time, albeit at a quadratic cost. Pesenti (2008, page 13) shows that the Phillips curve is then:

$$\pi_t = \beta E_t \pi_{t+1} + \frac{(\varepsilon-1)\varepsilon}{\phi} y_t$$

where ϕ reflects the cost of adjusting prices. The Phillips curve is flatter when prices are less flexible (ϕ is high) and when firms have more monopoly power (ε is low). The Phillips curve derived by Pesenti (2008) does not hinge on the presence of decreasing returns to scale.

BOX 5.3 An empirical assessment of the Phillips curve

We assess broad patterns across several countries by computing panel estimates on quarterly data for 19 countries from 1985 to 2008.¹²⁸ We estimate a standard, backward-looking Phillips curve that links inflation to the lagged output gap (computed as the difference between actual output and a smooth trend), lagged inflation, import prices and current oil price inflation.¹²⁹ We focus on five main questions. First, have shocks to inflation in the Phillips curve become less persistent over time? Second, has the impact of import prices on inflation declined? Third, has the effect of oil price inflation on inflation changed? Fourth, has the impact of the output gap on inflation declined? Fifth, have measures of global output gaps become increasingly important determinants of domestic inflation, and if so how can this be interpreted?

The results for various specifications are presented in Table 5.1, where we split the sample between 1985Q1 – 1992Q4 and 1993Q1 – 2008Q1. With regard to our first question, we observe a sharp fall in the persistence of inflation, with the sum of the autoregressive lags of inflation dropping from 0.62 to 0.33 (columns 1 and 2). Turning to our second question, the impact of import prices also fell (from 0.01 to -0.01), although it was moderate to start with. Furthermore, while import prices were highly significant in the first sample, they are insignificant in the second sample. Regarding the third question, the impact of oil price inflation is highly significant and declined as well over time, from 0.07 to 0.02. In terms of our fourth question, the parameter on the output gap fell from 0.31 to 0.17, and is highly significant in both samples.

Turning to our final question, we assess the role of the global output gap considering alternative measures. The estimates in column 3 and 4 are analogue to those in columns 1 and 2, except that they also include the GDP-weighted global output gap. We find that the global gap is insignificant, even in the most recent period. This result is robust to alternative measures of the output gap, such as the median output gap in the various countries (columns 5 and 6), or the first principal component of these output gaps (columns 7 and 8). Domestic output gaps by contrast remain highly significant.

In addition to this lack of robustness, the interpretation of a significant role for the global output gap would not be straightforward. It is unlikely to reflect export demand, as this is reflected in the domestic gap. Similarly, international price developments are captured by import prices. In addition, the US output gap plays a significant role (columns 9 and 10). This does not mean that the countries face a higher globalization with the US, but simply that the US gap is a leading indicator of the world business cycle.¹³⁰

Table 5.1 Panel estimates of Phillips curve

Model	1	2	3	4	5	6	7	8	9	10
Sample	1985Q1- 1992Q4	1993Q1- 2008Q1	1985Q1- 1992Q4	1993Q1- 2008Q1	1985Q1- 1992Q4	1993Q1- 2008Q1	1985Q1- 1992Q4	1993Q1- 2008Q1	1985Q1- 1992Q4	1993Q1- 2008Q1
Countries	19	19	19	19	19	19	19	19	19	19
Constant	2.12*** (0.28)	1.21*** (0.11)	1.27*** (0.24)	1.21*** (0.10)	1.44*** (0.25)	1.22*** (0.10)	1.27*** (0.24)	1.22*** (0.10)	1.31*** (0.23)	1.18*** (0.10)
Inflation(sum of lags)	0.62*** (0.05)	0.33*** (0.05)	0.64*** (0.05)	0.41*** (0.05)	0.64*** (0.05)	0.39*** (0.05)	0.65*** (0.05)	0.38*** (0.05)	0.63*** (0.05)	0.42*** (0.05)
Import prices (sum of lags)	0.01 (0.02)	-0.01 (0.01)	0.05*** (0.02)	0.01 (0.01)	0.05*** (0.01)	0.01 (0.01)	0.05*** (0.01)	0.01 (0.01)	0.04*** (0.02)	0.00 (0.01)
Oil price inflation (sum of lags)	0.07*** (0.02)	0.02*** (0.01)	-0.01** (0.00)	0.00 (0.00)	-0.01* (0.00)	0.00* (0.00)	-0.01** (0.00)	0.00** (0.00)	-0.01** (0.00)	0.00 (0.00)
Output gap, lagged	0.31*** (0.06)	0.17*** (0.04)	0.25*** (0.06)	0.11** (0.04)	0.31*** (0.06)	0.16*** (0.05)	0.24*** (0.06)	0.20*** (0.05)	0.25*** (0.06)	0.11*** (0.04)
Global gap (GDP weighted), lagged										
Global gap (median), lagged					-0.15 (0.15)	-0.07 (0.08)				
Global gap (PC), lagged							0.04 (0.03)	-0.04** (0.02)		
US gap, lagged									0.30*** (0.09)	0.18*** (0.06)
Adjusted R-squared	0.66	0.47	0.56	0.29	0.64	0.29	0.62	0.29	0.64	0.30
Country and/or time dummies	Country, time	Country, time	Country time	Country	Country	Country	Country	Country	Country	Country

Note: ***/** denotes significance at the 10%/5%/1% level

BOX 5.4 Taylor rule and the zero interest rate bound

The Taylor rule (Taylor 1993) links the nominal interest rate i to inflation π , the target long-run real interest rate r^* , the deviation of inflation from its long-run target π^* and the output gap y :

$$i_t = \pi_t + r^* + \frac{1}{2}(\pi_t - \pi^*) + \frac{1}{2}y_t$$

The interest rate remains positive ($i_t \geq 0$) as long as:

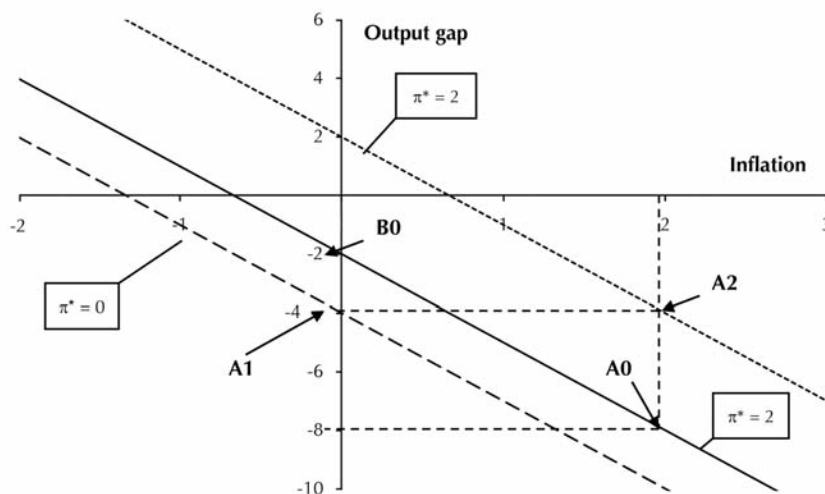
$$y_t \geq -2(\pi^* + r^*) - 3(\pi_t - \pi^*)$$

Consider that the equilibrium real interest rate r^* and policy-makers' inflation objective π^* are both 2%. The combinations of inflation and the output gap that are consistent with the nominal interest rate being zero are depicted as solid line in Figure 5.11. If inflation is equal to its long-run objective of 2%, the output gap can decline to -8 percent – an extraordinarily large recession – before the ZLB is reached at point A0. By contrast, if inflation is zero, the output gap can only fall to -2% – a much more likely event – before the ZLB is reached at point B0.

A lowering of the inflation objective raises the risk of hitting the ZLB. Assuming that inflation and the inflation objective π^* both are zero (dashed line), the output gap can fall to -4% – still a large and not very likely recession – before the ZLB is reached at point A1.

The risk of reaching the ZLB also depends on the equilibrium real interest rate r^* . Consider that it is zero and that policy-makers' inflation objective π^* remains at 2% (dotted line). The output gap can then fall to -4% before the ZLB is reached at point A2 when inflation is at its target level. If inflation is zero, however, the output gap must be positive (+2%) for the interest rate to remain above the ZLB.

Figure 5.11 Taylor rule and the zero lower bound



The figure represents the combinations of the output gap and actual inflation (conditional on the equilibrium real interest rate r^* and the inflation objective π^*) where the nominal interest rate is zero. The nominal interest rate is positive at any point above and to the right of the line.

BOX 5.5 The functioning of interbank markets

Interbank markets have been one of the hardest hit segments of the financial system since the beginning of the financial turmoil in the summer of 2007. Indeed, the soaring demand for liquidity (to a great extent in USD) following investors' losses on US mortgage-backed securities spilled over into short-term money markets. Overnight interest rates increased sharply and financial agents that used to finance themselves in these markets faced great difficulties in continuing to do so due to the severe liquidity squeeze that followed. Confidence – a necessary ingredient for the functioning of interbank markets – was rapidly eroded by the extremely high uncertainty about the funding needs of financial institutions and their direct or indirect exposure to US sub-prime mortgages. As a result, trading in interbank markets decreased sharply and short-term funding in US dollar, euro and sterling was impaired.

Spreads between US dollar Libor and corresponding index swap (OIS) rates have been used to assess conditions prevailing in interbank markets, as they reflect a combination of counterparty credit risk and liquidity factors. If Credit Default Swap premiums of banks are used as a proxy for credit risk, the aforementioned spread can be decomposed in these two components (credit and liquidity), as shown in Figures 5.5–5.7. These figures illustrate the impact of the financial crisis on interbank markets in the three main areas affected by the turmoil (the US, the euro area and the UK). The main characteristics can be summarized in the following stylized facts:

- Since July 2007, spreads have increased sharply, initially due to liquidity tensions and later on also due to credit concerns. Although they started to come down in the last two months of 2008, they remain elevated.
- The widening of spreads has been broadly similar in the three areas considered, illustrating the global nature of this phenomenon. Tensions originating in the US rapidly spilled over to other regions.
- As the turmoil worsened, spreads widened, reaching historic highs in September 2008, when it became a fully-fledged global financial crisis after the failure of Lehman Brothers.
- The main factor contributing to the recent tendency for interbank markets to normalize has been the ample provision of liquidity by central banks and the signaling that liquidity will remain abundant for the time needed. By contrast, credit risk remains elevated, which illustrates the persistent lack of confidence among credit institutions in spite of the extraordinary measures taken by many governments since the fall of 2008 to support their banking systems. The fact that many of these measures have only recently been actually implemented and that their effects are only felt with some delay may partly explain why confidence has not improved further yet. Another reason is that the announcement in early 2009 of new sizable bank losses and the increasing risks of a vicious circle gathering strength has countered the beneficial effect of these measures on confidence.

6 Summary and Conclusions

In this report, we reviewed the golden years of central banking which ended with the onset of the severe financial crisis that the world economy is now experiencing. Does this unprecedented disruption mean that the placid years of low inflation, stable growth, rapid globalization and propitious developments in financial markets were an aberration and will never return? We do not share this alarmist view. Still, the current crisis calls for a closer look at the preceding period of stability, as the benign macro-economic picture may have hidden the buildup of vulnerabilities that were not detected in time and that played an important role in the unfolding of the crisis.

Our purpose has thus been to identify the main characteristics of the golden years in order to understand what policy-makers did right, what structural changes in the economy and the financial system they might have overlooked and where reforms of policy frameworks need to be adopted. In this concluding chapter, we proceed as follows. We first summarise the salient features of the years before the crisis, asking how they might have contributed to the subsequent events. We then review the key features of the present turmoil and of the policy responses provided by central banks and other policy-makers. The third part, which is our main focus, reviews how policy may need to be adjusted in the years to come. While the world economy will recover from the crisis, its sheer magnitude demonstrates that central banks and other policy-makers cannot go back to 'business as usual'.

6.1 Before the crisis

The first and most obvious feature of the ten or fifteen years that preceded the crisis is the reduction of inflation across the world from the high levels of the 1970s. This is the primary reason why the period was perceived as the golden years of central banking, particularly so in advanced economies. Many countries saw inflation fall to the low single digits, a level that is normally understood by central banks to constitute price stability. Moreover, inflation rates became increasingly stable and less dispersed across countries, and shocks to inflation became less persistent. All of this coincided with more stable growth rates, which vindicated the strongly held view in the central banking community that price stability is a necessary condition for achieving sustained growth.

The global decline of inflation coincided with an intense deepening of trade and financial linkages among countries. While trade integration was already sub-

stantial in the early 1970s, financial globalization surged particularly since the mid-1990s and was especially intense among advanced countries. In contrast, in emerging economies trade globalization played a more prominent role and continued financial globalization therefore seems likely.

What were the reasons for these inflation developments? Our reading of the theory and the empirical evidence is that **a sustained reduction in inflation such as the one observed points to the overriding importance of monetary policy**: inflation over the medium term is primarily a monetary phenomenon and depends on the central bank's choice of the objective for inflation and its ability to deliver on it. This is not to say that other nonmonetary factors were not at play. For instance, **fiscal consolidation, increased international competition, and favorable terms-of-trade shocks appear to have played some role. Yet we think that absent changes in the conduct of monetary policy, these factors would only have had a temporary and limited impact.**

Turning to the specific changes in monetary policy, central banks' success in reducing inflation was in no small measure due to improvements in their institutional framework. These include primarily increased independence, along with the adoption of price stability as the primary goal of monetary policy and certain legal changes (e.g. prohibition of monetary financing of fiscal deficits) that were made to ensure that central banks could carry out their functions effectively. Other changes entailed improved internal decision-making mechanisms and better communication with the markets and the public. Taken together, these changes led to better monetary policies and, through them, to lower inflation. We view this as a result of a new political economy equilibrium reflecting both the authorities' view that lowering inflation was both desirable and feasible, and the public support for such a policy arising from increased awareness of the costs of inflation.

