Romer, Christina D.; Romer, David H.

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Program Report

IN THIS ISSUE

The NBER Monetary Economics Program

Christina D. Romer and David H. Romer*

The activities and research of the NBER's Program in Monetary Economics over the last several years have been dominated by the financial and macroeconomic crisis that began in 2007 and erupted in full force in the fall of 2008. The recession that lasted from December 2007 until June 2009 was the longest since World War II, and the collapse of GDP and employment at the end of 2008 and the start of 2009 dwarfed any declines since the demobilization at the end of that war. Moreover, the character of the downturn was very different from that of other postwar recessions. Tight monetary policy intended to slow economic activity in order to reduce inflation played no role. Instead, the recession was intimately bound up with asset price fluctuations, financial market disruptions, and the effects of private debt accumulation. And more than six years after the recession began, unemployment remains elevated in the United States, as well as in most other advanced economies.

The Monetary Economics Program is one of three programs at the NBER that focus on macroeconomics, and whose work in recent years has therefore been largely devoted to issues related to the crisis; the other two are International Finance and Macroeconomics, and Economic Fluctuations and Growth. The International Finance and Macroeconomics Program, as its name implies, focuses on international macroeconomics. The boundaries between the Economic Fluctuations and Growth and the Monetary Economics programs are less clear-cut. Research on issues concerning long-run growth is the purview of Economic Fluctuations and Growth, and most work that is specifically devoted to monetary policy is done in Monetary Economics. But the Monetary Economics Program also studies a wide range of issues that are central to macroeconomic fluctuations. Important topics include interactions between financial markets and the macroeconomy, the behavior of inflation and unemployment, fluctuations in consumption and

**Christina Romer and David Romer are co-directors of the NBER's Program on Monetary Economics. They are both professors of economics at the University of California, Berkeley.*

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investment, and the sources of macroeconomic fluctuations. The NBER Monetary Economics Program follows the informal definition of monetary economics as anything that monetary policymakers should be interested in.

Researchers in the NBER's Program in Monetary Economics contribute to our understanding of issues in monetary policy and macroeconomics by conducting empirical and theoretical studies of a wide range of subjects. These studies are issued as NBER Working Papers, and are presented and discussed at regular meetings of the program and at special NBER conferences devoted to particular subjects related to monetary policy. The studies are subsequently published in academic journals and in NBER volumes.

Although the greatest long-run influence of the members of the Monetary Economics Program is surely through their research, they also have a tangible, immediate influence through an entirely different channel: former members of the program often hold policymaking positions throughout the world. Former NBER Research Associate (and former Director of the Program in Monetary Economics) Ben Bernanke served as Chair of the Federal Reserve from February 2006 until January 2014, when he was succeeded by former NBER Research Associate Janet Yellen. Former program member Stanley Fischer served as Governor of the Bank of Israel from 2005 to 2013, and has recently been nominated as Vice-Chair of the Federal Reserve. Program member Mervyn King was Governor of the Bank of England from 2003 to 2013. Former program member James Stock is currently serving as a member of the Council of Economic Advisers (CEA). Program member Lawrence Summers served as Chair of the National Economic Council in 2009 and 2010. N. Gregory Mankiw resigned from his position as Director of the Monetary Economics Program in 2003 to serve as Chair of the CEA, as did Christina Romer in 2009. When she returned to the University of California, Berkeley after her public service, Romer was reappointed as an NBER Research Associate and as Co-Director of the program.

