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I begin with a simple observation: the current global economic crisis was man-made. This was the consensus of both the U.S. Financial Crisis Inquiry Commission in its 2011 report¹, as well as a broad range of economists. The economic crisis that began in 2008 in the United States was not inevitable. The implication is that policies, particularly the policies of the U.S. monetary and regulatory authorities, led to the crisis. (In many countries, central banks have responsibilities as regulatory authorities and, I think, should have such obligations.)

Sins of both commission and omission—most notably, excessive deregulation, a failure to effectively enforce the regulations that existed, and the

¹ The Financial Crisis Inquiry Commission, 2011, *The Financial Crisis Inquiry Commission Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States*, available online at http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf, accessed September 20, 2011.

failure to adopt new regulations reflecting changes in financial markets—made the economies of the United States and, to some extent, Europe vulnerable to collapse. These failures led to the crisis and have continued in its wake.

The economies in the United States and Europe have been brought back from the brink where they stood in September 2008 but have yet to be brought back to robust growth. Some policies, like the second round of U.S. quantitative easing (QE2), may have even contributed to instability in the global economy. They are also having adverse effects on global financial integration.

This crisis was caused by excesses in credit markets, which led to the creation of a bubble. This is not the first time that excesses in credit markets have led to bubbles that break and lead to a recession. For the past two hundred years, severe economic crises have been associated with finance, with excess credit expansions, the creation of bubbles, and the breaking of those bubbles. (Carmen M. Rogoff and Kenneth S. Reinhart have documented the long history of such crises in their 2009 book *This Time Is Different: Eight Centuries of Financial Folly*, and even before that, so did Charles Kindleberger².) The 1990 recession in the United States was related to the collapse of many savings and loan

² Kindleberger, C. P., 1978. *Manias, Panics, and Crashes: A History of Financial Crises*, New York: Basic Books.

institutions, and the financial sector played a central role in the 1997 East Asia crisis.

How Flawed Models Contributed to the Crisis and Provided Inadequate Guidance on How to Respond

In the aftermath of the 2008 crisis, there has been much debate about whether to blame the financial markets (which failed to allocate capital well and mismanaged risk) or the regulators (who failed to stop the markets' misbehavior). But economists (and their models) also bear responsibility for the crisis. Flawed monetary and regulatory policies were guided by economists' models, and the dominant models failed to predict the crisis and said that such a crisis could not or would not happen. Even after the bubble broke, those relying on such models said that the effects would be contained. In most models, the disturbances to the tranquility of the economy were exogenous, but historically—as now—the important shocks are endogenous.

One of the reasons for the failures of these models was their inadequate modeling of credit markets (banks and shadow banks). If this were the first time that a credit boom and bust had caused a major downturn, one could say that the profession had developed models that worked most of the time and that this was an unusual event. But these recurrent crises have shown that the failure of

mainstream monetary and macroeconomics to analyze credit markets—and ways to reduce the risk of disorderly expansions and contractions—is among the central failures of monetary economics in recent decades. Even today, this lacuna has its effects, for in spite of the megabailout, credit flows have not been restored to, for example, small and medium enterprises (SMEs), and the mortgage securitization market remains broken. Years after the breaking of the bubble, the government is still underwriting a large fraction of all mortgages. The standard macro and monetary policies have provided little guidance, and to the extent that they have given guidance, it has evidently been deficient.

The Importance of the Right Microfoundations

In the aftermath of what has been called the “new classical” revolution³, there was a consensus that macroeconomics should be put on sound microfoundations. The big mistake was that some economists put it on the wrong microfoundations. They turned to the microfoundations of competitive equilibrium analysis—an approach that, at the time that it became the foundation for the new macroeconomics, was being undermined by several strands of research, including work in game theory and on the economics of imperfect and asymmetric

³ Lucas’ 1972 paper is often cited as the seminal work in new classical economics. See R. Lucas, Jr., “Expectations and the Neutrality of Money,” *Journal of Economic Theory*, 4(2), 1972, pp.103-24 and B. Greenwald and J. E. Stiglitz, “Keynesian, New Keynesian and New Classical Economics,” *Oxford Economic Papers*, 39(1), 1987 pp. 119-133.

information. The standard competitive model was particularly suspect for an analysis of macroeconomics because it assumed full employment and its assumptions were the singular set of assumptions under which markets, by themselves, work well.