The decline in inflation was nevertheless accompanied by profound developments in financial markets that set the stage for the current turmoil. One important side effect of the reduction of inflation was lower nominal returns on a broad range of assets. This was compounded by a reduction in real returns, probably reflecting lower macroeconomic volatility and global imbalances. The latter, in particular, was reflected in the large demand for 'safe' assets by central banks in emerging markets economies across the world, including those with significant current account surpluses, and by pension funds and insurance companies in advanced economies. The reduction in nominal returns provided investors with strong incentives to search for yield by moving into assets that were more sophisticated than bonds or stocks. This development reflects the convergence of several trends. The reduction in volatility removed the biggest hindrance to a switch towards more profitable – but risky – investments, as they became seen as not being so risky after all. While the reach for yield provided a demand for more complex assets, financial innovation provided the supply, with increasingly refined financial techniques used to separate the various components of risk in an asset and sell them to investors that were willing to hold them. Finally, financial globalization made it possible to disseminate these new financial products to investors across the world through very different distribution channels.

The search for yield through more complex instruments had several important consequences for financial markets and helped set the stage for the crisis. First,

financial activity moved increasingly to what has been called a shadow financial sector, whose business was not well understood by financial authorities, and whose actors included both regulated and unregulated entities, characterized by a large number of small markets for highly complex products. With only a limited number of investors familiar with the specific features of a given product, the efficient functioning of such 'niche' markets hinged on their ability to attract a broader set of investors whose presence was essential to ensure market liquidity. When the crisis struck and these investors wished to withdraw to safer ground, liquidity evaporated from those markets and prices collapsed.

Second, the wish to generate higher returns led to an extensive use of leverage by all financial intermediaries, including banks, which resorted to very cheap short-term financing from depositors and, increasingly and more importantly, from wholesale markets. These changes led to an increasing maturity mismatch in the balance sheets of banks and other intermediaries and made financial institutions acutely sensitive to the continued availability of financing.

Third, the nature of risk arguably changed. Financial activity spread from large and deep markets for relatively standardized products that in normal times display volatility, to 'niche' markets that displayed little volatility most of the time but which occasionally underwent episodes of severe turbulence.

And fourth, of particular importance was the heavy use by banks of the so-called 'originate to distribute' banking model where loans are sold and used by other intermediaries to structure complex financial products which in turn are distributed to investors. As the current experience has made clear, weak incentives throughout the full chain of agents participating in that model – loan originators, credit rating agencies, intermediaries selling products to investors and investors themselves – led to a relaxation of lending standards, excessive confidence in the ability of credit-risk-transfer mechanisms to shift risks outside of banks, and insufficient attention being paid to the risk of structured products in 'niche' markets.

6.2 The crisis

The long period of stability described above came under pressure starting in the summer of 2007. Problems that had started in the subprime mortgage market, a relatively small corner of financial markets, grew into a worldwide crisis with wholesale financial markets seizing up and prominent financial institutions sustaining massive losses and even disappearing altogether.

The magnitude of the crisis is a direct consequence of the complexity and opacity of financial markets and their limited ability to function in periods of stress. While the subprime mortgage market was small, the losses on these products took by surprise investors that expected house prices to keep increasing. This was transmitted to other markets in two ways. First, losses forced leveraged investors to liquidate holdings in unrelated markets which impacted on the financial strength of other intermediaries. Second, the surprise led investors to take a more skeptical view on the value of a range of other complex assets, leading to a collapse in their liquidity. With the situation becoming more uncertain, investors took refuge in the safest products, such as government debt, leading to a freezing of other financial markets.

Central banks have responded decisively to the crisis, undertaking very large cuts in policy rates, providing financial markets with ample liquidity on very favorable terms and conditions, and in several cases even taking a direct stake in several categories of assets. In doing so, they faced two sets of challenges: how to set monetary policy and how to manage liquidity.

From a monetary policy perspective, the situation was made especially challenging by a pickup in inflation between the fall of 2007 and the summer of 2008 following the very large increases in oil, food and other commodity prices. Initially, the challenge was to balance the need for higher interest rates to contain inflation with the need for lower interest rates to prevent the financial turmoil from spreading to the real economy and to support the financial system.¹³¹ Central banks' interest rate responses to these pressures were varied as some tightened, other relaxed, and still others left monetary policy unchanged. These differences depended on a number of factors, including differences in economic conditions and economic structures, and, arguably, in central banks' mandates for monetary policy.

The 'stagflationary' challenge became a moot issue in the second half of 2008 as the increasing severity of the downturn of the global economy reduced the actual and expected demand for oil and other commodities, leading to a collapse in their prices and to a rapid decline in actual and expected future inflation. But following the bankruptcy of Lehman Brothers which placed the global financial system on the verge of a collapse, the early policy dilemmas gave way to a situation where both inflation and economic activity were falling in the context of heightened financial tensions. The challenge for monetary policy turned then to prevent the significant undershooting of inflation – and in some parts of the world to counter fears of deflation – associated to the advanced economies entering into a recession and the growth rates of emerging markets being significantly eroded.

But central banks not only responded to the crisis by changing the stance of monetary policy through reductions in official internal rates. They also faced the challenge of managing liquidity in a situation where financial tensions led to unexpected problems. In particular, those related to the seizure of interbank markets as a result of the high uncertainty and the lack of confidence among banks, which resulted in a surge in the demand for liquidity. This raised many new issues, including how to impact on the distribution of liquidity in the system and how to deal with situations in which counterparties lacked appropriate collateral or when the demand was for term, rather than overnight, liquidity. Central banks responded in innovative ways, including by expanding the range of eligible collateral, broadening the range of counterparties and lengthening the maturity of the operations. Pressed by the circumstances, many of these innovations were designed in an urgent manner and it remains to be seen which ones will be maintained after the financial turbulence settles, raising the question of how to exit from the present extraordinary measures.

6.3 Lessons for policy-makers

While monetary policy was the main factor behind the sustained reduction in inflation since the 1980s, with hindsight it is fair to say that macroeconomic and financial policies were not flawless. Clearly the ongoing disruption in financial

markets highlights that the existing framework for macro-financial policies needs to be improved. We identify several main issues: the conduct of financial supervision and regulation; the relationship between price and financial stability and, in particular, how monetary policy should take financial factors into account; the weakening of the monetary transmission mechanism in periods of stress; and the need for monetary policy to maintain its commitment to price stability.

6.3.1 Financial regulation and supervision

A major problem that has been detected as a result of the crisis is that the framework of financial supervision has not coped adequately with developments in financial markets. Given the complexity and rapidly changing nature of markets, there has been a tendency towards self-regulation or 'light regulation', leaving the monitoring to market participants that were deemed better informed than the authorities. These participants all too often have more to gain by letting their own business grow, thereby generating higher profits, than by focusing attention on making the market as a whole more resilient. The most glaring feature of the financial crisis is that the biggest losses (hence the biggest risk exposures) were originating from intermediaries that are both supervised and regulated.

In addition, there has been a progressive divergence between the regulatory framework and the functions performed by various financial actors. So, banks and investment banks have been increasingly more involved in the investment business than in the client servicing business, but within a set of regulations that were conceived for the client servicing business. Furthermore, the explosive growth of hedge funds (a type of investment funds) has created an important segment of the financial system, often engaged in liquidity transformation, outside mainstream regulatory supervision. The result is that the information gap of authorities has widened unacceptably. **Regulation should therefore focus on what financial intermediaries do: in particular, any entity that engages in liquidity transformation should be subject to adequate controls and be expected to have sufficient capital. The same prescription applies a fortiori to any firm that is a potential recipient of central bank liquidity, because of its size for instance.**

In a well working financial system authorities should have more information than market participants: **we believe that requiring financial firms to report their exposures to a centralized supervisory authority is feasible.** This would allow supervisors to construct a systemic view of financial markets. Given the myriad linkages of a multitude of financial actors across a broad array of highly complex markets, individual market participants have only a partial view of financial interrelationships. **There is therefore a need for a consolidation of information, which should be shared with the central bank in a suitably aggregate fashion, through the supervisor.**

The current crisis has also highlighted the governance problems in institutions that combine both **client business**, for which transparency is essential, and **proprietary business**, for which information advantages are highly profitable. **We regard these as fundamentally incompatible activities that should not be conducted in the same firm.**

Furthermore, in addition to revealing regulatory weaknesses, the crisis has shown that supervision was in some cases lacking even when regulation was adequate. Moreover, a major difficulty is that financial regulation and supervision

remained largely conducted in a micro-stability framework that focuses on the situation of individual actors without properly taking into account the systemic implications.

While we regard a broadening of regulation to the shadow financial sector and adequate supervisory enforcement as critical steps forward in avoiding a repetition of the crisis, it is vital that this is done in a manner that avoids stifling genuine – that is, welfare enhancing – financial innovation. While it is all too apparent that an unfettered financial sector can trigger major problems, one should not overlook the fact that, in principle, financial innovation can bring important benefits, provided that regulation and, in particular, supervision are appropriate. As is often said, in strengthening the regulatory and supervisory framework so as to avoid a repetition of the current crisis we should be careful not to throw away the baby with the bathwater.

6.3.2 Monetary policy and financial stability

Central banks do care about price stability and also about financial stability. This is clearly the case not only for central banks who are in charge of regulatory and/or supervisory functions but also for those who are not. This is reflected in the proliferation of financial stability reports produced in recent years by central banks, which are also very often entrusted with the task of contributing to the smooth functioning of the financial system. A different and more controversial matter, however, is to what extent and how should financial variables, in general, and financial stability concerns, in particular, enter into monetary policy decisions. Similarly, financial regulation has come recently under criticism for not sufficiently taking a system-wide approach instead of excessively focusing on the health of individual institutions. Consequently, the question is whether it would not be better to add a system-wide, macro-prudential dimension to the current micro-prudential approach.

While theory suggests that the first-best policy is for monetary policy and financial stability policy to be geared to preserving price and financial stability, respectively, the ongoing crisis demonstrates that these policies cannot be pursued in isolation.

Our conclusion is that **financial regulation should take into account any macro-economic implications that it may have**. For instance, whereas asking an individual bank to reduce its leverage when it has become overextended may be sensible, requiring the same from the entire banking system may risk leading to a credit crunch in certain circumstances. Moreover, **financial authorities should be mindful of the fact that interest rate changes can have systemic implications for the financial sector**. In particular, a sustained period of low interest rates can lead to a search for yield with excessive leverage building up and financial vulnerabilities developing. Consequently, it is critical that regulation is designed so as to avoid procyclical elements that lead to ‘too much in good times’ and ‘too little in bad times.’ In particular, **it is essential to adopt sensible prudential norms as, for example, countercyclical capital ratios, forward-looking provisions and other measures to lessen the excessive procyclicality of the financial system. This should be the first best weapon to fight the build-up of financial imbalances and implies adding a macro-prudential dimension to financial regulation.**

Similarly when setting monetary policy, the central bank should take financial considerations fully into account and also bear in mind that its interest rate decisions have consequences for its ultimate goal of price stability through its impact on financial stability. While, in principle, regulation and supervision should take care of financial stability concerns, not all systematically important players are regulated and, unfortunately, not all regulations are effective enough in achieving the desired results.

Consequently, central banks ought to fully consider the risk of financial imbalances when setting interest rates, which also requires that they receive adequate aggregate information from the supervisory authorities concerning the state of the financial system. This does not mean that they should target any specific asset price or level, but rather that they should be more willing than many might have been in the past to lean against large increases in credit and indebtedness (e.g. leverage).¹³² This can be justified as a 'pragmatic' adjustment to traditional monetary policy so as to better take into account the sort of financial interactions that the current crisis has brought out very clearly but which are only imperfectly incorporated into the models and structures guiding monetary policy decisions. While somewhat higher interest rates than otherwise may lead to somewhat lower inflation than desired say, next year, they may lower the risks of an eruption of financial instability and deflation later on, and thus help maintain price stability over the medium term. Consequently, this would not involve adding another objective or lessening the role of price stability as the primary goal of monetary policy but merely ensure that the latter is more effectively pursued over the medium term.

This point has been actively debated with regard to the sustained period of low interest rates in the early 2000s in the United States and some other countries, when the central banks were appropriately concerned by the risk of deflation. With the benefit of hindsight it appears that greater attention should have been paid to the risk that low interest rates might be fuelling financial imbalances. That said, we do not think that the current problems principally reflect too expansionary monetary policies in the past but rather market excesses that were not effectively dealt with by financial regulation and supervision. Furthermore, we recognize that higher interest rates could have slowed the economy even further and raised the risk of deflation taking hold at that time. All in all, however, things would have been better had monetary policy-makers and regulators and supervisors enhanced their dialogue and shared a macro-prudential focus.

6.3.3 Disruptions in the transmission mechanism

An additional challenge for central banks is to conduct policy in an environment where the transmission mechanism is uncertain or its effectiveness diminished. First, the disruption in interbank markets has led to a certain disconnect between the policy interest rate and short term market rates. Second, banks faced with substantial losses focus on repairing their balance sheets through deleveraging, and are thus reluctant to intermediate central bank liquidity into extra loans to businesses and households. Third, the massive cuts in policy interest rates have pushed official rates in some cases almost all the way to the zero lower bound.

These challenges do not imply that central banks have become powerless even in those cases where there is a risk of deflation. When the policy interest rate is

zero, the central bank can still affect real interest rates by affecting inflation expectations. This can be done by committing to maintain an expansionary monetary policy stance for as long as necessary, even once economic activity picks up, as well as through unconventional actions like the quantitative easing pursued by the Bank of Japan in the past or the credit easing now pursued by the Fed.

