Introduction

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For much of the postwar period the Federal Reserve conducted monetary policy as if it were a closed economy. This strategy was warranted since international factors did not seem to have much of an effect on U.S. economic performance and they were certainly not central to the policy debate. Globalization, however, is changing this. A combination of a reduction in trading costs, technological developments, and greater integration of goods and capital markets around the globe has tightened the link between national economies. As a result, one would expect international factors to play a growing role in shaping the performance of the U.S. economy. The global nature of the financial and economic crisis that began in the summer of 2007, and the efforts, led by the G20 countries, to coordinate the policy responses, is clear proof of the high degree of interconnectedness among economies, rich and poor.

The implications of this continuing evolution toward globalization for the conduct of monetary policy is a new and important question. The purpose of the volume is to bring together fresh research to address this issue. It contains the ten papers (along with the discussions, speeches, and panelists' remarks) that were presented at the NBER Conference "International Dimensions of Monetary Policy," which was held June 11 through 13, 2007 in the Hostal de la Gavina, located in the catalan village of S'Agaró. The papers presented at the conference and published in the present volume cover what we think are some of the main areas of concern. The broad goal is to provide a starting point for subsequent work on this fresh and exciting topic.

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The chapters have been organized into three parts. The first part, titled "Baseline Models for International Monetary Policy Analysis," contains three chapters that discuss some of the challenges facing open economy extensions of the workhorse monetary model as well as some key implications of those extensions, relative to their closed economy counterparts. The second part, titled "Extending the Baseline Models to Address Policy Issues," develops the baseline open economy model in specific dimensions in order to address the policy implications of three particular issues of interest; namely, current account deficits, dollarization, and imperfect pass-through. The third part, "Empirical Issues in International Monetary Policy Analysis," includes four chapters that provide empirical evidence on four different areas of interest pertaining to the international dimension of monetary policy: the macroeconomic effects of oil price shocks, the role of global factors in shaping the effectiveness of monetary policy, differences between Fed and European Central Bank (ECB) policies, and the impact of globalization on inflation dynamics. In the remainder of this introduction we briefly summarize each of the contributions to the present volume and at the end try to draw some general conclusions.

Baseline Models for International Monetary Policy Analysis

Much of the research on monetary policy and its design conducted over the past decade has relied on closed economy models. That was also a feature of the early estimated medium-scale dynamic stochastic general equilibrium (DSGE) models.[1] Three of the papers presented at the conference examined the implications of introducing open economy elements in otherwise standard optimizing monetary models with nominal rigidities.

The potentially negative effects of globalization on the ability of national central banks to control inflation and output within its own boundaries has become a subject of great controversy in recent years, especially in policy circles. In "Globalization and Monetary Control," this volume's opening chapter, Michael Woodford brings economic theory to bear on this subject. Using a simple two-country version of the new-Keynesian model, Woodford studies three different channels through which globalization is often argued to limit the effectiveness of national monetary policies. Such popular arguments can be summarized as follows. First, highly integrated financial markets may hamper a central bank's ability to influence real interest rates and hence, aggregate demand. Second, the same phenomenon may make it harder for a central bank to control domestic nominal interest rates through changes in the domestic money supply, especially if foreign and domestic currency are viewed as partial substitutes. Finally, domestic inflation may

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1. See, for example, Christiano, Eichenbaum, and Evans (2005), and Smets and Wouters (2003, 2007).

have become less responsive to domestic output and more responsive to measures of global slack; this would limit a central bank's effective control of domestic inflation, even if it were to succeed in steering domestic aggregate demand and output at will. Woodford scrutinizes each of these hypotheses under the lens of modern monetary theory, finding little or no support for any of them. Even in the limiting case of an economy of negligible size, with access to complete international financial markets and an arbitrarily large share of foreign goods in the consumption basket of its residents, Woodford's analysis shows how the central bank can still influence decisively domestic economic outcomes and, in particular, can still hold a firm grip on domestic inflation. Furthermore, he shows how the effects of global factors on domestic variables often have the opposite sign from that associated with common views of proponents of a dominant role for those factors. In the final analysis, Woodford's contribution suggests that globalization can be no excuse not to hold central banks accountable for the inflation performance of their respective economies.

