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The Rediscovery of Financial Market Imperfections

This conference is a fitting way to recognize Joe Stiglitz's numerous accomplishments and profound contributions across the field of economics as a researcher, a teacher, and a renowned figure not just within the academic community, but in the public arena as well. My remarks will focus on one small subset of Joe's vast body of research, that which deals with financial market imperfections and the macroeconomy. My perspective is from my seat at the Federal Reserve, both as an economist and policymaker. Before I go any further I have to state that the views I express are mine alone and do not necessarily reflect those of anyone else in the Federal Reserve System.

In thinking about this topic, I am transported back 25 years to one spring day at Stanford, my first class of Joe's first-year graduate macroeconomics course. The required text was Olivier Blanchard and Stanley Fischer's *Lectures on Macroeconomics*, which, I should add, cost a credit-constrained graduate student a bundle. Joe began the lecture with the offhand remark that he assigned this book only so we could see what mainstream macro looked like, but in this course we were going to learn how the economy really worked. For the next ten weeks we were immersed in theories of imperfect information, moral hazard, adverse selection, credit rationing, and all the reasons the economy did not live up to the textbook description.

Recall that this was happening at a time when much of the academic macroeconomics profession was eschewing the Keynesian in favor of the frictionless, perfectly competitive, complete information, real business cycle theories. Joe was decidedly swimming against the tide. But with his enthusiasm, passion, and conviction, you'd never have known it.

Some perspective on this situation is useful. Back in the mid-1960s, when Joe started his research career, there was a growing appreciation that financial markets and the economy did not conform to the Arrow-Debreu ideal. This is reflected in the Fed's own macroeconometric model, the MPS model developed by Franco Modigliani at MIT, Albert Ando at Penn, and Fed economists in the late 1960s.[1] The model featured a detailed accounting of the balance sheets of financial institutions and included important roles for credit rationing in the monetary transmission mechanism to housing and household wealth on consumption. Admittedly, the primary justification for credit rationing was not market failure, but the extensive regulations, including Regulation Q, that led to bouts of disintermediation and credit constraints in housing finance.

During the ensuing years, academic macroeconomic theory increasingly jettisoned these complications and confined itself to the fundamental determinants of financial conditions and aggregate spending, such as changes in technology. In the real business cycle (RBC) and related approaches, researchers fully took on board the arbitrage-free approach to pricing assets and delinking asset prices from economic decisions. This process culminated in the development and widespread use in central banks of dynamic stochastic general equilibrium (DSGE) models.

[1] Brayton et al. 1997.

Early DSGE models wholly abstracted from asset pricing, bank lending, and all other aspects of the financial system.[2] All financial flows were assumed to circulate effortlessly.

At the Fed, we were slow to abandon our tried-and-true models and jump on this bandwagon. In large part, this reflected the need to have models that are empirically relevant—that "fit the data"—so they are useful for forecasting and quantitative analysis. But it also reflected the human capital developed in the institution that valued insights and perspectives that were no longer in vogue.

In the early 1990s, around the time I joined the Fed, the staff at the Board of Governors developed a new macroeconometric model, dubbed FRB/US.[3] It eliminated most of the balance sheet apparatus designed to deal with Regulation Q and the explicit modeling of the banking sector. However, it did incorporate links between imperfections in financial markets and economic decisions. For example, the central role of internal financing was recognized through a corporate cash flow channel on investment. Similarly, household credit constraints were modeled as rule-of-thumb consumers. Although asset price risk premia were modeled in very stylized ways, they did feed into consumer and business spending decisions.

This was the state of play when financial markets started to set off alarms in 2007. To an outside observer, it might appear that we at the Fed were armed with macro models that were simply ill-equipped to diagnose the ills that beset the economy or devise effective treatment plans. And that would be half true. But, it would ignore the most important asset we had (well, besides the monopoly franchise to create unlimited amounts of reserves): The in-depth knowledge of the theories of financial market imperfections that Joe and many others had

[2] See, for example, Christiano, Eichenbaum, and Evans 2005.
[3] Reifschneider, Tetlow, and Williams 1999.

developed over the preceding 40 years. Many economists and policymakers at the Fed—including then-Chairman Ben Bernanke and Janet Yellen—were steeped in the literature that had its intellectual roots in this research.