Although feasible, these strategies entail risks that need to be taken into account. For instance, central banks' exposures to financial losses are higher when they purchase private sector assets (like, for example, those backed by loans to business and consumers). Moreover, a massive monetary easing that is appropriate in times of severe financial tensions can become inflationary when the crisis abates and economic growth returns. **Central banks must thus be vigilant in removing the present monetary stimulus in a timely fashion to prevent a sustained inflation episode that would damage their hard-won credibility.** This is especially delicate when the central bank commits to maintaining an accommodating monetary policy stance for a sustained period. Its aim to generate a temporary increase in inflation to reduce real rates today must be balanced against the need to keep medium term inflation expectations well anchored. The communication of this strategy to the public represents a challenging task.

6.3.4 The commitment to price stability

While at the time of writing central banks are mostly concerned by the under-shooting of inflation objectives and, in some cases, even with preventing deflation, care should be taken not to take the low inflation expectations over the golden years of central banking for granted. The inflation uptick of 2007–8 fortunately proved short-lived and had only a limited impact on inflation expectations. Still, concerns were raised at the time that a number of central banks were underestimating the risks that inflation expectations might rise.

While subsequent events have demonstrated that the overshoot of inflation objectives at that time was temporary and that the financial crisis has unleashed strong disinflationary forces, re-affirming the commitment to price stability over the medium term must remain a central focus of monetary policy. As mentioned above, the exit strategy from the unconventional measures adopted by central banks during the crisis is likely to prove delicate, and will be even more so should the public question their commitment to low and stable inflation. Moreover, at the present time, governments are engaging in substantial fiscal stimulus programs and financial rescue packages that will add to their indebtedness. Indeed, this has led observers to discuss the risk that governments could eventually find financing through inflation too tempting to resist in alleviating their future debt burdens. While this is a minority view, central banks should be careful to ensure that this risk does not materialize.

6.4 Looking ahead

After having lived through a period in which inflation was low and stable, growth was high and steady and financial markets enjoyed very low volatility, and now being in the midst of a financial crisis, it is too early to speculate on what the long-

term consequences of this change in environment will be for central banks in their role as monetary policy-makers. That said, we venture two guesses.

First, it seems clear that in order to prevent future episodes of this type, **regulatory and supervisory policies need to be strengthened significantly**. Second, financial stability considerations are likely to take a more prominent place in the policy debate and, in particular, take the form of improved dialogue between monetary policy-makers, on the one hand, and regulators and supervisors, on the other, so that both take financial stability considerations adequately into account in fulfilling their respective mandates. In practice this means that both **monetary policy and financial policy should incorporate a macro-prudential dimension**.

While this is certainly easier said than done and even if done may not deliver a perfect world, it can nevertheless set the stage for an economic and financial environment that delivers sustained non-inflationary growth while limiting the risks to financial stability.

Discussion

The following is a transcript of the discussion that took place during the Geneva Conference on 6 May, 2008. Circumstances, however, have been changing at an unusual pace. While inflation had been low for many years when this report was commissioned, it was quickly rising when the report was presented at the conference, and it subsequently fell as the world entered into recession. The authors have profoundly adjusted the report, in fact several times. Discussions, however, cannot be updated. They should be read as a snapshot of a rapidly evolving situation. The following is published under the responsibility of CIMB. While we have tried to retrace faithfully the discussion, the conference participants have not reviewed the text and should not be held responsible for the views ascribed to them.

Discussion of Chapters 1 to 4

Alexander Swoboda, *Graduate Institute of International and Development Studies*

Alexander Swoboda opened the session by commenting that, in addition to the lowering of the level and the variability of inflation, another feature of the Great Moderation is the decline in output variability. In more recent years, analysts have observed a longer time span between recessions and a weakening in the impact of recessions. Some people therefore have thought that the Great Moderation is not only the end of inflation, but also the end of the business cycle.

Swoboda then took a long term perspective and compared the volatility and the mean of inflation in the G7 countries under various exchange rate regimes since 1881. He pointed out that the highest average level of inflation took place in the floating period of 1974–89. He then questioned whether the Great Moderation is what we want to explain or whether it is the Great Immoderation in the 1970s and 1980s that needs to be explained.

Swoboda noted that the industrial countries presented in the report's sample are very wealthy, but underlined the importance of being cautious in more recent years, as twelve countries are founding members of the euro area. In that sense, the conclusion of falling inflation dispersion is inconsistent. However, even in a restricted sample of countries, Swoboda comes to the same findings: the Great Moderation is everywhere, but the timing varies. With regards to timing, Swoboda encouraged the authors to put more emphasis on the role of exchange rate regimes.

As for the question 'what role for globalization?', Swoboda agreed with the report's conclusion: globalization cannot account for the fall in inflation because

of the difference in timing. However, he underlined that the indirect impact of globalization could be accentuated in the report, as international and domestic integration of capital markets increased the costs of policy mistakes.

He interpreted the report's conclusion on the sources of the Great Moderation as follows: 80% may be explained by monetary policy, 10% by good luck, and 10% by globalization.

Swoboda was more pessimistic than the report about the future outlook of inflation. The Phillips curve has become flat because actual inflation has been stabilized. In his view, it is actual inflation that matters for the formation of expectations about future inflation. A focus on core inflation instead of headline inflation not only removes variability, but also cancels the upward trend in inflation. These past fifteen years, central banks were working in a propitious environment: there was no conflict of interest between the growth objective and the price stability objective. Now, they have to consider a third objective: financial stability. That is certainly true for the United States, which, incidentally, does not really have an independent central bank. Swoboda concluded with this warning: the belief that just lowering interest rates can avoid recessions will bring some trouble in the future.

Eric Chaney, Chief Economist for Europe, Morgan Stanley

Eric Chaney began his presentation by observing that the report had a clear central conclusion: the Great Moderation is largely a result of good policy. However, he underlined that nonmonetary factors might be more important than the report suggests. Chaney developed three main arguments.

First, there is a missing element in many econometric studies measuring the impact of globalization on structural parameters. Globalization is not only about the openness of borders to trade in goods and services, it is also about the entry into the global market economy of two giants, India and China. According to Chaney, there are two key parameters that are not taken into account in discussions on globalization: the scope of the shock, due to the scale of the economies, and the initial wage gap with developed countries.

Second, Chaney discussed the impact of globalization on the dynamics of relative prices. A robust feature of the globalization period is that the prices of manufactured traded goods are going down, while the prices of commodities are going up. The first trend seems to be losing steam, possibly because a new equilibrium point was reached. However, many analysts have noticed that the second trend is lasting much longer and is accelerating. The change in the relative price of commodities is mainly due to a shift in the demand curve, while the supply curve remains steady and rigid.

In theory, monetary policy should focus on relative prices. However, Chaney stressed that dynamics matter. If we take the assumption that the disinflationary part of the globalization trend is over, what remains is the inflationary part. In other words, ever more expensive commodity prices. If the central bank wants to keep inflation close to its target, it has to curb the prices of other goods and services through two channels: the exchange rate and the output gap. While commodity prices are very flexible, other prices are much more rigid. Chaney was concerned with the asymmetry in the stickiness of prices. During a transition period, monetary policy might be suboptimal if it focuses on the same measure of inflation as it did successfully in the first phase of globalization.

Third, Chaney reminded the audience of a point made by Kenneth Rogoff: increased competition should lead to a steeper, not a flatter Phillips Curve. Why do we observe flatter Phillips curves? This is one of the main paradoxes. Chaney suggested that it might be due to transitional dynamics. We assume that the natural rate of unemployment has fallen, which is certainly true in Europe, while the actual Phillips curve has become steeper. The estimated Phillips curve might then be flatter, whereas the real one has become steeper and has shifted inwards. Maybe this trend is coming to an end and that is why we see inflation accelerating.

David Longworth, *Deputy Governor, Bank of Canada*

David Longworth began by suggesting changing the sequence of Chapter 4: when talking about the zero lower bound problem, we need to take into account how the Phillips Curve has changed and what has happened to the equilibrium real interest rate or to food prices. The report should discuss the topics in that order.

By the mid 1970s, central banks knew they had been mistaken. This gas brought low inflation at the top of their agendas. Through the 1970s and the 1980s, empirical evidence accumulated that there is no long run trade off between inflation and unemployment. Political views changed and the de facto power of central banks increased as they became more independent. The consolidation of inflation was supported by the Great Moderation in the real economy. People could actually see the benefits of a low inflation policy.

Longworth went on to suggest that the report should take a closer look at how the variation of inflation within countries has evolved. He agreed with the report's conclusion that the lower real interest rate can be mainly explained by a high saving rate in large economies. The findings of a flatter Phillips curve due to a more credible monetary policy are also consistent with researches that were done at the Bank of Canada.

Longworth saw high energy and food prices as a challenge, but less so for industrial countries' central banks. The present shock may be larger, but it is not fundamentally different from what has been observed in the last ten to fifteen years. Central banks have a high credibility and the currently higher level of inflation will remain a blip in inflation graphs. For emerging markets it will be tougher. Central banks have less credibility, there might be more political pressure to do the wrong thing, and consumer baskets put a higher weight on food.

Longworth then turned to the zero lower bound problem. On the one hand, the problem should have become more severe now that inflation and real interest rates are low. On the other hand, there are several reasons why the zero lower bound problem might have become less severe: the Phillips curve has become flatter and responds less to any kind of shock. Inflation has become less persistent and the variance of the error term has fallen, which decreases the probability that inflation will become very low. Policy-makers are more forward looking and act more forcefully than a backward-looking Taylor rule would imply. The new policy is exemplified by the United States' and Canada's action in 2001 and in the last nine months. Longworth supported the instruments proposed in the report when the lower zero bound was attained: commitment to keep nominal interest rate low, expansion of the monetary base by purchasing a wide range of assets, foreign exchange intervention and fiscal policy co-ordination.

Charles Collyns, *Deputy Director, Research Department, International Monetary Fund*

In his presentation, Charles Collyns challenged the view that the Great Moderation is here to stay.

First, although globalization has made life easier for central bankers in the past, it may make things more difficult in the future. Currently, we can observe rising inflation both in advanced and developing economies. The downward trend in the price of manufacturing goods is not only flattening, but manufactured import prices in the G3 economies are actually picking up. Collyns was increasingly concerned about overheating in the rapidly growing emerging economies. For commodity prices, the situation looks even worse, with large rises across the board. Collyns explained the fundamental reasons for these rises as follows: a strongly growing demand from emerging economies and, in the case of grains, misguided bio fuel policies in industrial countries. According to him, the higher commodity prices are here to stay. A slowing down in industrial countries will have little effect as long as emerging economies' demand is growing. For some time now, futures prices have just been extrapolating the spot prices. However, looking at option prices, the implied uncertainty is large. Rising commodity prices are not the usual temporary shock that can be addressed with the standard central banking tools. Collyns was therefore a little more skeptical than Longworth about the industrial countries' ability to handle the present situation. However, he strongly agreed that it is going to be more difficult for emerging economies.

Collyns also wondered whether there are some asymmetries in current policy responses that might lead to an inflation bias over time. How should monetary policy respond to asset prices? He saw broad agreement that monetary policy should respond to a rapid fall in housing prices when it affects real activity. However, monetary policy should then also respond to upward movements in asset prices, which also influence real activity. Although central banks are not responsible for asset price bubbles and cannot control asset prices, there is some potential for leaning against the wind. In practice, however, monetary policy has been looser over the past years than suggested by a standard Taylor rule.

Session 2: General Discussion

Jaques Delpla, *Economic Analysis Advisor*

Jaques Delpla found that a discussion on statistical issues was missing in the report. We know since the Boskin report that in the past inflation has been overstated. Since then, improvements in measurement have statistically reduced inflation. Comparing different periods might therefore suffer from a statistical bias. Delpla also wished to know more about the optimal level of inflation. Is it close to 2% or should we follow the Akerlof-Yellen argument in favour of a somewhat higher inflation target because of sticky nominal wages? Finally, Delpla considered inflation from a fiscal perspective. The period of inflation coincides with the war in Iraq. The United States might finance its war and wriggle out of its budgetary problems through higher inflation.

Luigi Buttiglione, *Head of Global Strategy, Brevan Howard Asset Management*

Luigi Buttiglione thought that the report was too OECD-centric. While OECD countries, and to some extent Latin American countries, have learnt their lesson about high inflation, it is less obviously so in Asian countries. He also thought that the report was too complacent with central banks. The last 15 years is too short a period to assess the performance of central banks. Maybe US monetary policy has been too accommodating in recent years. It has benefitted from a flatter Phillip's curve that could well be exogenous rather than endogenous. Buttiglione then stressed that exchange rate pegs make non-OECD countries import US inflation. He went on to state that while in the past there has been no trade-off for central banks, this has changed in recent times with rising inflation and a slowdown of economic activity. The current testing times will show whether monetary policy really has improved and how profound the anti-inflation beliefs of central banks are.

Angel Ubide, *Director of Global Economics, Tudor Investment Corporation*

Angel Ubide regretted the absence in the report of any evidence on productivity shocks. Improvements in information technology and the doubling of the global labour force are two big and long lasting shocks. Their downward impact on inflation must be felt over several cycles. Ubide also asked whether the current inflation goals, set in a period of tranquility, were too ambitious, both in terms of levels and in terms of volatility. Maybe the productivity shocks have been the reason for inflation to display low mean and volatility. He added that he would have liked the report to be more forward-looking. Central banks now have three objectives: price stability, output stability and financial stability. How should central banks deal with three, potentially conflicting, goals? He suggested that stress tests to central banking frameworks should be developed.

Donald L. Kohn, *Vice-Chairman, Board of Governors, Federal Reserve System*

Donald Kohn had the impression that central banks have been subject to much stress testing recently. The results of the stress test will not be coming in for several years. Therefore, some time is needed to judge the central banks' performance.