In chapter 2 Christopher Erceg, Christopher Gust, and David López-Salido, all of them economists at the Federal Reserve Board, analyze the extent to which openness to trade may influence the economy's response to *domestic* shocks. Their analysis is conducted in terms of two models: a medium-scale two-country model used at the Federal Reserve Board for policy simulations (known as SIGMA), and a two-country version of the Erceg-Henderson-Levin (2000) model. While the former can be viewed as a more realistic model, the latter is more analytically tractable, which helps shed some light on the mechanisms underlying some of the findings. The authors examine the effects of three domestic shocks in each of the models: a permanent decline in the inflation target, a persistent increase in government spending, and a persistent technology shock. For each model and shock they compare the impulse responses of different variables under three different calibrations of the economy's degree of trade openness. For plausible values of the elasticity of substitution between domestic and foreign goods, the chapter's findings point to a small impact of openness on the response of domestic inflation and output to the aforementioned shocks. On the other hand, openness is shown to have a larger impact on the composition of aggregate demand, and on the wedge between consumer price index (CPI) and domestic inflation, in response to the same shocks. A corollary of the chapter's findings is that any substantial differences observed in the volatility and persistence of output and domestic inflation between highly open and relatively closed (but otherwise similar) economies will hardly be attributable to differences in the propagation mechanisms of domestic shocks, but rather must be the consequence of their differential response to shocks in the rest of the world.

Chapter 3 by Gunter Coenen, Giovanni Lombardo, Frank Smets, and Roland Straub (hereafter CLSS), titled "International Transmission and

Monetary Policy Cooperation," revisits a classic theme of international macroeconomics: the gains from policy cooperation in the presence of policy spillovers across countries. In line with other chapters in this volume, CLSS adopt a calibrated two-region DSGE model with nominal rigidities as a framework for their analysis, with which they provide a quantitative evaluation of those cooperation gains. More specifically, they use a version of the New Area-Wide Model (NAWM) developed at the ECB, calibrated to match a number of features of the U.S. and euro area economies. In the context of that model they derive and analyze the properties of the equilibrium under two alternative regimes. Under the cooperative regime, the two central banks implement the policies that jointly maximize a weighted average of the welfare of U.S. and euro area representative consumers. In contrast, under the noncooperative regime each central bank chooses the allocation that maximizes the welfare of its country's representative household, while taking as given the path of the money supply in the other country. A measure of the gains from cooperation can be derived by comparing the welfare of each country under the two regimes. For realistic calibrations of the degree of openness of the U.S. and euro area economies, CLSS find that the eventual gains from cooperation are very small, amounting to less than one-tenth of a percent of steady-state consumption. Furthermore, their analysis shows that such gains are largely the result of the different responses under the two regimes to markup shocks. The latter are the shocks that appear to generate the strongest trade-offs for the policymaker, and hence the greater incentive to export some of its costs to the foreign country. The finding of small welfare gain from cooperation appears to be robust to alternative calibrations of a number of parameters. Only when the openness parameter is assumed to take an unrealistically large value (implying import shares for both areas of about 30 percent) do the gains from cooperation attain values close to 1 percent of consumption. Finally, the findings of CLSS suggest that if simple, self-oriented interest rate rules are pursued by the Fed and the ECB, the losses relative to the full cooperation case will be limited to about one-tenth of steady state consumption.

Extending the Baseline Models to Address Policy Issues

The second block of chapters in the volume address three specific policy issues, using extensions of the baseline model developed with that purpose in mind. The issues addressed include the role and implications for monetary policy of the unwinding of current account balances, the specific challenges facing monetary policy in emerging economies, and the consequences of imperfect exchange rate pass-through for monetary policy design.

A striking feature of global economy has been the emergence of significant imbalances in saving and investment across countries, highlighted by the large and persistent U.S. current account deficit. For two basic reasons,

the current imbalances may be relevant for monetary policy. First, as Obstfeld and Rogoff (2006) argue, adjustment of the U.S. current account may involve a substantial depreciation of the dollar. To the extent they are correct, the depreciation will fuel short-run inflationary pressures. Second, even if unlikely, there is the potential for a rapid reversal of the current account, which could have disruptive effects on real economic activity. In chapter 4, Andrea Ferrero, Mark Gertler, and Lars Svensson examine the implications of current account adjustment for monetary policy. In order to study the role of global imbalances, the authors develop a two-country monetary DSGE model with nominal rigidities and incomplete international financial markets. The framework is initialized to match the recent U.S. account deficit as well as its overall indebtedness with respect to the rest of the world. The authors then consider two different adjustment scenarios. The first is a "slow burn" scenario where the adjustment of the current account deficit plays out smoothly and slowly over time. The second is a "fast burn" scenario, where a sudden shift in expectations of relative productivity growth rates leads to a rapid reversal of the home country's current account. Overall, the authors find that good monetary management can significantly mitigate any pain from current account adjustment. A policy that works well under either the slow or fast burn scenarios is domestic inflation targeting. By contrast, attempts to peg the exchange under the fast burn can lead to considerable damage to the economy. On the other hand, CPI inflation targeting is relatively harmful under full exchange rate pass-through, but not so much when the latter is partial.

