Handbook of Financial Stress Testing

Stress tests are the most innovative regulatory tool to prevent and fight financial crises. Their use has fundamentally changed the modeling of financial systems, financial risk management in the public and private sector, and the policies designed to prevent and mitigate financial crises. When financial crises hit, stress tests take center stage. Despite their centrality to public policy, the optimal design and use of stress tests remains highly contested.

Written by an international team of leading thinkers from academia, the public sector, and the private sector, this handbook comprehensively surveys and evaluates the state of play and charts the innovations that will determine the path ahead. It is a comprehensive and interdisciplinary resource that bridges theory and practice and places financial stress testing in its wider context. This guide is essential reading for researchers, practitioners, and policymakers working on financial risk management and financial regulation.

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"This well-documented compendium on financial stress testing could not arrive at a more timely moment. As the world embarks on a daunting mission to reign in global warming, stress testing promises to be a key tool for helping central banks and supervisors assess climate-related risks, not only on their own balance sheets, but in the economy as a whole, as well as the books of the banks it supervises."

Christine Lagarde, President of the European Central Bank

"Stress tests have grown from their beginnings as a simple, practical tool for communicating risk in a particular portfolio into a much broader framework. This Handbook is a thought-provoking package of 30 essays by leading academics, regulators, and practitioners. Topics range widely, from fundamental scenario design to transparency considerations, feedback effects, micro versus macro perspectives, as well as the implications for different types of financial institutions. The Handbook has something for anyone interested in the state of the art, including risk professionals, regulators, policymakers, and academics."

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"This excellent compilation of contributions on stress testing covers a vast spectrum ranging from the economic history of evolution of stress tests as a centerpiece in prudential regulation of the financial sector to the challenges going forward. The book covers both micro- and macro-prudential stress tests, provides a conceptual foundation for the use of both, touches upon ongoing issues such as stress tests for central counterparties, and is a must-read for practitioners, policymakers, and academics interested in creating a robust financial sector."

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Darrell Duffie, Stanford University

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Foreword

My first exposure to the power and limits of stress testing came too late, just a year or so into my tenure at the Federal Reserve Bank of New York (FRBNY). I had asked Gerry Corrigan in the fall of 2004 to reprise his post–Long-Term Capital Management (LTCM) Counter party Risk Management Policy Group work with a fresh assessment of the state of risk management in the major financial institutions. His assessment was damning. The vast majority of the major banks and investment banks could not capture, in anything close to real time, the full exposure of the institution to individual counterparties or particular types of risks. And not many of these institutions made more than a cursory attempt to examine the losses they might face in a terrible recession or major financial crisis. We undertook a coordinated effort with the other supervisors, US and non-US, of the major financial institutions to try to remedy those failings, but those efforts came late in the boom and were insufficiently forceful.

Around the same time, within the FRBNY, I started to ask why we were confident that the “8 percent” minimum capital against risk-weighted assets—a ratio that had prevailed as the standard for almost two decades—was “enough” capital and how much would be left if we faced a severe recession. Those discussions led to an early attempt at a system-wide stress test, which produced the observation that with losses two or three times peak losses in the last few recessions, the major banks would be left with thinner but still comfortable levels of capital.

As this history suggests, we approached the end of one of the largest and longest credit booms of the prior half century with a limited appreciation of the limits of the prevailing regulatory capital regime. That regime, as we discovered too late, had many failures, and those failures were magnified by the structure of the US financial system, with a vast and diverse array of financial institutions operating outside the constraints of the bank capital regime and without access to the safety net of deposit assistance and access to the Fed’s standing lender-of-last-resort facility for banks.

The regulatory capital regime was limited in scope, applying only to banks, and on the eve of the crisis, banks were responsible for less than half of intermediation in the US financial system. The capital regime that did apply to banks was exacting enough to encourage the migration of risk outside of banks, but it was too weak overall in terms of the level and quality of capital required against risk. As the crisis intensified and the recession deepened, expected losses approached levels that would have consumed the total amount of common equity in the major banks, which worked to accelerate the run on the system. The capital regime was not just too thin to allow banks to withstand the effects of the near collapse

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of much of the rest of the financial system but also too thin to allow banks to expand to compensate for the reduction in lending capacity as a diverse mix of nonbank institutions came under acute pressure.

The bank capital regime provided little warning of the approaching abyss. It was not forward-looking in capturing the increasing probability of large expected losses. And in part because of this, the authority available to supervisors was not used effectively to preserve or build capital in the quarters leading up to the acute phases of the crisis. It is worth noting that no market-based or other indicators of bank capital were any more effective in foreshadowing the approaching fear of systemic insolvency of the financial system.