He observed that, from a policy perspective, commodity prices are difficult to deal with. It is hard to make sense of short term fluctuations in commodity prices, although the long term trend can be explained with sluggish supply and growing demand. The argument that demand outpaces supply is not sufficient to explain recent price changes. Commodity prices immediately respond to new information. What information has made them rise so rapidly, given that demand has been growing more slowly recently?

Inflation forecasts are very important for central banks, but they are subject to considerable uncertainty when they are driven by commodity prices. Kohn found it reasonable to assume that commodity prices will level off – otherwise, futures markets, which predict constant prices, would have to be considered as incorrect. As a result, growing commodity prices should not drive the central tendency in inflation forecasts. In Kohn's view, commodity prices should rather be seen as the source of a persistent change in relative prices, which acts as a supply shock in western economies. The central banks' task is to keep inflation expectations stable and to avoid second-round effects. This is indeed the case in the United States where unemployment rate is rising and wage increases are moderating.

Kohn then commented on low long term interest rates. The report sees lower real interest rates as an equilibrium phenomenon, mainly due to high savings in China. Yet, in a world where markets are incomplete and borders matter, the lower real interest rates could possibly also have a lot to do with the housing situation in the United States. At any rate, Kohn felt that this phenomenon makes life more difficult for central banks than shown in the report.

Jean-Pierre Landau, *Deputy Governor, Banque de France*

Jean-Pierre Landau stated that the report should discuss how expectations are formed. He underlined the importance to determine whether low inflation was the result of good policy or of luck. Have inflation expectations been low because inflation has been low, or because monetary policy has been credible? Commenting on Eric Chaney's discussion, he agreed that it is very difficult to distinguish between a flatter Phillips curve and a falling natural unemployment rate.

Landau felt that asset pricing bubbles had created a feeling of well-being that helped a broad public acceptance of wage moderation. Wage moderation, in turn, has created a demand for price stability. He then wondered what will happen when the asset price bubbles are gone: will the public accept the constraints of low inflation policy as easily?

Carlo Monticelli, *Senior Director, Treasury Department, Ministry of Economy & Finance Italy*

Carlo Monticelli suggested that more attention be paid to the role of money as an indicator of medium run inflation. Observing the discrepancy between the growth rates of money and of credit aggregates, Monticelli suggested that monetary policy could have done more to avoid the current market turmoil. He also called for more focus on the long term perspective. The increase in food and commodity prices over the last two years is impressive, but compared to the 1950s and the 1960s, these prices are still low. Furthermore, from a 1,000-year perspective, the long-run positive trend of the price level is a feature of only the last 50 years. Monticelli wondered whether such a historical perspective could tell us something as we consider downward nominal rigidities as a reason for accepting a minimum level of inflation. Finally, commenting on low real interest rates, he noted that theory predicts that rapid global growth should lead to high, not low interest rates. He thought that low real interest rates could well be a temporary phenomenon. If that were to be the case, he saw difficult times ahead for Western central banks.

Dino Kos, *Managing Director, Morgan Stanley Investment Management, Hong Kong*

Dino Kos agreed with other discussants that the report gave central banks too much credit. Bringing inflation down was a difficult job, but the surge in productivity and falling commodity prices might have helped central banks. He wished that the report explore these issues in more detail. With rising commodity prices and Asia no longer experiencing deflation – Asian countries now have high inflation rates – he thought that some of the features that had helped central banks to bring inflation down are now turning in the opposite direction. Finally, commenting on the inflation targeting framework adopted by many central banks, Kos argued that policy responses should be symmetric. If they deviate temporary from their target because of higher commodity prices, they should move in the opposite direction when and if commodity prices are falling.

Charles Goodhart, *London School of Economics*

Charles Goodhart observed some inconsistencies between chapters. Chapter 4 of the report argues for a loose monetary policy to avoid the zero lower bound, whereas Chapter 5 discusses whether loose monetary policy has created an asset pricing bubble. Consequently, if the authors assert in Chapter 5 that greater scrutiny of asset prices is required, this should also be discussed in Chapter 4. The same criticism goes for chapters tackling asset price busts. At a time when the financial system is encountering serious difficulties, official interest rate changes might be much less effective in affecting the output gap. There is a substantial increase in margins between official interest rates and the effective interest rates that borrowers have to pay. Interest rate cuts should either increase lending or decrease saving. It is unlikely that mortgage related lending will increase. Goodhart wondered whether we do really want to have even lower saving rates. Although policy might be less influential on domestic variables, it still affects the exchange rate. Are commodity price movements independent of the dollar exchange rate? If they are not, could it be that an expansive monetary policy has actually adverse effects on the US economy?

Ulrich Kohli, *Alternate Member of the Governing Board, Swiss National Bank*

Ulrich Kohli agreed that it had become more difficult to determine real equilibrium interest rates and that this was an important dilemma for monetary policy. However, he did not see any direct link to low inflation. Based on the principle of monetary neutrality he did not support the reasoning that real interest rates were low because inflation was low. The report also puts forward the savings glut argument as an explanation. The argument is plausible, but it is not entirely convincing, because it comes from a flow perspective. From a stock perspective, Kohli underlined that we should look at the marginal product of capital, a link that is missing. He saw various reasons why the marginal product of capital could have declined: an increase in physical capital accumulation around the world, a shift in labour supply towards more skilled labour, and technological changes.

Jean Pisani-Ferry, *Director, Bruegel*

Jean Pisani-Ferry thought that the convergence of inflation rates was as remarkable as the lower average level of inflation. However, this may not last. Countries with different institutional designs and different structures may react very differently to the new environment. For example, Europe and the United States may respond differently, because they have a different policy framework and also because they are in a different situation. We would also expect heterogeneity between industrial and emerging countries, because of different shocks and different institutions. Pisani-Ferry encouraged the authors to use their framework of demand for and supply of low inflation to explain cross-sectional variation in inflation rates. Agreeing with Eric Chaney that globalization should be understood as a series of shocks, he thought that the report's indicators were too smooth and too aggregated to capture the shock nature of the phenomenon. However, he did not share Chaney's worry that the downward trend in the price of manufactured goods was already over. Richard Freeman's 'Great Doubling' hypothesis implies that the entry of China in the global labour force and the downward pressure on prices is a long term process. It may take at least a generation for China to

build up its capital stock. Pisani-Ferry called for establishing a clear distinction between short term developments, such as overheating, and long term trends, such as China's need to create every year ten million new jobs in order to absorb people coming from the country side.

Ignazio Visco, *Member of the Board and Deputy Director General, Banca d'Italia*

Ignazio Visco agreed that the lower inflation is a world-wide phenomenon. However, there is little discussion in the report on what may have brought persistence down. Arguing that a decrease in formal indexation has played an important role, Visco expressed concerns with current requests to bring back indexation mechanisms. He agreed with Landau that it is crucial to determine whether good policy brought low inflation or whether good luck induced good behaviour. There is a risk that central banks may again start to use interest rates countercyclically. Visco then turned to a discussion of the low interest rates. On the one hand, the information technology revolution has increased productivity and should have driven up real interest rates. On the other hand, lower impatience should have driven down real interest rates. Visco was skeptical that the low impatience phenomenon would last. Finally, he pointed out that central banks were facing a challenge: Is it possible to keep inflation expectations stable when actual inflation is rising, without moving interest rates?

Jonathan Wilmot, *Chief Global Strategist, Fixed Income Research, Credit Suisse*

Jonathan Wilmot started with some stylized facts about long term inflation. First, the cycle between periods of high inflation and periods of low inflation has been global and can be explained as a broader socio-economic phenomenon. Second, for the United Kingdom there is a strong correlation between major wars and inflation. Looking forward, Wilmot then emphasized the role of emerging countries' central banks in keeping inflation low. Because of the size of the relative price shock, it is no longer possible to remain pegged to the dollar and to maintain low inflation at the same time. Supporting the report's emphasis on the political economy nature of inflation, Wilmot saw central banks in the industrialized countries as being confronted with two regressive shocks, housing and the terms of trade, both of which bear most heavily on the weakest and most vulnerable actors of the economy. OECD governments may therefore be very reluctant to curb energy demand and to build new energy infrastructure. This in turn may constrain the BRIC's growth. Wilmot then argued that low real interest rates are best understood through the aging phenomenon in both the developed and the developing world. It has led to a growing demand for assets with lower risk than stocks and higher yields than bonds. The growing demand may explain the downward pressure on returns and the increase in risk taking.

Neal Soss, *Chief Economist, Credit Suisse, New York*

Neil Soss commented that Chapter 4 should have not only considered real interest rates, but also the cost of capital. This would have linked Chapter 4 more closely to Chapter 5. With regards to the argument that central banks have three goals and only one instrument, he noted that there is a separate instrument for financial stability. Central banks can change the composition of their balance sheet, something that they recently did extensively.

Paul Jenkins, *Senior Deputy Governor, Bank of Canada*

Paul Jenkins suggested that the report should emphasize even more the role of exchange rate flexibility in preserving low inflation. Flexible exchange rates help to absorb shocks. He also saw two main advantages in a clear central bank objective: the first is the anchoring of expectations; the second is increased accountability.

Charles Wyplosz, *ICMB and Graduate Institute of International and Development Studies*

Wyplosz reacted to Kohn's presentation by recalling the quick drop of interest rates in 2001 in the US. He noted that this move, which cannot be explained by a Taylor rule, has been criticized for creating the asset price bubble, without any immediate impact on inflation. Should the 2008 policy response be criticized on the same ground? While Kohn reaffirmed that price stability is the first priority for central banks, Wyplosz thought that the current actions of the Federal Reserve are hard to explain in this light.

Donald L. Kohn, *Vice-Chairman, Board of Governors, Federal Reserve System*

Donald Kohn answered that he would certainly not advocate a higher level of inflation in order to achieve financial stability. He saw two problems with Taylor rules. First, while monetary policy should be forward looking, Taylor rules are backward looking. Second, the assumed 2% level of the natural rate of interest might be right over long periods of time. Right now there is a considerable tightening of lending conditions and a considerable widening of spreads. The Federal Reserve is lowering the policy rates in order to offset the tightening of financial conditions, consistent with its objective to achieve price stability.

Claudio Borio, *Head of Research and Policy Analysis, Bank of International Settlements*

Claudio Borio welcomed the fact that the report went beyond characterizing globalization as a relative price shock and acknowledged that globalization may also affect productivity. However, as Ubide and Kos, he thought the report did not give enough weight to the impact that this major productivity shock had. He also shared Visco's skepticism towards the savings glut explanation of low real interest rates. To him the main reasons are the low policy rates set in industrial countries for domestic reasons. Emerging economies with an exchange rate peg responded by accumulating reserves. This is not really an increase in savings, as it can be achieved with sterilization. Borio continued with a warning: thinking that the impact of globalization on inflation can be captured fully by import prices is dangerous. He quoted recent work conducted at the BIS that uses measures of the global output gap additional to input prices to ask whether inflation has been consistently underestimated in recent years because global factors have been improperly taken into account. While commodity prices are high mainly because of demand factors, central banks have treated the high commodity prices as an exogenous supply shock. In the aggregate, he noted, global excess demand is endogenous.

Alexander Swoboda, *Graduate Institute of International and Development Studies*

Replying to Jean Pisani-Ferry, Alexander Swoboda argued that the convergence of inflation rates in industrial countries can be reasonably well explained by shifts in the policy regime. The real question is what led to the convergence of emerging countries' inflation rates.

Alberto Giovannini, *CEO, Unifortune Asset Management*

Alberto Giovannini replied to questions on the hierarchy of inflation, output, and financial stability. To him the appropriate method is to solve out the financial system model and to analyze its impact on prices and output. Additionally, the question of who bears the costs of bankruptcy is a fiscal, not a monetary problem.

Jose Viñals, *Deputy Governor, Banco de España*

Jose Viñals thought that the issue of expectations' formation, mentioned by Landau and Visco, is important and likely to result into a two-way causality. Although inflation has been kept low because of central banks' deeds, there is a risk that the public may change expectations if commodity prices would cause inflation to lie above its target for an extended period of time. Commodity prices are making the life of central banks more difficult. On the issue of low real interest rates Viñals replied that the report argues that nominal rates were low because real rates were low and not the other way around.

Discussion of Chapters 5 and 6

Charles Goodhart, *London School of Economics*

Charles Goodhart praised the well written and structured report, which takes on the ambitious task of trying to 'hit a moving target'. With respect to the recommendations of the report, Goodhart noted that more information is generally considered a good thing. However, information is not at the core of the current problem. Rather it is the lack of instruments or, where instruments are available, the authorities' lack of will to make use of them. To illustrate his point, Goodhart cited the example of Northern Rock. Northern Rock was considered to be well capitalized on the basis of Basel II and could even increase its dividends. Based on the market information at that time, there existed no solvency problem. However, when housing prices fell rapidly, it became obvious that Northern Rock would be subject to problems given its heavy exposure to the housing market. Increasing the available information today does not increase the knowledge about the risk to come in the future. The information really needed is what is likely to happen in the future, which is information not given to any market participant.

Related to this, Goodhart emphasized the need of better awareness about the shortcomings associated with the mark-to-market approach, in particular in periods of downturns. Goodhart appreciated that the report stresses the importance of niche markets and their implication for overshooting, both on the upside and the downside. He proposed adding additional policy recommendations on the problematic salary and benefit incentive structure for bankers. The main problem is that benefits are private while costs are carried by the society.

Another remark related to cross-country differences in the measurement of prices, an issue not addressed in the report. For instance, the United Kingdom

excludes housing prices from the definition of CPI inflation but are prices stable if housing prices rise by 25% while all other prices rise by 2.5%? Cross-country comparison will deliver very different results if this aspect is not taken into account. Generally, Goodhart wished the report to be more specific in its recommendations. Advice like proposition 3 ('conflicts of interest need to be tackled') are too general. Goodhart was also skeptical towards the recommendation that central banks should be in possession of information regarding any entity that engages in the public market (like hedge funds). It remains an un-addressed and debatable question whether a central bank should regulate only a few big market players or extend its reach to all players in the market.