Most of the chapters in this volume examine the implications of increased openness for monetary policy in the context of industrialized economies. In Chapter 5, Nicoletta Batini, Paul Levine, and Joseph Pearlman consider the ramifications for emerging market economies. As the authors note, for the question at hand there are several aspects that distinguish those economies. First, they typically have less developed financial markets; second, foreign liabilities are generally denominated in foreign currency; and third, foreign currency is often used in some domestic transactions. The authors integrate those features into an open economy monetary DSGE model with nominal rigidities, of the type used elsewhere in the volume. They first confirm the conventional wisdom that the combination of financial market frictions and foreign currency denominated debt enhances the vulnerability of the economy to disturbances. They find, however, that attempting to peg the exchange rate only serves to create more instability, as it leads to movements in interest rates that, in combination with financial factors, only serve to raise the variability of real output. This finding is consistent with Stanley Fischer's observation in the wake of the emerging market crises in Southeast Asia in the late 1990s, that the economies that suffered greater disruptions were those that had fixed exchange rate regimes in place. Targeting CPI inflation (as opposed to domestic inflation) is also rejected by the authors as a

desirable strategy, given that it implicitly requires that the nominal exchange rate be (partly) stabilized. At the same time, the authors show that a simple Taylor rule under flexible exchange rates may be problematic due to the lower bound on the nominal interest rate. They then derive an optimal policy in light of this constraint. The policy allows the exchange rate to float but takes into account that the nominal interest rate cannot be negative. Finally, the authors show that the fact that foreign currency may be used for domestic transactions may not pose a significant problem, so long as the country maintains control over its short-term nominal interest rate.

To the extent it encourages greater economic intergration, globalization raises the sensitivity of inflation to movements in exchange rates. Going forward, it is important for central banks interested in maintaining price stability to understand this mechanism and the implications it may have for optimal monetary policy. Developing this understanding is the objective of chapter 6, a contribution to this volume by Giancarlo Corsetti, Luca Dedola, and Sylvain Leduc. The authors begin with the observation that the evidence from industrialized economies suggests that pass-through of exchange rate movements into import prices is imperfect. They then develop a model of imperfect pass-through that is based on a combination of nominal rigidities—importers set prices on a staggered basis—and endogenous destination-specific markup adjustment. The authors then integrate this model of imperfect pass-through into a complete monetary DSGE model with nominal rigidities, in order to study the implications for optimal monetary policy. The authors find that in this kind of environment it is optimal for the central bank to stabilize different components of the CPI, though this policy does not exactly correspond to either targeting of headline inflation or domestic inflation. Furthermore, they show that the optimal policy does not necessarily imply that the real exchange rate should be less volatile than the terms of trade; whether that is the case or not depends on a number of characteristics of the economies involved.

Empirical Issues in International Monetary Policy Analysis

The last papers presented at the conference dealt with four empirical issues: the macroeconomic effects of oil price shocks, the role of global factors in shaping the effectiveness of monetary policy, differences between Fed and ECB policies, and the impact of globalization on inflation dynamics.

In chapter 7, authors Olivier J. Blanchard and Jordi Galí start out by documenting the large output losses and the rises in inflation rates that accompanied the two oil shocks of the 1970s in most industrialized countries, and show the absence of analogous effects in the recent period, even though the rise in oil prices has been of a similar magnitude. Using a Value at Risk (VAR) to identify exogenous oil price shocks, the authors show that the latter can only account for a relatively small part of the stagflationary

episodes of the 1970s, suggesting that shocks other than oil but coinciding in time with the latter should also be held responsible for the dismal macroeconomic performance of that period. Interestingly, however, the authors' estimates also point to a much more muted impact of an oil price shock of a given size on both prices and quantities in the period after the mid-1980s, thus suggesting the presence of some structural changes in the economy that might be needed to explain those differences. In the second part of the chapter, Blanchard and Galí put forward three alternative explanations for the dampening effects of oil price shocks: a smaller share of oil in production and consumption, more flexible labor markets, and an enhanced credibility of monetary policy. Using an extension of the new-Keynesian model that incorporates exogenous variations in the price of imported oil, and that is calibrated to the U.S. economy, they evaluate the likely quantitative significance of those three hypothesis, concluding that they all seem to have played a role in explaining the smaller fluctuations in output and inflation resulting from oil price movements.

In chapter 8, Jean Boivin and Marc P. Giannoni develop a Factor-Augmented VAR in order to shed light on the role played by international factors in U.S. economic fluctuations and in the transmission mechanism of U.S. monetary policy. Their approach starts by identifying and estimating a small number of domestic and foreign latent factors that are common to a large set of U.S. and non-U.S. variables. They subsequently model those factors (which include, by construction, the Federal Funds rate) by means of a standard VAR. Overall, Boivin and Giannoni's analysis uncovers a small role for international factors in accounting for fluctuations in U.S. variables. That role appears to have changed over time for some variables, but not always in the upward direction that popular accounts of the impact of the process of globalization on domestic economic performance might suggest. That evidence of a limited role for international factors carries over to measures of the U.S. economy's response to an identified exogenous monetary policy shock: estimates of that response are shown to be largely independent of whether feedback effects from the estimated global factors are allowed for or not, with little evidence found of any changes over time in the significance of those effects.