The emerging consensus (based in part on historical experience, but also based in part on theoretical work in the economics of imperfect and asymmetric information and incomplete risk markets) that has been reflected in much of the discussion (and Guillermo Ortiz, who was a student of mine at Stanford, mentions this in chapter 3) is that markets by themselves are not always efficient. Whenever markets have imperfect information and incomplete risk, the markets are almost never efficient. They are also not stable, and this crisis is one of the worst manifestations of problems that have been recurrent.

The Key Missing Element: Credit

As I have noted, a key missing element in the standard models is credit. In normal times, money and credit are highly correlated, so we can use one for the other. But crises are not normal times, and the relationship between money and credit breaks down in such times. It is precisely at such times that reduced form relationships, such as between money and credit, or money and GDP, are no longer useful, and may actually be very misleading. One then has to return to structural models,

focusing on the links between what the central banks do and the flow of credit. This aspect should have been at the center of modeling and of policy. What has come to be called the “Lucas critique”⁴ emphasized the importance of structural models for the analysis of the consequences of policy changes because of the effect of those policy changes on expectations. But the standard models were ad hoc and not structural in the postulated relationships involving money (for instance, in the relationship between money and GDP), with even more profound implications for both prediction and policy.

Some have defended these lacunae in the same way that some defend the Fed’s not taking preemptive action to contain the bubble. The claim is made that *before the crisis*, “no one saw the bubble coming,” and, so too, no one *before the crisis*, recognized these deficiencies in the standard model. But neither defense has much merit. There were many who warned forcefully of the bubble, explaining with some precision what was going on and what the consequences of the breaking of the bubble would be. But if one is wedded to a model that says that markets are efficient and bubbles don’t occur, then there is little reason to heed such warnings. So too, there was a large literature on the relationship between credit and macroeconomic activity; or more accurately, I should say that

⁴ Lucas, Robert Jr, 1976. "Econometric policy evaluation: A critique," Carnegie-Rochester Conference Series on Public Policy, Elsevier, 1(1), pp. 19-46.

there were large *literatures*, because there were many traditions—including a Latin American tradition, an older microeconomic tradition, and a newer microeconomic tradition that was derived from the economics of information, focused on the role of credit markets in ascertaining creditworthiness and designing and enforcing credit contracts in the presence of information asymmetries.⁵ None of these many traditions were incorporated into mainstream macroeconomics.

Here I focus on three issues—objectives and targets, instruments, and governance. I conclude by returning to the role of modeling in providing insights into these and other key policy issues.

Objectives of Monetary Policy

The crisis has brought home something that should have been recognized even before the crisis: managing inflation is not an end in itself but a means to an end. The end is a more stable economy—not just price stability but real stability—and an economy that is growing faster in a sustainable way. We ought to be concerned about how the economy affects ordinary individuals. And here, employment and wages are critical.

⁵ See, in particular, my book with Bruce Greenwald, *Towards a New Paradigm in Monetary Economics*, Cambridge: Cambridge University Press, 2003

The perspective that low and stable inflation leads to a stable real economy and fast economic growth was never supported by either economic theory or evidence, and yet it became a main tenet of central-bank doctrine. This idea has been destroyed by the crisis—and it ought to have been. Economists focused on the n th-order social losses that arise from disequilibrium relative prices that arise in the presence of inflation, on the deadweight loss of consumer surplus that results when price misalignments occur. Focusing on inflation diverted attention away from something that was much more important, the far larger, first-order consequences of financial instability. Indeed, the price misalignments were not even of second-order importance. They were more like tenth order of significance relative to the losses resulting from the failure of the financial market. With the output gap, those losses have reached trillions of dollars. Compared to that, the losses in the consumer surplus that come from the small microeconomic misallocations are miniscule. The crisis has shown that financial stability is far more important than price stability.