Philipp Hildebrand, *Vice-Chairman of the Governing Board, Swiss National Bank*

Philipp Hildebrand expressed sympathy for the statement that central banks should focus on price stability and leave financial stability to the responsible regulators. However, the statement needs to be put in perspective with the mandate of the central bank (e.g. the Swiss National Bank has a legal mandate to contribute to financial stability). Hildebrand argued that one should not overstate the potential conflict between the aim of price stability and financial stability. Even today many observers argue that the monetary policy stance should have been only slightly different.

The report does not address sufficiently the question of which policy stance to take in 'bad times'. Not reacting to financial turmoil seems not to be a persuasive policy in particular if a central bank's mandate incorporates financial stability. He favored a policy that keeps the focus on medium-term price stability. Within this framework, the central bank can pursue other objectives, without creating the potential for a moral hazard problem. Such policies could include, for example, changing the composition of the balance sheets or using moral suasion and informal power to enforce re-capitalization. If a shock occurs there is a bigger cushion.

Hildebrand next raised a word of caution with respect to regulatory policy recommendations. In particular, it is advisable not to react to complexity with further complexity through regulation. Such a reaction bears the risk of diluting the effectiveness of the regulatory response.

Simple regulations (like a leverage ratio) that help to strengthen shock absorbers are a key recommendation to be stressed. Similarly, rules on concentration limits may be worth considering. For example, UBS had no country limits relating to its 'home' markets such as the United States and the United Kingdom.

On a more conceptual point, Hildebrand mentioned the need for a better description of the link between the search for yield and the monetary stance (nominal interest rate). He agrees that this may stem from some form of money illusion, but then this should be a short term phenomenon. If the report had instead real rates in mind then there is the problem of linking this to the monetary policy stance. He therefore proposes the authors to concretize their ideas on the 'search for yield'.

Avinash D. Persaud, *Chairman, Intelligence Capital Limited*

Avinash Persaud regarded the report's conclusion that we must not overburden monetary policy as problematic. Caring about price stability implies that the central bank should also care about the housing market given that in many countries housing is an essential part of household spending.

The importance of housing (and assets) in affecting monetary policy in recent times relates to the fact that we moved from a bank-finance to a market-finance model. The move implies that search liquidity (liquidity in quiet times) is improved but systemic liquidity (in times of stress) is undermined. This creates a trade-off. In times of stress the central bank becomes the natural player to move in and put a floor on prices. How does this affect the central bank's target of price stability?

Persaud regarded the distinction between banks versus non-banking institutions as outdated and proposed to focus on leveraged versus non-leveraged institutions. Agreeing with Goodhart, Persaud claimed that lack of information is not at the core of the problem. Hence, providing more information cannot fix the problems policy-makers are facing in times of financial turmoil. This has been learnt from various crisis periods over the past.

Persaud suggested developing further the political economy analysis that is sketched in the report. For instance, he proposed to incorporate the impact of demography on the supply of and demand for low inflation.

A weakness of the report is that its hypotheses can not be falsified. To illustrate this, Persaud gave the example of the report's description of inflation as being (in the medium run) a monetary phenomenon. The report starts from the hypothesis that money causes inflation. Since the central bank creates money, monetary policy is found to be the main determinant of inflation.

Another issue which is not sufficiently addressed in the report is whether central banks are in control of the transmission mechanism. Many countries are far from having an independent (and forward-looking) central bank but nevertheless have low levels of inflation. This goes in contrast with the report's conclusion that much of the merit of low inflation is a result of better monetary policy.

Persaud criticized the fact that the report is asymmetric in its assessment of the role of the exchange rate. The report mentions the role of a depreciating dollar in driving today's prices but does not mention the role of the appreciating dollar in earlier times of world-wide decline in inflation. Furthermore, the report should elaborate more on the role of exchange rates and the current account.

Persaud then turned to the search for yield argument. The recent turmoil may be understood as a one-off bubble. Investors were exposing themselves to more risk in order to maintain an unchanged nominal return, abstracting from the declining risk free interest rate.

Since confidence is at the heart of finance, Persaud noted that overconfidence is risky. Furthermore, he stressed the fact that challenging times are still to come since central banks have essentially one policy instrument to address three problems. This should lead to caution regarding too overconfident conclusions.

Finally, Persaud alluded to the idea that the fall in inflation may reasonably well be explained by Philipp's curve considerations over the first half of the period while the second half is explained away by globalization.

In his concluding remark, Persaud warned that we should not rely on explaining disinflation with a single argument (monetary policy) but rather with a combination of various policies and developments.

Neal Soss, *Chief Economist, Credit Suisse, New York*

Neal Soss approved of the link, made in the report, between a low volatility environment and the need for more intense prudential supervision. He suggested that the trend towards transparency and pre-commitment among central banks may have contributed to reduced uncertainty and increased risk taking. The path of the interest rate has become much easier to predict, with repeated interest rate increases of 25 basis points at the time of regularly scheduled FOMC meetings. Commitment and transparency may not be the right approach to financial stability.

Soss next observed that banks have increasingly diversified, including geographically, their deposits and lending opportunities. But if all financial institutions start looking more alike and have similar deposit and credit portfolios, the result is more instability. The overall system may be subject to, potentially less frequent, but systemic shocks and less to idiosyncratic shocks.

Soss noted that institutions' deposit basis has become less 'sticky', as deposits are more short-lived. As deposits react faster, financial institutions must behave more cautiously. Over-the-counter trading adds another layer of complexity in the form of counter-party risk. The setting-up of a clearinghouse or exchange arrangements would reduce systemic risk by rationalizing counter-party risk.

He would have liked the report to address the need for guidance in terms of expected levels of spreads (and other variables) once the turmoil settles down. Another pressing issue which needs further attention is the counter-party risk that banking institutions face.

Session 4: General Discussion

David Longworth, *Deputy Governor, Bank of Canada*

David Longworth thought that affirming that monetary policy has only one instrument but three targets is overstating the problem. Though it is difficult to address situations like the current one, providing central banks with a single, clear objective makes the task more manageable. Indeed, a clear objective allows the central bank to take a specific view which shapes priorities and to design policy accordingly. Anyway, central banks have more than one tool at their disposal. For example, they have the possibility to affect the situation by changing the composition of their balance sheets.

Longworth encouraged the authors to elaborate more on which models could be referred to in the discussion on the search for yields.

Dino Kos, *Managing Director, Morgan Stanley Investment Management, Hong Kong*

Dino Kos observed that the banks that recorded the highest losses are those that are the most regulated. This led him to conclude that further regulation is unlikely to help in effectively countering potential problems to financial stability. The key problem lies primarily with the difficulty of recognizing whether the information provided by banks and other financial institutions indicates a situation of increased risk. Another potentially important aspect in the discussion of the effect of global savings on lower interest rates is the role of Sovereign Wealth Funds (and Sovereign Pension Funds).

Angel Ubide, *Director of Global Economics, Tudor Investment Corporation*

Angel Ubide pointed out that the authors should provide more concrete policy implications. Should central banks lean against the wind? Should more emphasis be put on macro prudential supervisory policies? He also encouraged the authors to analyse the issue of risk absorbers. Will this task be taken up by central banks, injecting liquidity in the system when necessary?

Luigi Buttiglione, *Head of Global Strategy, Brevan Howard Asset Management*

Luigi Buttiglione asked whether within the given mandates, central banks can extend their range of tools. Although we might say ex post that a more timely response to the current developments may have been appropriate, the more interesting question is whether world wide lax monetary policy has contributed to the current high level of commodity prices. This question has not been sufficiently addressed in the report, in his view.

Charles Collyns, *Deputy Director, Research Department, International Monetary Fund*

Charles Collyns too stressed the need for more concrete recommendations. For example, the report should determine where to draw a line for the provision of information among institutions that have access to liquidity by the central bank in times of turmoil.

He also thought that we should analyze why the emerging market economies have so far been spared from severe consequences of the current turmoil. The report could also provide some advice to emerging markets on how to maintain a stable economy. In particular, the current context raises questions about the role of exchange rate policy, fiscal policy as a counter-cyclical measure and even the role of financial sector development.

Jaques Delpla, *Economic Analysis Advisor*

Jaques Delpla raised the question of whether there is a benefit from moving to a more incentive-based payroll scheme for central bankers.

Ignazio Visco, *Member of the Board and Deputy Director General Banca d'Italia*

Ignazio Visco commented that it has become increasingly difficult to distinguish between solvency and liquidity problems. However, it is crucial to know in which state an institution is, since the two require different policy responses. Visco considered the report's distinction between the role of central banks aiming at price stability and financial regulators supporting financial stability too abstract. Financial distress may jeopardize price stability, which implies that the central bank has necessarily an interest in financial stability. In such a case a central bank needs to explain well its action to market participants, relying on the indirect impact of financial instability on price stability.

Charles Wyplosz, *ICMB and Graduate Institute of International and Development Studies*

Reacting to the suggestion that real shocks (productivity shocks) can have nominal effects (inflation), Charles Wyplosz noted that such a result is very hard to establish when thinks of inflation not as a temporary but as an on-going phenomenon. He thought, therefore, that the report is right in the way it assesses the impact of globalization on inflation.

However, he noted that the report should state more precisely whether central banks should consider financial stability also part of their realm. Acknowledging the risk of 'overloading' central banks, Wyplosz was concerned that – given that there is no 100% insurance against financial turmoil – the reputation gained by central banks in fighting inflation might be undermined by financial instability. He noted that central banks will always have a role to play in financial stability, given their unavoidable role as lenders in last resort. This calls for clarifying their tasks in case of lending in the last resort.

Carlo Monticelli, *Senior Director, Treasury Department, Ministry of Economy & Finance Italy*
Carlo Monticelli noted that global imbalances played a role in the current financial turmoil and would like to see this mentioned in the report.

Claudio Borio, *Head of Research and Policy Analysis, Bank for International Settlements*
According to Claudio Borio, it is essential to have a framework for monetary policy that gives central banks the ability to counter financial turbulences even if short-run forecasts do not ask for immediate reaction. He noted that doing so entails a credibility issue, since the central bank must well communicate the reasoning for its (pre-emptive) moves. Communication becomes a key dimension of monetary policy. Borio encouraged the authors to take a stance on this issue.

A second concern raised by Borio relates to the exit strategy after a sustained period of low interest rates.

On the role of prudential policy, Borio agreed with the authors that monetary policy cannot be overburdened. The design of prudential policy should be a joint effort involving all the relevant authorities. The key is to shift from a micro perspective towards a macro and hence systemic perspective, which entails dealing with pro-cyclicality issues. The challenge will be to build on the current arrangements to address this issue more forcefully. In this respect, Borio noted that fair-value accounting has a significant impact on the pro-cyclicality of the system.

Alexander Swoboda, *Graduate Institute of International and Development Studies*
Alexander Swoboda raised the concern that low interest rates have not only led to search for yield, but created a potential problem related to the flattening of the yield curve. Concerning the recommendation on improved provision of information by any institution with leverage, Swoboda noted that, except for some mutual funds, nearly all other institutions would fall under this category. The authors should hence be more precise and state what type of institutions should provide which specific information at which frequency. Furthermore, regulation may hamper buffering functions of the institutions in the advent of a systemic shock.

Donald L. Kohn, *Vice-Chairman, Board of Governors, Federal Reserve System*
Donald Kohn expressed skepticism about whether stronger interest changes or earlier adjustments of monetary policy would have avoided the current difficulties. He also noted that 'leaning against the wind' could be dangerous if that strategy does not deliver its expected benefits. He agreed with Wyplosz that central banks have a natural role in financial regulation due to their lender-of-last-resort function. However, because of the inherent moral hazard problem, their role cannot be fully spelled out a priori.

Central banks should not get detached from first-hand supervision as it is essential for them to have a good understanding of the health of the financial system. Similarly, separating the central bank from financial supervision may have adverse implications for coping with systemic crisis. Regarding the access to the discount window, Kohn saw an increased need to set the conditions and prices for access.

Jonathan Wilmot, *Chief Global Strategist, Fixed Income Research, Credit Suisse*

Jonathan Wilmot voiced concern about two conflicting outcomes over the horizon of the next one to three years. On the one hand, there is the potential for a situation where leverage undershoots. More regulation and provision of information will make this rather worse than better. Though acknowledging potential problems in their implementation and the fact that full insurance is not attainable, Wilmot sees a need for indicators. These indicators could be used to increase capital requirements raised as a buffer for less favorable times. Wilmot also regarded the overshooting of commodity prices as worrying. A turn is unlikely as long as demand remains strong and supply does not keep up. The problem could be further fuelled by speculative money that flows into commodity market. Though he opposed any intervention on the supply side, he suggested taxing profits.

Vít Barta, *Advisor to the Vice-Governor, Czech National Bank*

Vít Barta argued that central banks do not have any problem coping with demand shocks nor with second round effects in the case of temporary supply shocks. The difficulty, instead, is to identify whether shocks are temporary or permanent. This is why Barta would like to see the authors discuss more precisely which type of shock we are currently facing. If the shock is permanent, which monetary policy stance should the central banks take? It could be advisable to accept a period of higher inflation rather than depressing the economy with high interest rates. Since such a step may hurt the credibility of monetary institutions, Barta considered it important that the report addresses these issues more in-depth.

Bernhard Winkler, *Senior Advisor, Monetary Policy Stance Division, European Central Bank*

Bernhard Winkler appreciated the reference to Otmar Issing, the father of the ECB strategy. He acknowledged that it may not be the answer to the current financial imbalances, but it is an attempt and one way to bring in the fact that money and credit not only drive inflation but are also associated with financial imbalances and asset price boom-bust cycles.