Within the industrialized world, the two major central banks are the Federal Reserve and the European Central Bank. In chapter 9, Harald Uhlig examines how each central bank has performed in recent years with the aim of understanding the similarities and differences. Uhlig is motivated by the observation that the paths of both interest rates and real output in the two economies have been rather different over the years. As Uhlig notes, it is useful to understand the sources of the differences. In principle they could reflect (a) differences in policy; (b) differences in structure (e.g., flexible versus rigid labor markets, bank versus open market finance, etc.); or (c) differences in the nature of the shocks. To get at the issue, Uhlig estimates a small-scale

monetary DSGE model for each country that is flexible enough to allow for differences in policy, structure, and shocks. His principal finding is that the sluggish behavior of the euro area economy relative to the United States primarily reflects differences in shocks. The monetary policy rules of each central bank were not that dissimilar. Rather, the relative U.S. productivity boom and differences in exogenous wage demands across the two regions appears to account for most of the differences in economic behavior. Both central banks appear to agree on the basic template for feedback monetary policy responses.

There has been much speculation among central bankers about how globalization might affect a central bank's ability to stabilize inflation. Indeed, a recent Bank for International Settlements (BIS) study by Borio and Filardo (2006) suggests that globalization may have raised the sacrifice ratio; that is, the percentage reduction in output required to reduce steady state inflation. In chapter 10, Argia Sbordone systematically addresses how globalization may have influenced the short-run Phillips curve trade-off between inflation and output. She begins by developing a Phillips curve relation that stems from optimization-based price setting at the individual firm level. Within this setting firms adjust prices on a staggered basis. How much they adjust depends on the degree of market competition. Sbordone then interprets globalization as inducing a rise in competition through the increase in the number of goods varieties available. She then proceeds to show explicitly how the degree of competition influences the relation between inflation and movements in real marginal cost. The weaker this relation, the more difficult it is to stabilize inflation without incurring undesirable output losses. In general, the chapter shows that the impact of increased competition from globalization has an ambiguous effect on the short-run trade-off between inflation and real activity, though for large changes in the number of goods varieties the sensitivity of inflation to changes in real marginal costs declines, thus flattening the slope of the Phillips curve through this mechanism. Yet Sbordone argues that there is no evidence to presume that the United States is already subject to that negative relationship.

Finally, the conference benefited from a set of interesting speeches by Lucas Papademos and John Taylor, and also a fascinating panel discussion by Donald L. Kohn of the Federal Reserve Board, Rakesh Mohan of the Reserve Bank of India, and José Viñals of the Bank of Spain. We include these in section 4.

Lessons

Despite the diversity of topics and approaches, many of the chapters in the present volume appear to converge in some of their conclusions, in general terms if not in the details. At the risk of oversimplification, one could argue that a common thread of the chapters presented is that, even though

rising globalization may have large effects on the allocation of resources and welfare, its impact on short-run fluctuations and stabilization policies is likely to be muted. This is reflected in the following findings:

1. Globalization is unlikely to hamper the ability of central banks to affect output, employment, and inflation, a prediction that seems to be borne by the evidence.

2. The economy's response to domestic shocks is not substantially affected by a rise in trade openness, at least of the magnitude observed in industrialized economies over the past two decades.

3. The size of the policy spillovers that result from the current degree of interconnectedness between economies like the United States and the euro area is not large enough to imply large welfare gains from monetary policy coordination.

4. Globalization does not seem to have significantly affected key U.S. economy's structural relations, including the slope of the Phillips curve.

5. Even in highly open economies, central banks should be advised to pursue policies that focus on stabilization of domestic prices. Pegging the exchange rate or partially stabilizing it through the back door of CPI inflation targeting are not advisable strategies. Only in the presence of a limited pass-through may there be a case for some version of CPI inflation targeting.

6. Improvements in credibility, together with greater flexibility in labor markets, have made it possible for monetary policy to achieve better outcomes in the face of global shocks, like the rise in oil prices. Furthermore, the policy rules of major central banks, like the ECB and the Fed, seem to have converged to a great extent.

Finally, as organizers of the conference and editors of this volume, we want to thank all the authors, discussants, and panelists for the high quality of their contributions. Special thanks goes to Martin Feldstein, who not only proposed the topic, but was the driving force in making the conference come together. We also thank Brett Maranjian from the NBER and Eulàlia Ribas from the Centre de Recerca en Economia Internacional (CREI) for their logistical support, and Helena Fitz-Patrick for her role in putting the volume together. Finally, we want to express our gratitude to the Smith Richardson Foundation for its generous financial support.

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