The idea that targeting inflation will lead to financial stability or that focusing on only price and financial stability is sufficient for maintaining a low output gap and stable and robust growth is fundamentally flawed. (In extreme cases, of course, where the issue is not 3, 4, or 5 percent inflation but more like 10 percent inflation, central banks must focus on inflation as well. But in places like

the United States and Europe, where inflation has been controlled, this is not the issue.)

Instruments

What instruments are at our disposal? Some central bankers claimed that they had only one instrument, the interest rate, and that it was a blunt instrument. Even, granted, that there was a bubble (which the standard models said could not occur), it was claimed that were they to have tried to contain it by raising interest rates, there would have been severe adverse effects, sending the economy into a downturn. But monetary authorities and regulatory authorities have a wide range of instruments, and the interest rate is only one instrument that affects the flow of credit and aggregate demand and aggregate supply. The constraint that they not use these other instruments was self-imposed, perhaps because they believed too much in the models that said that the economy was efficient. There were, in particular, a wide range of regulatory measures that could and should have been taken and that would have at least dampened the bubble and thus lessened the severity of the consequences of its breaking. Indeed, Congress had explicitly given the Fed additional regulatory authority in 1994.

Macroprudential Regulation

It has long been recognized—*outside of what before the crisis had become the conventional wisdom, supported by the “standard model”*—that macroprudential regulation is needed to stabilize the economy. Such regulation can take on a variety of forms, including provisioning requirements and cyclically adjusted capital-adequacy requirements, and so forth. Indeed, it was even recognized that capital adequacy requirements that were not cyclically adjusted, especially with mark-to-market accounting, could be destabilizing (acting as an automatic *destabilizer*).

Monetary policy affects the economy not just (or even so much) through the interest rate but also through credit availability. Credit availability is of first-order importance and is especially affected by such regulations. But such regulations also affect the interest rates at which banks lend, and, if economic activity is affected by the interest rate, it is that interest rate, as much as (or even more than) the T-bill rate that matters.

The Spread

One of the important endogenous variables in the macroeconomic system is the lending rate. The relationship between the U.S. Treasury bill rate and the lending

rate can change over the cycle. It can change in different circumstances, and modeling that spread ought to have been an essential part of the modeling of monetary models. But most models did not include it—and therefore had nothing to say about how policy might affect it.

Leverage

An essential aspect of financial sector regulation concerns restrictions on leverage. Policy discussions that require banks to have more capital often seem to begin with the presumption that there are benefits to more leverage, which have to be weighed against the costs, but the discussions of the presumptive benefits of leverage ignore the insights provided by Modigliani and Miller.⁶ The Modigliani-Miller theorem⁷ argues that corporate financial structure doesn't matter—changes

⁶ In the aftermath of the crisis, this point seems at last to be grasped. See, e.g. the U.S. Senate Committee on Banking, Housing, and Urban Affairs hearing on “Debt Financing in the Domestic Financial Sector,” August 3, 2011, including my testimony and the references cited there.

⁷ See F. Modigliani and M. Miller, “The Cost of Capital, Corporation Finance, and the Theory of Investment,” *American Economic Review*, 48(3), pp. 261-297, 1958. They later showed that dividend policy also was irrelevant, in “Dividend Policy, Growth, And The Valuation Of Shares,” *Journal of Business*, 34(4), 1961, pp. 411-433. I subsequently generalized these results (in J. E. Stiglitz, “On the Irrelevance of Corporate Financial Policy,” *American Economic Review*, 64(6), 1974, pp. 851-866), at the same time showing the limitations imposed by bankruptcy and information asymmetries. See also J. E. Stiglitz “A Re-Examination of the Modigliani-Miller Theorem,” *American Economic Review*, 59(5), 1969, pp. 784-793 and J. E. Stiglitz, “Information and Capital Markets,” in *Financial Economics: Essays in Honor of Paul Cootner*, William F. Sharpe and Cathryn Cootner (eds.), Prentice Hall, New Jersey, 1982, pp. 118-158. For a broader discussion, see J. E. Stiglitz, *The Selected Works of Joseph E. Stiglitz, Volume II*, Oxford: Oxford University Press, forthcoming.

in leverage or debt equity ratios don't affect the total value of the firm.