José Viñals, *Deputy Governor, Banco de España*

José Viñals acknowledged the importance of two questions: how to enhance the prudential rules of the macroeconomic system; and how to establish counter-cyclical features consistent with international accounting standards. He was not convinced that asset prices, like stock prices and housing prices, should be considered part of the price stabilization objective. Responding to Persaud's proposal that inflation may be explained without considerations about central bank policies, Viñals argued that most empirical findings support the view that monetary policy is the main determinant of inflation in the medium run. As an example he cited the post-oil shock period in the 1970s. Expectation-based policies would have avoided the spike in inflation and its prolonged impact throughout the 1970s and early 1980s.

Acknowledging the natural concern of central banks about financial stability, Viñals argued that gearing monetary policy to financial stability would overburden monetary policy. He would suggest instead that central banks should keep the overnight rate as close as possible to the policy rate. This, in his view, allows to stabilize the money markets and to make monetary policy as effective as possible.

Alberto Giovannini, *CEO Unifortune Asset Management*

Clarifying the approach of the report, he mentioned that boom-and-bust cycles in financial markets can be a good development. What is important is that losses are confined to those institutions that made mistakes. The report tried to avoid giving very specific recommendations which are subject to many conditionalities and are not generally applicable. Furthermore, he argued, it is too early to give particular recommendations since the full picture is not yet fully revealed. Opinions should not be based on early perceptions.

Endnotes

- 1 See Bean (2008).
- 2 We use the median rather than the mean since it is less affected by outliers.
- 3 We focus on the post WWII period as sustained increases in the price level are specific to this period. By contrast, the price level showed little trend in the earlier part of the century, and in the 18–19th century, when episodes of high inflation in war times were followed by episodes of deflation. These countries account for 70% of world GDP (50% on a purchasing power parity basis). A detailed description of the data is found in Box 1.
- 4 Viñals (2001) surveys these issues and the state of the literature at that time.
- 5 See Ahmed et al. (2002), Backus and Wright (2007), Bernanke (2004), Blanchard and Simon (2001), Kahn et al. (2002), Kim and Nelson (1999), Longworth (2002), McConnell and Perez-Quiros (2000), Stock and Watson (2003).
- 6 See Perron (1990).
- 7 We estimate persistence by regressing inflation on its value over the previous four quarters, and take the sum of the estimated coefficients as our measure of persistence.
- 8 A value of one actually implies that once inflation increases, it remains permanently higher even if the underlying shock was temporary.
- 9 As expected, we obtain a higher estimate of inflation persistence over the entire sample (0.85) than in the individual subperiods (0.4–0.6) since in the latter case we allow the average inflation rate to vary.
- 10 It should be noted that fixed-effect panel estimates of persistence can be biased if the autoregressive parameters differ across countries. See Imbs et al. (2005).
- 11 IMF (2006); Lane and Milesi-Ferretti (2007). Other studies focus on the particular situation of individual countries. Gourinchas and Rey (2007) and Tille (2003) focus on the United States. Stoffels and Tille (2007) review the situation in Switzerland, while Reserve Bank of Australia (2006) looks at the case of Australia.
- 12 The list of countries and the specific data sources are given in Box 3.
- 13 Our measures are designed to capture broad trends and give a sense of the dispersion across countries. Notice that they are distinct from other measures often used in the literature. For instance, the median ratio of external assets to GDP does not take account of the relative sizes of the countries. By contrast, expressing total external assets to world GDP corrects for country sizes, but does not reflect cross-country heterogeneity.
- 14 The reduction in the inter-quartile range in 2007 reflects the fact that the IMF's International Financial Statistics data base contains missing data for several countries.
- 15 Panel B presents figures until 2006 due to limited data coverage for 2007.
- 16 Hellerstein and Tille (2008) discuss this for the case of the United States.
- 17 This is especially the case for short-term yields as shown below in Figures 2.7 and 2.9.
- 18 We focus on industrialized economies due to limited data availability for the emerging markets in our sample.
- 19 If inflation expectations did not come down immediately following the reduction of inflation in the 1980s, our measure over-estimates the true level of real interest rates.

146 *Are the Golden Years of Central Banking Over?*

- 20 Such considerations would by contrast be primordial if the sample also included emerging markets with rising productivity.
- 21 Specifically, a simple regression of the interquartile range on a trend shows a decrease of 0.2 percentage point per year (i.e. 7.4 percentage points over the sample), with a low value for the R² statistic (0.13).
- 22 See Fratzscher (2001) and Obstfeld and Taylor (2002).
- 23 See Ferguson et al. (2007) and Rogoff (2006).
- 24 See Nickell (2007). The countries are: Italy (4.3%), Norway (4.1%), Spain (5.5%) and the US (4.8%).
- 25 See Sargent and Wallace (1986). Another illustration of the role of fiscal consideration is the fiscal theory of the price level discussed in Cochrane (1998).
- 26 See Campillo and Miron (1997), IMF (2006) and Sargent (1983).
- 27 'Overdrafts or any other type of credit facility' by the ECB or the national central banks in favour of 'Community institutions or bodies, central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of Member States' are prohibited, as is "the purchase directly from them by the ECB or national central banks of debt instruments' (Protocol on the Statute of the European System of Central Banks and of the ECB, OJ C 191, 29.7.1992, p. 68).
- 28 The data are described in Box 4.
- 29 See Barro and Gordon (1983a,b) and Kydland and Prescott (1977).
- 30 See Rogoff (2003) and Romer (1993).
- 31 See Borjas (2003) and Card (2005).
- 32 See IMF (2005).
- 33 Blanchard and Galí (2006) argue that the large influx of immigrants in the Spanish labour market has held inflation down by close to one percentage point. The evidence for countries with smaller flows remains however sparse. See also Bentolila, Dolado and Jimeno (2008).
- 34 See Chen *et al.* (2008).
- 35 See IMF (2006) and Pain et al. (2006). Harrigan (2000) documents the reduction in import prices in the United States in the wake of the Asian financial crisis of the late 1990s.
- 36 See Bernanke (2007), Kohn (2006) and Yellen (2006).
- 37 See Campillo and Miron (1997, p. 355) who find that oil-price shocks have a positive and significant effect on average inflation rate in their cross-sectional regressions.
- 38 The terms-of-trade could also be linked to globalization. For instance, the integration of a country such as China in the world economy could have boosted the demand for commodities, thereby leading to higher prices that in turn represent terms-of-trade shocks for other economies. Such an effect would have inflationary consequences on other countries.
- 39 Orphanides and Wilcox (2002).
- 40 Alesina and Summers (1993), Grilli et al. (1991).
- 41 Goodfriend (2007).
- 42 This argument is supported by the fact that the link between low inflation and central bank independence is mainly present in high-income countries which have highly developed financial systems.
- 43 Campillo and Miron (1997), Cukierman, Webb and Neyapti (1992), Obstfeld (1997), Posen (1995).
- 44 Baltensperger, Fischer and Jordan (2007), Gerlach (1999).
- 45 See Bank of Japan (2006).
- 46 The trade-off is consistent with conducting monetary policy with a flexible inflation targeting strategy. See Svensson (1997).
- 47 See Svensson (2008).
- 48 See Cecchetti et al. (2007) and Stock and Watson (2007). See also the discussion in Cogley (2005).

- 49 Under this argument it is surprising that inflation persistence in 1993–2007, when monetary policy was generally felt to be ‘good,’ is about as low as in the high inflation period 1973–84. The explanation for this is most likely that the sharp spikes in oil prices in the latter period raised inflation substantially, but temporarily, which tended to reduce the overall persistence of inflation in that period. Thus, the mapping between persistence and the ‘quality’ of monetary policy is only valid for a given time series process of the shocks hitting the economy.
- 50 This interpretation is consistent with the findings in Roberts (2006), who simulates the FRB model under various assumptions regarding the aggressiveness of monetary policy and finds that the persistence of inflation declines if the central bank shifts from a time-varying objective to a constant objective for inflation.
- 51 This part of the analysis borrows heavily from Viñals (2001), Section 2.2. See also the discussion in White (2008).
- 52 See DeLong (1997), Taylor (1997, 1998) and Clarida, Galí and Gertler (1998). Sargent (1999) points to a ‘good luck’ hypothesis where US policy-makers’ estimates of the Phillips curve shifted in response to shocks, showing a smaller impact of inflation on economics activity.
- 53 See Goodfriend (2007).
- 54 See IMF (1999).
- 55 See the discussion in Flood and Mussa (1994) and Viñals (1998).
- 56 See Andrés, Hernando and López-Salido (2000), Feldstein (1999), Fischer (1994) and Lucas (2000).
- 57 See Ahrend et al. (2006), Desroches and Francis (2007) and Gruber and Kamin (2008). Ahrend et al. (2007) also provide a long run perspective showing the real interest rate for the US since 1900. They document that the real rate has been above its historical average over the last twenty-five years, and has now reverted to this average. The decrease in real interest rates is also evident when one looks at the yield on inflation-indexed bonds in the UK and the US (even taking account of the technical issues, such as limited liquidity, in the market for such bonds). Robertson and Symons (1993) discuss the specifics of the U.K. situation.
- 58 A detailed description of the exercise is given in Box 5.
- 59 It is important to keep in mind that this argument bears on the growth rate of consumption, and not the current level of consumption. In particular, an increase in the short-run real interest rates, through a monetary policy tightening, achieves a high growth rate of consumption by reducing the current level of consumption.
- 60 See Desroches and Francis (2007).
- 61 We use the standard measure of non-farm business sector productivity.
- 62 See Laubach and Williams (2001).
- 63 See Cahn and Saint-Guilhem (2007).
- 64 See Backus and Wright (2007) and Bernanke et al. (2004). Rudebusch et al. (2006) however note that allocating the reduction in real interest rates between structural aspects and reduced risk premiums is sensitive to the model on which the analysis relies.
- 65 Bernanke (2007); Warnock and Warnock (2005). Rudebusch et al. (2006) and Wu (2008) find no impact of foreign capital flows into the US on interest rates.
- 66 Caballero et al. (2007). The relevance of this channel is questioned by Gruber and Kamin (2008).
- 67 Desroches and Martin (2007); IMF (2005).
- 68 Backus and Wright (2007).
- 69 Rudebusch et al. (2006) and Wu (2008).
- 70 <http://www.tcd.ie/iiis/pages/people/planedata.php>.
- 71 While the data starts in 1985, we estimate from January 1993 onwards in order not to mix monetary regimes.
- 72 The variance decomposition suggests that at a time horizon of two months, the fraction of the forecast error variance of the ten-year real yield explained by the nominal one-month rate is less than 6%; after two years it is less than 3%.

- 73 Although movements in the ten-year real yields are reflected one-for-one in one-month nominal rates, they explain only about 16% of the forecast error variance of one-month rates at a two-year horizon.
- 74 See also Panetta *et al.* (2006).
- 75 For a discussion of leverage in modern financial systems, see Adrian and Shin (2008).
- 76 See the analysis in Borio (2003 and 2007).
- 77 For a review of these developments, see Trichet (2008).
- 78 See Brunnermeier (2008).
- 79 One of the best-known application of this general issue is the micro-structure literature that analyzes the determinant of exchange rates at very short horizons (see Evans and Lyons (2002) and Lyons (2001)).
- 80 See Mishkin (2008) for a discussion about the role of information in maintaining market liquidity and maintaining financial stability.
- 81 See Ferguson *et al.* (2007).
- 82 See Brunnermeier (2008).
- 83 See the discussion in Brunnermeier (2008) and Gerardi *et al.* (2008).
- 84 See BIS (2008a, Chapter 6) for a discussion of developments in the subprime sector.
- 85 See the chronology in BIS (2007, p. 4), Borio (2008) or in BIS (2008a, p. 95).
- 86 This section draws heavily from the excellent overview chapter of BIS (2008b).
- 87 See Box 2 in the overview chapter of BIS (2008b).
- 88 See Bean (2008).
- 89 See Rajan (2005, 2006).
- 90 See Rajan (2005).
- 91 See Kohn (2006, 2008) for why gearing monetary policy to asset prices may be undesirable.
- 92 See Bernanke (2009) for an analysis of the crisis.
- 93 See Borio and Lowe (2002).
- 94 See IMF (2007, p. 13) and CGFS (2008).
- 95 IMF (2008b) details the problems that central banks faced in liquidity management.
- 96 See Chailloux *et al.* (2008).
- 97 The Swiss National Bank, which defines policy using three-month Libor but implemented it using a one-week repo rate, was in the unique position of being able to stabilize the former by reducing the latter rate without that being seen as change in policy.
- 98 See for instance Buiter (2008).
- 99 Galí (2008) offers a concise presentation of the workhorse modern monetary model. A simplified version is presented in Box 1.
- 100 See the discussion in Clark and Kozicki (2005).
- 101 This operates through several channels. Higher output boosts employment, leading workers to ask for higher wages. In addition, if production exhibits decreasing returns to scale, higher output directly raises the marginal cost.
- 102 See Ball, Mankiw and Romer (1988).
- 103 See Roberts (2006).
- 104 See Galí (2008), Pesenti (2008) and Guerrieri *et al.* (2008).
- 105 See Borio and Filardo (2006), IMF (2006), Melick and Galati (2006), Mishkin (2008) and Pain *et al.* (2006).
- 106 Pain *et al.* (2006) note that import prices also impact on inflation through competition effects on the margins of domestic producers. They conclude that the overall effect of import prices on inflation has become more important over time as international openness and contestability has increased.