As events unfolded, I was struck by the immediate translation of abstract theoretical models to the real world. Despite the fact that the trend in macro for decades was to abstract from these issues. Despite the fact that many of the early problems were in capital markets or the shadow banking system, rather than traditional commercial banking. Despite the fact that many theoretical models focused on the nonfinancial business sector's decisions to invest and produce, while, at least in the early stages, the real-world problems were centered in financial firms. I could imagine Ben Bernanke thinking, "I have seen this before and I know what it means." Almost overnight, Fed economists and policymakers pivoted to applying the insights and tools they were taught—in many cases, back in graduate school—to understand what was going wrong, why, and what could be done to fix it.[4]

Three insights of the theoretical literature were key. First, owing to various information and market imperfections, the degree of credit rationing and its effect on the economy depends on the state of the world. Constraints that in "good" times may not bind and therefore may be invisible can have huge consequences during a period of stress. Second, financial and economic decisions depend on perceived probabilities of default. When those probabilities rise, panic sets in and everyone hunkers down—even those who should, in principle, feel safe—and economic activity collapses. Third, under extreme circumstances, these effects are so acute that credit is unavailable at any market price.

[4] Bernanke 2015.

All of these ideas owe their intellectual roots to the research on asymmetric information and financial market frictions that started back in the 1960s and was developed over the subsequent 40 years.[5] The details and names differed—whether it was called "the financial accelerator" or "credit rationing"—but the insights that grew out of this extensive line of decades-long research shaped our understanding of events and the policy responses that followed.

Three policies are particularly noteworthy in this regard. First, in addition to discount window lending to banks, the Fed used its emergency lending powers to provide liquidity to primary dealers and commercial paper markets, money market mutual funds, and securitization markets in response to parts of our credit markets shutting down.[6] Second, working with the other key regulatory agencies and the U.S. Treasury, the Fed's first stress tests, or Supervisory Capital Assessment Program, forced the largest banks to have adequate capital reserves in a severely adverse economic environment. This program was designed to overcome the private interest in avoiding stock dilution and assure that banks were far away from risk of insolvency, and thereby ready and able to get credit flowing again.

Third is monetary policy. Standard textbook theories saw little benefit from balance sheet policies. But, going back to the work of Jim Tobin, some economists had highlighted the potential for balance sheet policies to affect the economy in the presence of financial market imperfections. The aggressive use of purchases of mortgage-backed securities (MBS) and longer-term Treasury securities, more commonly referred to as quantitative easing (QE), became

[5] See, for example, Stiglitz and Weiss 1981, Bernanke and Gertler 1989, Greenwald and Stiglitz 1993, Kiyotaki and Moore 1997, and references therein.
[6] See Williams 2011 for a summary.

a critical and powerful tool of monetary policy.[7] These purchases worked by pushing up prices of Treasuries and MBS and related assets, fostering financial conditions that supported stronger economic growth. Although these effects were not in our off-the-shelf models, economists at the Fed and elsewhere quickly ramped up analysis and found ways to incorporate these effects in models and to analyze the effects of policy actions.[8]

This period of seat-of-the-pants analysis and cobbling together models with financial frictions has morphed into an extensive research program on the theory and empirics of financial market imperfections. Indeed, Gilchrist and Zakrajšek (2012) find that financial risk premium shocks are a major driver of economic cycles. Macroeconomists are busy building models that incorporate these frictions in a variety of ways.[9] Much of this research is still fairly rudimentary. Nonetheless, it represents an exciting rediscovery of the importance of financial market frictions in macroeconomics.

To sum up, we have, to some extent, gone full circle in bringing institutional details and market imperfections into macro thinking and models in the past 50 years. That brings me to a conversation I had with a colleague a while ago. When I explained that my macro teachers at Stanford were Bob Hall, Tom Sargent, John Taylor, and Joe, not to mention my LSE professors Chris Pissarides, Charlie Bean, and Richard Layard, he quipped that he now understood why I was so confused about macroeconomic principles. But what I have learned in the past 20 years is that this eclectic approach to studying the economy is the greatest gift my teachers gave me. And we did end up using Blanchard and Fischer's book in a later class, so that investment paid off in the end as well. More generally, having economists with diverse perspectives at the Federal

[7] See D'Amico et al. 2012 and Williams 2014 for summaries.
[8] See, for example, Gagnon et al. 2011, Chung et al. 2012, Chen, Cúrdia, and Ferrero 2012, and references therein.
[9] Christiano, Motto, and Rostagno 2010 and Clerc et al. 2015

Reserve—who learned from inspiring teachers like Joe Stiglitz—has served us and our country well over these very difficult past eight years and will continue to do so in the future. Thank you.

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