Program members also interact frequently with macroeconomic policymakers. These interactions serve to keep program members abreast of developments in policymaking, and allow policymakers to inform NBER researchers about issues that are currently important to them. Traditionally, one session of the meeting of the Monetary Economics Program at the NBER's

Summer Institute is devoted to a discussion with a policymaker. However, for the past two years the program has taken this a step further by devoting an entire day to a symposium where current and former policymakers and NBER researchers discuss important policy issues. In 2012, the event, which was conducted jointly with the International Finance and Macroeconomics Program, focused on the European crises. In 2013, it focused on the 100th anniversary of the Federal Reserve. The four background papers that were prepared for the 2013 meeting (including [1, 2,] and [3]) were recently published in the *Journal of Economic Perspectives*, together with the remarks at that meeting by Federal Reserve Chair Ben Bernanke and the interview that former NBER President Martin Feldstein conducted with former Federal Reserve Chair Paul Volcker.

The work of the Monetary Economics group is so extensive and varied that discussing all of it would be almost impossible. In the remainder of this report, we therefore highlight a few areas of work that are closely related to the recent financial crisis and the subsequent weak recovery and research areas where program members have been particularly active.

Finance and Macroeconomics

Probably the biggest shift in the focus of researchers in the Monetary Economics Program in response to the crisis has been toward work on the interactions between financial markets and the macroeconomy. Before the crisis, those interactions were merely one subject out of the many that were addressed by researchers in the program. But since the crisis began, they have absorbed a large fraction of the program's attention. One indication of this greater emphasis on interactions between finance and macroeconomics is that the Monetary Economics Program now devotes a full day of its summer meeting to a joint session with researchers in finance to discuss research spanning the two fields. These events attract large audiences and great interest.

The evolution in the subject matter of the program is related to an important ongoing methodological development in monetary economics — one whose beginnings considerably predate the crisis, but that has gathered strength in recent years. Researchers are increasingly using microeconomic data to study macroeconomic questions. One obvious advantage of microeconomic data is that they allow for much larger samples: there is only so much that can be learned from a few hundred observations of quarterly macroeconomic time series data from the United States, or from several dozen macroeconomic observations from different countries. But a more important advantage of microeconomic data is that they often provide more compelling ways of untangling the difficult issues of causation that make much of economic research so challenging. In microeconomic settings, it is often possible to identify "natural experiments" where it is clear that differences among economic actors are not the result of confounding factors. And financial economics, where there are detailed data on prices and quantities of different assets, on prices at very high frequencies, and on the financial positions of numerous firms, households, sectors, and regions, provides a particularly fertile setting for the use of microeconomic data.

Researchers in the Monetary Economics Program and papers presented at program meetings have examined a wide range of issues at the intersection of finance and macroeconomics. One extremely important issue is the effects of financial market disruptions. If we observe financial market turmoil and disruptions in credit availability being followed by an economic downturn, we do not know whether the financial market problems caused the economy to weaken, or whether other forces caused both the financial and economic troubles. Microeconomic data provide ways of resolving this issue. For example, Bo Becker and Victoria Ivashina[4] focus on the *type* of financing obtained by firms in an attempt to separate shifts in bank loan supply from shifts in bank loan demand. They find that in times when credit markets are disrupted, firms that are normally able to issue debt and that need to borrow shift sharply away from borrowing from banks, and toward issuing debt directly. Since other considerations suggest that bank borrowing should be particularly attractive in times of economic turmoil, this strongly suggests a reduction in bank loan supply. Becker and Ivashina go on to show that these reductions in bank loan supply are associated with lower probabilities of borrowing among firms that have previously relied entirely on bank borrowing.

Papers by Gabriel Chodorow-Reich and Jesse Edgerton presented at the program's 2012 joint meeting with researchers in finance take this line of research a step further by looking for evidence of how financial market disruptions affect real economic outcomes.[5] Both papers exploit variation across firms in the extent to which the financial institutions they had been relying on were weakened by the housing-market and financial developments associated with the recession. Both find large effects of the disruptions in credit availability on firms' employment and investment. In a similar spirit, Mary Amiti and David Weinstein[6] use evidence from Japan, where some individual banks are quite large relative to the economy, to show that disruptions to the financial health of banks can have large effects on the economy as a whole.