- 107 See Borio and Filardo (2006). Ihrig et al. (2007) however show that this is sensitive to the exact specification of the inflation equation. See also Bernanke (2007), Kohn (2006), White (2008) and Yellen (2006).
- 108 The detailed results are in Box 3.
- 109 See Melick and Galati (2006), Roberts (2006) and White (2008).
- 110 See Bentolila and al. (2008) and Nickel (2007).
- 111 The economy could then be confronted with a 'liquidity trap' (Summers 1991).
- 112 The detailed analysis is given in Box 4. See also Coenen et al. (2004) and Viñals (2001).
- 113 See Eggertsson and Woodford (2003), Orphanides and Wieland (2000) and Svensson (2003).
- 114 See Bernanke (2009). King (2009) discusses how monetary policy can be used to stimulate the economy using 'unconventional' tools.
- 115 See Bernanke (2008).
- 116 See for instance Caballero (2009).
- 117 See Brunnermeier (2008).
- 118 Of course, as shown by bank lending surveys, the deceleration of lending also owes much to the lower credit demand by households and firms – which were initially quite leveraged and whose consumption and investment is now significantly lower – and to the reduced ability to pay off potential debtors in a deteriorating economic environment.
- 119 See Diamond and Dybvig (1983).
- 120 See Borio (2003, 2007) and White (2006).
- 121 See for instance Bean (2008).
- 122 For various perspectives on this, see e.g. Bean (2008), Borio (2003, 2007), Cecchetti et al. (2000) and White (2006).
- 123 See Fernandez Ordoñez (2008) and Viñals (2008).
- 124 See, in particular, Department of the Treasury (2008), Financial Stability Forum (2008) and the IMF's Global Financial Stability Report (2008b). For a private sector perspective, see Institute for International Finance (2008).
- 125 See Giovannini (2008a,b).
- 126 We simplify the setting by considering a log utility of consumption, a linear cost of effort and a constant return to scale technology.
- 127 Without loss of generality, we assume that there is no inflation in the steady-state.
- 128 The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the UK and the US.
- 129 While oil prices are part of the import prices, we use both variables to capture the effect of price movements in other imported goods.
- 130 See Giannone and Reichlin (2006) for formal evidence.
- 131 See Buiter (2008 p. 28).
- 132 Papademos (2006) discusses the usefulness of monetary analysis for analyzing risks to financial stability.

References

- Adrian, T. and H. S. Shin (2008), 'Financial Intermediaries, Financial Stability and Monetary Policy,' paper presented at the Federal Reserve Bank of Kansas City's Symposium on 'Maintaining Stability in a Changing Financial System,' Jackson Hole, 21–23 August 2008.
- Ahmed, S., A. Levin and B. A. Wilson (2002), 'Recent U.S. Macroeconomic Stability: Good Policies, Good Practices, or Good Luck?' Board of Governors of the Federal Reserve System, International Finance Discussion Paper 730.
- Ahrend, R., P. Cattaui and R. Price (2006), 'Factors Behind Low Long Term Interest Rates,' OECD Economics Department Working Paper 490.
- Alesina, A. and L. H. Summers (1993), 'Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence,' *Journal of Money, Credit and Banking*, 25, 151–162.
- Altissimo, F., M. Ehrmann and F. Smets (2006), 'Inflation Persistence and Price-Setting Behaviour in the Euro Area: A Summary of the IPN Evidence,' European Central Bank Occasional Paper 46.
- Andrés, J., I. Hernando and J. D. López-Salido (2000), 'Assessing the Benefits of Price Stability: the International Experience,' *Estudios Económicos*, no 69, Banco de España.
- Aspachs, O., C. Goodhart, M. Segoviano, D. Tsomocos and L. Zicchino (2006), 'Searching for a Metric for Financial Stability,' Oxford Financial Research Centre Working Papers Series 2006fe09.
- Assenmacher-Wesche, K. and S. Gerlach (2008), 'Ensuring Financial Stability: Financial Structure and the Impact of Monetary Policy on Asset Prices,' Institute for Monetary and Financial Stability Working Paper 16.
- Backus, D. and J. Wright (2007), 'Cracking the Conundrum,' Federal Reserve Board, Finance and Economic Discussion Paper 2007–46.
- Ball, L., G. Mankiw and D. Romer (1988), 'New Keynesian Economics and the Output-Inflation Trade-Off,' *Brookings Papers on Economic Activity* 1988:1, 1–82.
- Baltensperger, E., A. M. Fischer and T. J. Jordan (2007), 'Strong Goal Independence and Inflation Targets,' *European Journal of Political Economy*, 23, 88–105.
- Bank for International Settlements (BIS) (2008a), 78th Annual Report.
- Bank for International Settlements (BIS) (2008b), Quarterly Review, December.
- Bank of Japan (2006), 'The Bank's Thinking on Price Stability,' March 10 2006, available at the Bank of Japan's website.

- Barro, R. J. and D. B. Gordon (1983a) 'Rules, Discretion and Reputation in a Model of Monetary Policy,' *Journal of Monetary Economics*, 12, 101–121.
- Barro, R. J. and D. B. Gordon (1983b), 'A Positive Theory of Monetary Policy in a Natural Rate Model,' *Journal of Political Economy*, 91, 589–610.
- Bean, C. (2008) 'Some Lessons for Monetary Policy from the Recent Financial Turmoil,' remarks at the conference on Globalisation, Inflation and Monetary Policy, Istanbul, November 22.
- Bentolila, S., J. J. Dolado and J. F. Jimeno (2008), 'Does Immigration Affect the Phillips Curve? Some Evidence for Spain,' CEPR Discussion Paper 6604.
- Bernanke, B. S. (2004), 'The Great Moderation,' speech delivered at the meetings of the Eastern Economic Association, Washington DC, February 20.
- Bernanke, B. S. (2007), 'Globalization and Monetary Policy,' speech delivered at the Fourth Economic Summit, Stanford Institute for Economic Policy Research, Stanford, March 2.
- Bernanke, B. S. (2008), 'Federal Reserve Policies in the Financial Crisis,' speech delivered at the Greater Austin Chamber of Commerce, Austin, Texas, December 1.
- Bernanke, B. S. (2009), 'The Crisis and the Policy Response,' Stamp Lecture, London School of Economics, London, January 13.
- Bernanke, B. S., V. Reinhart and B. Sack (2004), 'Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment,' Federal Reserve Board, Finance and Economics Discussion Paper 2004–48.
- Blanchard, O. and J. Gali (2006), 'Real Wage Rigidities and the New Keynesian Model,' *Journal of Money, Credit and Banking*, forthcoming.
- Blanchard, O. and J. Simon (2001), 'The Long and Large Decline in US Output Volatility,' *Brookings Papers on Economic Activity* 2001,1, 135–64.
- Borio, C. (2003), 'Towards a Macroprudential Framework for Financial Supervision and Regulation?' BIS Working Paper 128.
- Borio, C. (2007), 'Change and Constancy in the Financial System: Implications for Financial Distress and Policy,' BIS Working Paper 237.
- Borio, C. (2008), 'The Financial Turmoil of 2007–?: A Preliminary Assessment and Some Policy Considerations,' BIS Working Paper 251.
- Borio, C. and A. Filardo (2007), 'Globalisation and Inflation: New Cross-Country Evidence on the Global Determinants of Inflation,' BIS Working Paper 227.
- Borio, C. and P. Lowe (2002), 'Asset Prices, Financial and Monetary Stability: Exploring the Nexus,' BIS Working Paper 114.
- Borjas, G. (2003), 'The Labour Demand Curve is Downward Sloping: Re-examining the Impact of Immigration on the Labour Market,' *Quarterly Journal of Economics*, 118 (4), 1335–74.
- Brunnermeier, M. (2008), 'Deciphering the 2007–08 Liquidity and Credit Crunch,' *Journal of Economic Perspectives*, forthcoming.
- Buiter, W. H. (2008), 'Central Banks and Financial Crisis,' paper presented at the Federal Reserve Bank of Kansas City's Symposium on 'Maintaining Stability in a Changing Financial System,' Jackson Hole, 21–23 August 2008.
- Caballero, R. (2009), 'A Global Perspective on the Great Financial Insurance Run: Causes, Consequences, and Solutions,' www.voxeu.org

- Caballero, R., E.I. Fahri and P.O. Gourinchas (2007), 'An Equilibrium Model of 'Global Imbalances' and Low Interest Rates,' *American Economic Review*, forthcoming.
- Cahn, C. and A. Saint-Guilhem (2007), 'Potential Output Growth in Several Industrialized Countries: A Comparison,' European Central Bank Working Paper 828.
- Campillo, M. and J. A. Miron (1997), 'Why Does Inflation Differ across Countries?' in C. Romer and D. Romer (eds), *Reducing Inflation: Motivation and Strategy*, NBER and University of Chicago Press, Chicago.
- Card, D. (2005), 'Is the New Immigration Really So Bad?' *Economic Journal*, 115, 507, F300 – F323.
- Cecchetti, S. G., P. Hooper, B. C. Kasman, K. L. Schoenholtz and M. W. Watson, 'Understanding the Evolving Inflation Process,' U.S. Monetary Policy Forum 2007.
- Cecchetti, S. G., H. Genberg, J. Lipsky and S. Wadhwani (2000), 'Asset Prices and Central Bank Policy,' Geneva Report on the World Economy 2, ICMB and CEPR.
- Chailloux, A., S. Gray, U. Klüh, S. Shimizu and P. Stella (2008), 'Central Bank Response to the 2007–08 Financial Market Turbulence: Experiences and Lessons Drawn,' IMF WP/08/210
- Chen, N., J. Imbs and A. Scott (2008), 'The Dynamics of Trade and Competition,' mimeo, University of Lausanne.
- Clarida, R., J. Galí and M. Gertler (1998) 'Monetary Policy Rules in Practice: Some International Evidence,' *European Economic Review*, 42, 1033–1067.
- Clark, T. E. and S. Kozicki (2005), 'Estimating Equilibrium Real Interest Rates in Real Time,' *North American Journal of Economics and Finance*, 16(3), 395–413.
- Coenen, G., V. Wieland and A. Orphanides (2004), 'Price Stability and Monetary Policy Effectiveness When Nominal Interest Rates are Bounded at Zero,' Berkeley Electronic Press: Advances in Macroeconomics, 4.
- Cogley, T. (2005), 'Inflation dynamics,' manuscript prepared for the New Palgrave Dictionary of Economics.
- Committee on the Global Financial System (CGFS) (2008), 'Central Bank Operations in Response to the Financial Turmoil,' CGFS Papers 31.
- Cukierman, A., S. B. Web and B. Neyapti (1992), 'Measuring the Independence of Central Banks and Its Effect on Policy Outcomes,' *World Bank Economic Review*, 6, 353–398.
- Darity, W. A. (1985), 'Loan Pushing: Doctrine and Theory,' Board of Governors of the Federal Reserve System, International Finance Discussion Paper 253.
- De Long, J. B. (1997), 'America's Peacetime Inflation: the 1970s,' in C. Romer and D. Romer, (eds), *Reducing Inflation: Motivation and Strategy*, NBER and University of Chicago Press, Chicago.
- Department of the Treasury (2008), The Department of the Treasury Blueprint for a Modernized Financial Regulatory Structure, Washington DC.
- Desroches, B. and M. Francis (2007), 'World Real Interest Rates: A Global Savings and Investment Perspective,' Bank of Canada Working Paper 2007–16.
- Diamond, D. W. and P. H. Dybvig (1983), 'Bank Runs, Deposit Insurance, and Liquidity,' *Journal of Political Economy*, 91, 401–19.

- Eggertsson, G. and M. Woodford (2003), 'The Zero Bound on Interest Rates and Optimal Monetary Policy,' *Brookings Papers on Economic Activity* 2003:1, 139–234.
- Evans, M. D. D. and R. K. Lyons (2002), 'Order Flow and Exchange Rate Dynamics,' *Journal of Political Economy*, 110, 170–180.
- Feldstein, M., (1999), (ed), *The Costs and Benefits of Price Stability*, University of Chicago Press for NBER, Chicago.
- Fender, I. and P. Hördahl (2007), 'Overview: Credit Retrenchment Triggers Liquidity Squeeze,' *BIS Quarterly Review*, 1–16, September.
- Fender, I. and J. Gyntelberg (2008), 'Overview: Global Financial Crisis Spurs Unprecedented Policy Actions,' *BIS Quarterly Review*, 1–24, December.
- Ferguson, R., P. Hartmann, F. Panetta and R. Portes (2007), *International Financial Stability*, Geneva Report on the World Economy 9, ICMB and CEPR.
- Fernandez Ordoñez, M. (2008), 'Weiss und Rot: The Cycle, Central Bankers and Supervisors,' speech delivered at the conference 'World Currency Regime – To Float or Not to Float,' Frankfurt, November 20.
- Financial Stability Forum, FSF (2008), Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience.
- Fischer, S. (1994), 'Modern Central Banking', in F Capie, C Goodhart, S Fisher and N Schnadt, *The Future of Central Banking*, Cambridge University Press, Cambridge.
- Flood, R. and M. Mussa (1994), 'Issues Concerning Nominal Anchors for Monetary Policy,' in T Baliño and C Cottarelli, (eds), *Frameworks for Monetary Stability*, IMF, Washington.
- Fratzscher, M. (2001), 'Financial Market Integration in Europe: On the Effects of EMU on Stock Markets,' European Central Bank Working Paper 48.
- Gali, J. (2008), *Monetary Policy, Inflation, and the Business Cycle*, Princeton University Press, Princeton.
- Gerardi, K. A. Lehnert, S. Sherlund and P. Willen (2008), 'Making Sense of the Subprime Crisis,' *Brookings Papers on Economic Activity* 2008:3.
- Gerlach, S. (1999), 'Who Targets Inflation Explicitly?' *European Economic Review*, 43, 1257–1277.
- Giannone, D. and L. Reichlin (2006), 'Trends and Cycles in the Euro Area: How Much Heterogeneity and Should We Worry About It?' ECB Working Paper 595.
- Giovannini, A. (2008a), 'Reforms that Can Boost Securities Markets,' *Financial Times*, July 31.
- Giovannini, A. (2008b), 'Let Banks Be Banks, Let Investors Be Investors,' www.voxeu.org
- Giovannini, A. and L. Spaventa (2007), 'Filling the Information Gap,' www.voxeu.org.
- Goodfriend, M. (2007), 'How the World Achieved Consensus on Monetary Policy,' NBER Working Paper 13580.
- Gourinchas, P.O. and H. Rey (2007), 'International Financial Adjustment,' *Journal of Political Economy*, 115, 665–703.
- Greenlaw, D., J. Hatzius, A. K. Kashyap and H. S. Shin (2008), 'Leveraged Losses: Lessons from the Mortgage Market Meltdown,' US Monetary Policy Forum.