How significant was the regulatory failure in the design of the capital regime? It was obviously substantial. Actual gross losses during the crisis totaled about $800 billion relative to about $2.4 trillion in capital at banks and broker-dealers at year-end 2007. For the largest banks and investment banks, the actual erosion in Tier 1 common capital ratios due to losses net of income averaged a bit over 300 basis points, but with a wide range from over 1,000 basis points for the weakest bank to almost 0 for the strongest. Market-based expectations of losses at the peak of the crisis were substantially higher than actual losses, reflecting the collapse in liquidity and the fear of a much-worse recession. If you applied the tougher risk weights of the postcrisis capital regime to the precrisis balance sheets of the major banks, their reported regulatory capital ratios would have been around 200 basis points weaker on average. Total public capital injections plus the required capital raises for the major banks in the crisis totaled $350 billion, which was about 500 basis points relative to risk-weighted assets in the middle of 2008.

These estimates, although large, understate the scale of potential losses that would have occurred without the full power of the other policy actions deployed by the United States in the crisis. Without the aggressive fiscal and monetary policy response, the dramatic expansion of explicit and implicit guarantees of liabilities, the broader purchase and funding facilities that put a floor under asset prices, and the government-sponsored enterprise (GSE) and housing market interventions, the recession would have been much more severe, there would have been an even larger number of failures across the financial system, and losses for the core of the financial system would have been much higher.

The "stress test" adopted by the United States in early 2009 played an important role, although not the decisive role, in the resolution of the crisis. It proved, beyond our expectations, an effective way to complete the recapitalization of the US financial system with a very modest additional use of public resources. Critical to its effectiveness were several aspects of the design. The requirement was set in terms of common equity, rather than capital ratios, to limit the risk that banks would cut assets further, which would have worsened the recession. The loss estimates were conservative relative to market estimates. The results were disclosed to the public with a fair amount of detail by institution. We made it clear that we would provide public capital, if the firms were unable to raise private capital, and set the price for that capital, which helped put a floor on bank equity prices. The capital backstop helped reinforce our commitment to not allow another run on the system to jeopardize the immediate survival of any of the major banks. The capital backstop allowed the creditors of banks to be more confident in funding them, and it allowed equity investors to be more confident that they could purchase bank equity again and be compensated for the risks in doing so.

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The fact that we were able to recapitalize the US financial system so quickly with so little public money—and earned a substantial financial return on those public equity investments—was possible because of the forcefulness of the US macroeconomic policy response, with the Fed's asset purchase program and the fiscal stimulus; the Federal Deposit Insurance Corporation's guarantee of the liabilities of the banking system; the Treasury's guarantee of money market funds; and the array of funding backstops to the commercial paper, asset-backed securities, and other markets provided by the Fed, in some case with support from the Treasury.

Observers have spent some time since the crisis debating why the stress test "worked" despite the minimal amounts of incremental capital needs identified in May 2009. It worked because it was credible and well designed, but perhaps more importantly, it worked because of the force of these other policy measures in limiting the depth of the recession and containing the collapse of the broader financial system. Together, the US strategy was to recapitalize the financial system quickly and definitively and by doing so, to limit the risk of a deeper recession, and in parallel, to use the full Keynesian arsenal of the United States to limit the severity of a recession, which in turn improved the effectiveness of the other financial programs in preventing the collapse of the financial system.

The most important lessons of the financial crisis are not just about capital and stress testing. The resilience of the financial system depends not just on the level and distribution of common equity in the entire financial system but on the strength of the Keynesian arsenal and the power of the funding protections provided by the central banks and the government to the financial system as a whole. Capital was necessary but not sufficient.

No capital regime, even with the more systematic integration of stress testing, can fully compensate for the weakness of these other policy tools. But a capital regime built on a foundation of tough, independently designed stress tests can provide a greater margin of safety in future crises. By forcing the financial system to hold more capital against the severe recession, we should be able to reduce the probability and severity of a future crisis. And when we next face a major crisis, stress testing can be used as part of a strategy to prevent the collapse of the financial system and restore it to health more quickly.

We live in an uncertain and challenging world, always vulnerable and with a limited capacity to predict and preempt crisis. This makes it critically important to maintain a strong Keynesian macroeconomic policy arsenal, a full range of emergency financial authorities and tools, and strong capital defenses. Stress testing should remain a critical part of the defenses of the major financial systems.

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