A closely related issue is whether the large accumulation of household debt in the years before the recession contributed to the downturn and the slow recovery, as highly indebted households cut back on other spending to try to pay off their debt. In a series of papers, Atif Mian and Amir Sufi[7, 8, 9] use a range of different evidence to address this issue. For example, in one paper[10] they show that in counties where the increase in household leverage in the years before the crisis was larger, decreases in spending occurred sooner and were much larger. They go on to show that these effects may account for a substantial part of the overall decline in economic activity in the recession. Theoretical work by Veronica Guerrieri and Guido Lorenzoni,[11] Thomas Philippon and Virgiliu Midrigan,[12] and Paul Krugman and Gauti Eggertsson[13] demonstrates that effects through these channels can be very large.

Another example of an important set of issues at the intersection of finance and macroeconomics concerns the macroeconomic consequences of financial regulation and "macroprudential" policies. NBER researchers have tackled these issues in a wide range of ways. For example, Sumit Agarwal, David Lucca, Amit Seru, and Francesco Trebbi[14] identify a compelling natural experiment in bank supervision arising from the legally mandated rotation of supervision of some banks between state and federal regulators. They find powerful evidence of differences in the strength of supervision, and show that these differences have important effects on loan quality, the frequency of bank failures, and other outcomes. To give another example, Ing-Haw Cheng, Sahil Raina, and Wei Xiong[15] use an ingenious approach to investigate whether risky financial actions in the run-up to the crisis resulted from overoptimistic beliefs or from distorted incentives facing participants in the markets for sophisticated financial products. Understanding the relative importance of these two factors is potentially important to the design of future financial regulation. Using extensive detective work, they examine the personal housing-market transactions of participants in the mortgage securitization business. They find little evidence that these individuals acted as if they believed that housing was overvalued; this points to overoptimism affecting both their personal and professional decisions, rather than distorted incentives specific to their activities in mortgage securitization, as a driver of the housing bubble. Another example is provided by Shekhar Aiyar, Charles Calomiris, and Tomasz Wieladek,[16] who find that in the United Kingdom, the impact of changes in capital requirements on regulated banks on overall lending has been substantially blunted by offsetting movements in lending by financial institutions that are not subject to the requirements.

The Zero Lower Bound on Nominal Interest Rates

One prominent feature of the crisis is that central banks in many advanced economies brought their target interest rates close to zero. Because individuals always have the option of holding cash, which provides a zero rate of return, nominal interest rates cannot be negative. Thus central banks had largely exhausted their main traditional tool for stimulating a weak economy. Such a situation is known as a "liquidity trap."

As described in our previous program report, Japan's experience with zero nominal rates starting in the late 1990s and the Federal Reserve's decision to bring its target rate down to 1 percent in the early 2000s prompted considerable research on the zero lower bound and the possibility of a liquidity trap even before the crisis. However, the widespread and long-lasting experience with zero interest rates in the crisis has led to a great deal of additional work. Indeed, the NBER convened a conference in October 2013 under the leadership of Research Associate (and new Co-Director of the Economic Fluctuations and Growth Program) Mark Gertler on "Lessons from the Financial Crisis for Monetary Policy." Not surprisingly, many of the papers at the conference focused on issues related to the zero lower bound.

One body of work on the zero lower bound focuses on the ability of monetary policymakers to continue to influence the economy by changing expectations of future interest rates and money supplies — so-called "forward guidance." Earlier work by Lars Svensson[17] and Eggertsson and Michael Woodford[18] had shown that such policies can affect expectations of inflation, and so affect real interest rates. More recent work by Iván Werning[19] identifies another important channel: that policies can affect expectations of future economic activity and real income, which in turn affect decisions today.