Increasing leverage shifts risks around. And if banks benefit, it is largely either because shareholders don't understand the risks they face or because they do—they realize that by increasing leverage, they are getting the government to absorb more of the downside risk, in the inevitable bailouts that follow. Many economists (including myself) have noted problems with the Modigliani-Miller theorem at the microeconomic level (for instance, information may be conveyed by corporate financial structure). But at the macroeconomic level, the basic insight of Franco Modigliani and Merton Miller—that more leverage does not mean a more efficient use of capital—remains persuasive. Increased leverage means that equity becomes riskier. With banks that are too big to fail, increased leverage increases the likelihood of a bailout.

The Second Round of Quantitative Easing (QE2)

In this crisis, monetary authorities have increasingly made use of an instrument that previously was seldom used—buying long-term bonds (long-term government bonds, or even mortgages). This has come to be called "quantitative easing." This policy reflects a focus on the interest rate as the key economic instrument in current macroeconomic/monetary policy in the United States. With short-term interest rates already as low as they could go, attention naturally

shifted to what monetary authorities could do about long-term interest rates. The second round of quantitative easing (QE2) has been defended on the grounds that it will lower the long-term interest rate and that lower long-term interest rates will stimulate the economy. Most people around the world feel that QE2 has led toward a flood of liquidity, which has not helped the country that needs liquidity—the United States—but rather has caused enormous disturbances in booming emerging markets, which do not need additional liquidity. This is not a surprise.

The main channel by which monetary policy normally affects the economy is the credit channel, and the credit channel, especially to small and medium enterprises, is still blocked. (Many of the regional and community banks that traditionally do a disproportionate share of SME lending are still weak; and much of the lending is collateral-based, and the value of the collateral—typically real estate—has greatly diminished with the crash.) Larger enterprises, awash with cash and with excess capacity, were not likely to invest more simply because long-term interest rates were slightly lower. To the extent that more credit was made available, markets looked for where returns were highest and risk lowest—in the booming emerging markets, not the moribund U.S. economy. Money is going where it's not wanted, and not going where it's needed.

Lowering interest rates may lead to higher asset prices, helping to fuel another asset bubble. The monetary authorities should have been cautious about doing so, given the repeated problems that such asset bubbles have presented for the economy.

The Fed welcomed the increase in equity and bond prices that lower interest rates might bring about, suggesting that it would encourage consumption. The significance of these effects, however, may be more limited than its advocates claim, since the intervention has been announced to be temporary. If the government's purchase of bonds leads to higher prices for stocks and bonds, its later sales should lead to a lower price. If markets anticipate this, then knowing that in the future prices will be lower limits the rise of the prices today. If there are significant effects, they arise out of market imperfections, which typically are not well modeled. But if market imperfections are significant enough to imply a significant effect on prices today, the boost to consumption of such temporary increases in prices will be limited. And there are two significant adverse effects. First, there will be large potential losses by the central bank. The fact that the central bank does not use mark-to-market accounting does not make these losses any less real. Second, the attempt to hide the losses (to ensure that they are not recognized) may impede the conduct of monetary policy.

That relates to one of the critiques of the first round of quantitative easing (QE1). Basically, it temporarily lowered long-term interest rates. With private parties recognizing that they would experience a capital loss on any long-term mortgage, it was unattractive for any private party to engage in the mortgage market. In that way, it destroyed the private mortgage market. As the low interest rates (particularly in the U.S. context, with no prepayment penalties) pushed people to refinance their mortgages, the mortgages moved off the banks' balance sheets onto the government's books. The banks were effectively bailed out, as the risk of these assets becoming non-performing was moved off their balance sheets. This was an important hidden part of the bailout.