- Greenspan, A. (2005), Testimony, Federal Reserve Board's Semiannual Monetary Policy Report to the Congress, before the Committee on Banking, Housing, and Urban Affairs, February 16.
- Greenspan, A. (2007), *The Age of Turbulence: Adventures in a New World*, Penguin, New York.
- Grilli, V., D. Masciandaro and G. Tabellini (1991), 'Political and Monetary Institutions and Public Financial Policies in the Industrial Countries,' *Economic Policy*, 6, 341–392.
- Gruber, J. and S. Kamin (2008), 'Do Differences in Financial Development Explain the Global Pattern of Current Account Imbalances?' Board of Governors of the Federal Reserve System, International Finance Discussion Paper 923.
- Guerrieri, L., C. Gust and D. Lopez-Salido (2007), 'International Competition and Inflation: A New Keynesian Perspective,' mimeo, Federal Reserve Board.
- Harrigan, J. (2000), 'The Impact of the Asia Crisis on US Industry: An Almost-Free Lunch?' Federal Reserve Bank of New York, *Economic Policy Review*, 6(3), 71–81.
- Hellerstein, R. and C. Tille (2008), 'The Changing Nature of the U.S. Balance of Payments,' Federal Reserve Bank of New York, *Current Issues in Economics and Finance*, 14(4),
- Iakova, D. (2007), 'Flattening of the Phillips Curve: Implications for Monetary Policy,' IMF Working Paper 07/76.
- Ihrig, J., S. B. Kamin, D. Lindner and J. Marquez (2007), 'Some Simple Tests of the Globalization and Inflation Hypothesis,' Board of Governors of the Federal Reserve System, International Finance Discussion Paper 891.
- Imbs, J. H. Mumtaz, M. Ravn and H. Rey (2005), 'PPP Strikes Back: Aggregation and the Real Exchange Rate,' *Quarterly Journal of Economics*, 70, 1–43.
- IMF (1999), Code of Good Practices on Transparency in Monetary and Financial Policies,' available at www.imf.org/external/np/mae/mft/code/index.htm#goodtrans.
- IMF (2005), 'Global Imbalances: A Saving and Investment Perspective', World Economic Outlook, September, Chapter II.
- IMF (2006), 'How Has Globalization Affected Inflation?' *World Economic Outlook*, April, Chapter III.
- IMF (2007), 'The Globalization of Labour,' *World Economic Outlook*, April, Chapter V.
- IMF (2008a), *World Economic Outlook*, April.
- IMF (2008b), *Global Financial Stability Report*, April.
- Institute of International Finance, IIF (2008), Interim Report of the IIF Committee on Market Best Practices.
- Jiménez, G., S. Ongena, J. L. Peydró-Alcalde and J. Saurina (2007), 'Hazardous Times For Monetary Policy: What do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk?' CEPR Discussion Paper 6514.
- Kahn, J., M. McConnell and G. Perez-Quiros (2002), 'On the Causes of the Increased Stability of the U.S. Economy,' Federal Reserve Bank of New York, *Economic Policy Review*, 8, 183–202.
- Kim, C.-J. and C. Nelson (1999), 'Has the U.S. Economy Become More Stable? A Bayesian Approach Based on a Markov-Switching Model of the Business Cycle,' *Review of Economics and Statistics*, 81, 608–16.

- King, M. (2009), speech delivered at the CBI Dinner, January 20.
- Kohn, D. (2006), 'The Effects of Globalization on Inflation and their Implications for Monetary Policy,' speech delivered at the 51st Economic Conference sponsored by the Federal Reserve Bank of Boston, Chatham, Mass., June 16.
- Kohn, D. (2008), 'Monetary Policy and Asset Prices Revisited,' speech delivered at the Cato Institute's 26th Annual Monetary Policy Conference, Washington DC, November 19.
- Kydland, F. E. and E. C. Prescott (1977), 'Rules Rather Than Discretion; The Inconsistency of Optimal Plans,' *Journal of Political Economy*, 85, 473–491.
- Lane, P. and G. M. Milesi-Ferretti (2007), 'The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004,' *Journal of International Economics*, 73, 223–250.
- Laubach, T. and J. Williams (2003), 'Measuring the Natural Rate of Interest,' *The Review of Economics and Statistics*, 85, 1063–1070.
- Longworth, D. (2002), 'Inflation and the Macroeconomy: Changes from the 1980s to the 1990s,' *Bank of Canada Review*, Spring, 3–18.
- Lucas, R. E. Jr (2000), 'Inflation and Welfare,' *Econometrica*, 68, 247–274.
- Lyons, R. K. (2001), *The Microstructure Approach to Exchange Rates*, MIT Press, Cambridge, MA.
- McConnell, M. and G. Perez-Quiros (2000), 'Output Fluctuations in the United States: What Has Changed Since the Early 1980s?' *American Economic Review*, 90, 1464–76.
- Melick, W. and G. Galati (2006), 'The Evolving Inflation Process: An Overview,' BIS Working Paper 196.
- Mishkin, F. S. (2007), 'Financial Instability and Monetary Policy,' Speech given at the Risk USA 2007 Conference, New York.
- Mishkin, F. S. (2008), 'Globalization, Macroeconomic Performance and Monetary Policy,' NBER Working Paper 13948.
- Nickell, S. (2007), 'Immigration: Trends and Macroeconomic Implications,' paper presented at the BIS conference on Globalisation and Population Trends: Implications for Labour Markets and Inflation, in honor of Palle Andersen.
- Obstfeld, M. (1997), 'Comment' (on Campillo, Marta and Miron), in C Romer and D Romer, (eds), *Reducing Inflation: Motivation and Strategy*, NBER and University of Chicago Press, Chicago.
- Obstfeld, M. and A. Taylor (2002), 'Globalization and Capital Markets,' NBER Working Paper 8846.
- Orphanides, A. and V. Wieland (2000), 'Efficient Monetary Policy Design Near Price Stability,' *Journal of the Japanese and International Economies*, 14, 327–365.
- Orphanides, A. and D. Wilcox (2002), 'The Opportunistic Approach to Disinflation,' *International Finance*, 5, 47–71.
- Pain, N., I. Koske and M. Sollie (2006), 'Globalisation and Inflation in the OECD Economies,' Economics Department Working Paper 524, OECD.
- Panetta, F., P. Angelini, G. Grande, A. Levy, R. Perli, P. Yesin, S. Ramaswamy and M. Scatigna (2006), 'The Recent Behaviour of Financial Market Volatility,' BIS Paper 29.
- Papademos, L. (2006), 'The Role of Money in the Conduct of Monetary Policy,' speech delivered at the Fourth ECB Central Banking Conference, November 9.

- Perron, P. (1990), 'Testing for a Unit Root in a Time Series with a Changing Mean,' *Journal of Business and Economic Statistics*, 8, 153–162.
- Pesenti, P. (2008), 'The Global Economy Model (GEM): Theoretical Framework,' mimeo, Federal Reserve Bank of New York.
- Posen, A.S. (1995), 'Declarations Are Not Enough: Financial Sector Sources of Central Bank Independence,' *NBER Macroeconomics Annual*, 10, 251–74.
- Rajan, Raguram G (2005), 'Has Financial Development Made the World Riskier?' paper presented at the Federal Reserve Bank of Kansas City's Symposium on 'The Greenspan Era: Lessons for the Future,' Jackson Hole, 25–27 August 2005.
- Rajan, R. G. (2006), 'Monetary Policy and Incentives,' address at the Bank of Spain conference on 'Central Banks in the 21st Century,' June 8.
- Reserve Bank of Australia (2006), 'The Growth in Australia's Foreign Assets and Liabilities,' Reserve Bank Bulletin, April.
- Roberts, J.M. (2006), 'Monetary Policy and Inflation Dynamics,' *International Journal of Central Banking*, 2, 193–230.
- Robertson, D. and J. Symons (1993), 'Real Interest Rates and Index Linked Gilts,' Center for Economic Performance Discussion Paper 181.
- Rogoff, K. (2003), 'Globalization and Global Disinflation,' paper presented at the Federal Reserve Bank of Kansas City's Symposium on 'Monetary Policy and Uncertainty: Adapting to a Changing Economy,' Jackson Hole, Wyoming, August 28–30.
- Rogoff, K. (2006), 'The Impact of Globalization on Monetary Policy,' in Federal Reserve Bank of Kansas City, *The New Economic Geography: Effects and Policy Implications*.
- Romer, D. (2003), 'Openness and Inflation: Theory and Evidence,' *Quarterly Journal of Economics*, 108, 869–903.
- Rudebusch, G., E. Swanson and T.Wu (2006), 'The Bond Yield 'Conundrum' from a Macro-Finance Perspective,' *Bank of Japan Monetary and Economic Studies*, December.
- Sargent, T. J. (1983), 'The Ends of Four Big Inflations,' in T Sargent, (ed), *Rational Expectations and Inflation*, Harper and Row, New York.
- Sargent, T. J. (1999), *The Conquest of American Inflation*, Princeton University Press, Princeton.
- Sargent, T. J. and N. Wallace (1981), 'Some Unpleasant Monetarist Arithmetic,' *Federal Reserve Bank of Minneapolis Quarterly Review*, 5(3), Winter, 1–17.
- Sbordone, A. (2007), 'Globalization and Inflation Dynamics: The Impact of Increased Competition,' NBER Working Paper 13556.
- Shiller, R. (1997), 'Why Do People Dislike Inflation?' in C Romer and D Romer, (eds), *Reducing Inflation: Motivation and Strategy*, University of Chicago Press, Chicago.
- Stark, J. (2008), 'Main Challenges for Monetary Policy in a Globalised World,' speech delivered at the conference 'Monetary Policy in Sub Saharan Africa: Practice and Promise', Cape Town, March 28.
- Stock, J. H. and M. W. Watson (2003), 'Has the Business Cycle Changed? Evidence and Explanations,' paper presented at the Federal Reserve Bank of Kansas City's Symposium on 'Monetary Policy and Uncertainty,' Jackson Hole, Wyoming, August 28–30.

- Stock, J. H. and M. W. Watson (2007), 'Why Has U.S. Inflation Become Harder to Forecast?' *Journal of Money, Credit, and Banking*, Supplement to vol. 39, 3–33.
- Stoffels, Nicolas and Cédric Tille (2007), 'Why Are Switzerland's Foreign Assets so Low? The Growing Financial Exposure of a Small Open Economy,' Federal Reserve Bank of New York Staff Report 283.
- Summers, L. (1991), 'How Should Long-Term Monetary Policy be Determined?' *Journal of Money, Credit, and Banking*, 23, 625–31.
- Svensson, Lars E O (1997), 'Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets,' *European Economic Review*, 41, 1111–1146.
- Svensson, L. E. O. (2003), 'Escaping from a Liquidity Trap and Deflation: The Foolproof Way and Others,' *Journal of Economic Perspectives*, 17, 145–166.
- Svensson, L. E. O (2008), 'What Have Economists Learned about Monetary Policy over the Past 50 Years?' mimeo, Sveriges Riksbank.
- Taylor, J.B. (1997), 'Comment', in C Romer and D Romer, (eds), *Reducing Inflation: Motivation and Strategy*, University of Chicago Press, Chicago.
- Taylor, J. B. (1998), 'Monetary Policy and The Long Boom,' *Federal Reserve Bank of St Louis Review*, 80, 3–12.
- Tille, C. (2003), 'The Impact of Exchange Rate Movements on the U.S. Foreign Debt,' Federal Reserve Bank of New York *Current Issues in Economics and Finance* 9(1).
- Trichet, J.C. (2008), 'Undervalued Risk and Uncertainty: Some Thoughts on the Market Turmoil,' speech delivered at the Fifth ECB Central Banking Conference, November 13.
- Viñals, J. (1998), 'The Retreat of Inflation and the Making of Monetary Policy: Where Do We Stand?' Special Paper Series, Financial Markets Group, London School of Economics and Political Science.
- Viñals, José (2001), 'Monetary Policy Issues in a Low Inflation Environment,' in A. García Herrero, V. Gaspar, L. Hoogduin, J. Morgan and B. Winkler, (eds) *Why Price Stability?* ECB, Frankfurt.
- Viñals, J. (2008), 'Improving fair value accounting,' in Banque de France *Financial Stability Review* 12, 121–130.
- Warnock, F. and V. C. Warnock (2005), 'International Capital Flows and U.S. Interest Rates,' Board of Governors of the Federal Reserve, International Finance Discussion Papers 840.
- White, W. R. (2006), 'Is Price Stability Enough?' BIS Working Paper 205.
- White, W.R. (2008), 'Globalisation and the Determinants of Domestic Inflation,' BIS Working Paper 250.
- Woodford, M. (2007), 'Globalization and Monetary Control', NBER working paper 13329.
- Wu, T. (2008), 'Accounting for the Bond-Yield Conundrum,' Federal Reserve Bank of Dallas Economic Letter, 3(2).
- Yellen, J. (2006), 'Monetary Policy in a Global Environment,' speech delivered at the conference 'The Euro and the Dollar in a Globalized Economy,' University of California at Santa Cruz, Santa Cruz, California, May 27.