Central banks' other main policy tool in a liquidity trap is "quantitative easing" — purchases of long-term government debt and other assets whose interest rates are not yet at zero. NBER researchers have explored numerous aspects of quantitative easing. Dimitri Vayanos and Jean-Luc Vila[20] show how investors' preferences for holding different types of assets can cause quantitative easing to bring down the interest rates on the assets targeted by central banks' purchases and on assets that are viewed as close substitutes. Empirical studies of the effects of quantitative easing often combine high-frequency observations with data on prices of wide ranges of assets. For example, Simon Gilchrist and Egon Zakrajsek[21] use data not just on interest rates but on the prices of credit default swaps, and find evidence that quantitative easing has had substantial effects on corporate credit risk but little impact on the risk of financial institutions. Arvind Krishnamurthy and Annette Vissing-Jorgensen[22] decompose the various channels through which quantitative easing affects different interest rates. They find the strongest effects on the assets directly targeted by the policies; for example, purchases of mortgage-backed securities are more effective in reducing mortgage interest rates than are purchases of Treasury bonds of comparable maturity. They also find that quantitative easing affects interest rates in part because investors interpret it as conveying information about the Federal Reserve's intentions about future monetary policy, which suggests an intriguing link between quantitative easing and forward guidance.

Fiscal Policy

At first glance, it might seem surprising that a recession linked to a financial crisis has caused researchers in the Monetary Economics Program to devote considerable effort to studying the short-run macroeconomic effects of fiscal policy. But the connection is logical. Prior to the crisis, there was broad support for the view that short-run stabilization should be mainly the province of monetary policy. As a result, the Monetary Economics Program was a center for research on macroeconomic stabilization policy. But the limitations on monetary policy arising from the zero lower bound have led to renewed interest in possibilities for using fiscal policy to stabilize the economy. It was natural for researchers in monetary economics, with their expertise in stabilization policy, to become actively involved in those efforts.

Microeconomic data play a major role in the fiscal policy work of researchers in the Monetary Economics Program. Emi Nakamura and Jón Steinsson[23] use the fact that defense spending is distributed very unevenly across U.S. states to estimate the effect of changes in government purchases on GDP at the state level. They then build a theoretical model to investigate the implications of their estimated state-level effects for the economy-wide effects of fiscal expansion. Jonathan Parker, Nicholas Souleles, David Johnson, and Robert McClelland[24, 25] use the fact that the exact timing of households' receipt of tax rebates designed to stimulate the economy has a component that is effectively random to estimate the short-run spending impact of the rebates. Claudia Sahm, Matthew Shapiro, and Joel Slemrod[26, 27, 28, 29] use surveys of consumers to address the same issue. And Christopher Nekarda and Valerie Ramey[30] use the uneven distribution of government spending across industries to investigate the impact of that spending on output, hours, productivity, and real wages.

Other researchers focus on the aggregate evidence, and use a variety of approaches to address issues of causation. In our own work,[31] we use information from historical documents to identify a subset of legislated tax changes that were not taken in response to other factors likely to have important short-run effects on the economy, and that can therefore be used to estimate the macroeconomic effects of tax changes. Ramey[32] uses an analysis of news sources and other contemporary documents to find the timing of when news about changes in government purchases became available; she then uses this information to address the difficulties created by the fact that economic actors often know a great deal about changes in purchases well before they occur. Alan Auerbach and Yuriy Gorodnichenko[33, 34, 35] use information from real-time forecasts and other sources to tackle the important issue of whether the effects of fiscal policy are different when economic activity is depressed compared to times of normal economic activity.