There is one channel through which Quantitative Easing may have had some effect: it may have led to an exchange rate that was lower than it otherwise would have been. In effect, the US was engaged in competitive devaluation.

The Assignment Problem

A standard part of the "conventional wisdom" is that there should be as many instruments as there are objectives, with each instrument assigned to an objective. Thus, monetary policy—interest rates—is assigned toward the objective of price stability. But it is a mistake to think that different instruments and objectives can be assigned to different agencies to allocate responsibility

neatly—with each agency having one instrument and one objective. All instruments have to be coordinated. The Nash equilibrium that would emerge from an uncoordinated system, with each agency assigned one instrument and pursuing its own objective, will generally not be efficient. In the presence of uncertainty, even with a single objective, it will in general be desirable to use multiple instruments.

Governance

While the theory of monetary policy in recent years has largely been shaped by macroeconomic models, which I have suggested were badly flawed, how monetary policy has been conducted has largely been shaped by a set of beliefs about what constitutes good institutional structures. Attention in and outside of the IMF has focused on governance, on how the structure of decision-making institutions and the incentives (implicit and explicit) facing decision makers. The conventional wisdom argued for independent central banks. But the independent central banks did not perform better—and in many instances they performed much worse—in the run-up to the crisis. The crisis should, accordingly, make us rethink our ideas about "good governance," just as it should lead to a rethinking of the underlying models.

The notion of independence of central banks raises questions of accountability. Central banks reflect certain parties' perspectives, particularly those of the financial markets. When Alan Greenspan said that he was surprised that banks did not look after their risk better, I was surprised that he was surprised. Any microeconomist looking at the incentives that were in place would have said that the banks had incentives for excessive risk taking and shortsighted behavior. The repeal of the Glass-Steagall Act led to the formation of much-too-big banks that were too big to fail. Again, incentive structures encouraged excessive risk taking. We would have had to rewrite our microeconomic textbooks if we had *not* had a crisis. Greenspan evidently was taken in by the views prevailing in the financial sector that ignored problems posed by agency issues and externalities. With central banks accountable largely to financial markets, it was not surprising that there was "cognitive capture."

Not only was there a failure by the Fed to take actions that would have prevented, or at least lessened, the crisis: how it responded to the crisis also reflected its "cognitive capture." I have come to have views close to those of Simon Johnson, who used to be the chief economist at the IMF. When we saw this crisis coming, we both feared that there would be a massive redistribution of wealth in the wrong direction, and there was. We feared that there would be a lack

of transparency, and there was. (The AIG bail-out has become emblematic of both.)

One can have independence, but it must be independence with representativeness, and that is where we have failed.⁹

Modeling

The central thesis of this Chapter is that economists' models did not describe or reflect what was really going on before, during, and after the crisis. Our models of macroeconomics did not include agency problems or the risk-taking decisions of banks. What is especially remarkable is that central banks had models in which banking did not play an important role. In their own self-interest, they should have tried to make banking important. And banking *is* important, even though their models did not capture this.

There were also deeper mathematical flaws in the structure of the models: they embedded assumptions of concavity, which meant risk diversification necessarily worked. But whenever a crisis emerges, contagion is mentioned, and

⁹ In 2011, US Congressman Barney Frank introduced legislation to make the Federal Reserve more representative.

the natural mathematical assumptions in analyzing contagion are different. Integration worsens problems of contagion. Coherent models, consistent with both views of the world, both before and after the crisis, were never developed, at least among those in the "mainstream."

Moving forward, the challenges for modeling will be great. But many of the building blocks have existed for a long time. There are good models of banking, good models of the risks of excessive interconnectivity within the financial sector, good models of credit bubbles, and good models of agency problems. Because those building blocks were not considered before the last crisis, the insights into policy that they provided were given short shrift, as, for instance, banks were allowed to become too interconnected and to be too self-regulated. At the same time, we failed to connect central banking to the rest of our society—and the rest of economics.