Policymakers' and researchers' interest is often in the effects of fiscal policy in a particular set of circumstances, such as when the economy is in a liquidity trap. In addition, there are many different possible tools of fiscal policy, which may have substantially different effects; and there are different exchange rate regimes, which may have large effects on the impact of fiscal policy. Because these concerns raise issues that are often complex and subtle, there is often room for insightful theoretical analyses. For example, Woodford[36] analyzes how the response of monetary policy and the persistence of changes in government purchases affect the short-run effects of fiscal policy in baseline versions of widely used "new Keynesian" models. Lawrence Christiano, Martin Eichenbaum, and Sergio Rebelo[37] focus specifically on the zero lower bound on interest rates, and show that the effects of changes in fiscal policy can be very large when monetary policy is constrained by the bound. Emmanuel Farhi, Gita Gopinath, and Oleg Itskhoki[38] show how a country that has a fixed exchange rate or is in a currency union can use a combination of fiscal tools to achieve the same effects as it could if it were able to devalue. Similarly, Isabel Correia, Farhi, Juan Pablo Nicolini, and Pedro Teles[39] show how a combination of fiscal tools can be used to address the difficulties created by the zero lower bound on nominal interest rates. Farhi and Werning[40] address more broadly the issue of how membership in a currency union alters the effects of fiscal policy.

The Behavior of Inflation

Stabilization policy traditionally focuses on two outcomes: real economic activity and inflation. The behavior of inflation in the crisis has been deeply puzzling. Laurence Ball and Sandeep Mazumder[41] show that traditional models of inflation imply that the extended period of substantial economic slack over the past several years should have led to inflation falling sharply below zero, and that other standard models of inflation also do a poor job of explaining the recent behavior of inflation. Researchers in the Monetary Economics Program have therefore been devoting considerable effort to understanding the behavior of inflation.

A very large number of studies examine price-setting behavior at the level of individual products and firms. The studies use a wide range of data sources. For example, Peter Klenow and Oleksiy Kryvtsov[42] examine the individual observations underlying the Consumer Price Index; Eichenbaum, Nir Jaimovich, and Rebelo[43] employ scanner data from grocery stores; and Gopinath and Roberto Rigobon[44] study the individual prices used to construct indexes of import and export prices. Likewise, this work investigates a broad range of issues related to price setting. For example, Eric Anderson, Nakamura, Duncan Simester, and Steinsson[45] and Judith Chevalier and Anil Kashyap[46] study the nature of temporary sales and how they affect price adjustment at the macroeconomic level; Gopinath and Itskhoki[47] and Gopinath and Rigobon[48] examine the price adjustment of imported goods; and Michael Elsby, Donggyun Shin, and Gary Solon,[49] Alessandro Barattieri, Susanto Basu, and Peter Gottschalk,[50] and Pedro Martins, Solon, and Jonathan Thomas[51] consider the behavior of wages rather than prices. This work, ably summarized by Nakamura and Steinsson[52] and by Klenow and Benjamin Malin,[53] has established that the microeconomics of price adjustment are extremely complex, and has identified a range of intriguing stylized facts and potentially important determinants of price setting.

Some recent work proposes explanations of the puzzling resilience of inflation in recent years. Olivier Coibion and Gorodnichenko[54] document the failures of a wide range of existing theories. They then demonstrate that inflation behavior is much easier to understand if one uses survey-based measures of expected inflation in place of the assumption that economic agents have rational expectations, and they show that expectations of inflation appear highly correlated with the level of oil prices. Of course, this explanation raises the question of why agents would form their expectations in this way. James Stock and Mark Watson[55] propose instead that long-term expected inflation is cen-

tral to the behavior of inflation, and that the recent steadiness of inflation reflects an "anchoring" of inflation expectations. But this explanation too raises another puzzle: how can the Federal Reserve have succeeded in anchoring agents' expectations when actual inflation has been persistently below its target? And in work presented at the most recent meeting of the Monetary Economics Program, Gilchrist, Raphael Schoenle, Jae Sim, and Zakrajsek present evidence that recent financial disruptions themselves may be the source of the failure of inflation to decline sharply. The mechanism they explore is that in many settings lower prices are an investment in future market share, and that financial market disruptions can cause firms to forgo what would otherwise be profitable investment opportunities.[56] But given this wide range of hypotheses, the additional issues they raise, and the absence of decisive evidence for any of them, it is clear that we remain far from having a full understanding of the recent behavior of inflation.

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