

Ben S Bernanke: Stress testing banks – what have we learned?

Speech by Mr Ben S Bernanke, Chairman of the Board of Governors of the Federal Reserve System, at the “Maintaining financial stability: holding a tiger by the tail” financial markets conference, sponsored by the Federal Reserve Bank of Atlanta, Stone Mountain, Georgia, 8 April 2013.

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Let me begin by thanking President Lockhart and the organizers of the Financial Markets Conference for inviting me to speak here again this year. I have participated regularly in this conference and have always found it stimulating.

Four years ago, in remarks at this very conference, I described the 2009 Supervisory Capital Assessment Program, or SCAP, popularly known as the bank stress tests.¹ The SCAP marked the first time the U.S. bank regulatory agencies had conducted a supervisory stress test simultaneously across the largest banking firms.² At the time of my 2009 speech, we had just published the results of the SCAP and were still evaluating its effects. In retrospect, the SCAP stands out for me as one of the critical turning points in the financial crisis. It provided anxious investors with something they craved: credible information about prospective losses at banks. Supervisors’ public disclosure of the stress test results helped restore confidence in the banking system and enabled its successful recapitalization. The resilience of the U.S. banking system has greatly improved since then, and the more intensive use and greater sophistication of supervisory stress testing, as well as supervisors’ increased emphasis on the effectiveness of banks’ own capital planning processes, deserve some credit for that improvement.

I will begin today with a brief discussion of the state of U.S. banking. I will then turn to the subject of what we have learned about stress testing in the four years since the SCAP, with a focus on the increasingly central role it is playing in bank supervision in the United States. Importantly, as I will elaborate, stress testing adds a macroprudential dimension to our supervision by helping us evaluate the aggregate capital position of the largest banking firms as well as their individual capital levels.

The Federal Reserve – like all bureaucracies – has an unfortunate tendency to create acronyms, so, before I proceed further, let me explain our acronyms, in addition to SCAP, for stress tests. With the SCAP now in the past, we currently have two distinct but related supervisory programs that rely on stress testing. The first is the stress testing required by the Dodd-Frank Act, which we have shortened to the acronym DFAST – the Dodd-Frank Act stress tests. The purpose of DFAST is to quantitatively assess how bank capital levels would fare in stressful economic and financial scenarios. The second program, called the Comprehensive Capital Analysis and Review, or CCAR, combines the quantitative results from the stress tests with more-qualitative assessments of the capital planning processes used by banks. For example, under CCAR, supervisors evaluate the ability of banks to model losses for various categories of loans and securities and to estimate earnings and capital requirements in alternative scenarios. We recently completed the first set of DFAST stress

¹ See Ben S. Bernanke (2009), “[The Supervisory Capital Assessment Program](#),” speech delivered at “[Financial Innovation and Crises](#),” a financial markets conference sponsored by the Federal Reserve Bank of Atlanta, held in Jekyll Island, Ga., May 11–13.

² For more information about the SCAP exercise, see the Board’s website at www.federalreserve.gov/bankinforeg/scap.htm.

tests and disclosed the results, followed a week later by the disclosure of our CCAR findings, which included our qualitative assessments of firms' capital planning.³

The state of the banking system, then and now

To provide context for the developments in the banking system since the introduction of the SCAP in early 2009, it's worth briefly recalling the economic situation that prevailed at that time. The economy was in deep recession, with the unemployment rate having risen 4 percentage points, from 5 percent to 9 percent, over the preceding 12 months. The prices of real estate and equities had plummeted, interest rate spreads – such as the spread between rates on mortgages and Treasury securities – had widened to unprecedented levels, and securitization markets had frozen. Write-downs and losses continued to deplete banks' capital, unnerving investors and counterparties and exacerbating the severe funding pressures faced by many institutions. In the face of this instability, in 2008 and 2009 policymakers had taken a range of extraordinary measures: The Federal Reserve supplied liquidity to banks and other financial institutions, helping to calm the panic and begin the process of restoring the flow of credit to households and businesses; the Treasury Department guaranteed money market funds and injected capital into banks under the Troubled Asset Relief Program; the Congress expanded deposit insurance under the Federal Deposit Insurance Corporation (FDIC); and the FDIC guaranteed banks' issuance of long-term debt. And, as I noted, the SCAP helped to increase confidence in the banking system and restore banks' access to private capital markets. Ten of the 19 large bank holding companies that underwent the SCAP were required to raise equity capital – by \$75 billion in total.

Today the economy is significantly stronger than it was four years ago, although conditions are clearly still far from where we would all like them to be. Because bank credit for households and businesses is critical to continued economic expansion, it is positive for the recovery that banks are also notably stronger than they were a few years ago. For example, premiums on bank credit default swaps have fallen by more than half of their 2009 levels, and other measures of bank risk have also declined substantially. More than 90 percent of the public capital injections that were used to stabilize the banking system have been repaid, and the Federal Reserve's extraordinary liquidity programs and the FDIC's temporary guarantees for uninsured business deposits and bond issues have largely been wound down.

The results of the most recent stress tests and capital planning evaluations continue to reflect improvement in banks' condition. For example, projected aggregate loan losses under this year's most stressful scenario (the so-called severely adverse scenario) were 7 percent lower than the comparable figure last year, in part because the riskiness of banks' portfolios continues to decline. The comparison of today's bank capital levels with those at the time of the SCAP is particularly striking. Over the past four years, the aggregate tier 1 common equity ratio of the 18 firms that underwent the recent tests has more than doubled, from 5.6 percent of risk-weighted assets at the end of 2008 to 11.3 percent at the end of 2012 – in absolute terms, a net gain of nearly \$400 billion in tier 1 common equity, to almost \$800 billion at the end of 2012. Indeed, even under the severely adverse scenario of the latest stress test, the estimate of these firms' post-stress tier 1 common capital ratio is more

³ See Board of Governors of the Federal Reserve System (2013), "[Federal Reserve Releases Summary Results of Bank Stress Tests](#)," press release, March 7; and Board of Governors of the Federal Reserve System (2013), "[Federal Reserve Announces Results of Comprehensive Capital Analysis and Review \(CCAR\)](#)," press release, March 14.

than 2 percentage points higher than *actual* capital levels at the end of 2008.⁴ Higher capital puts these firms in a much better position to absorb future losses while continuing to fulfill their vital role in the economy. In addition, a majority of the 18 CCAR firms already meet new internationally agreed-upon capital standards (the proposed Basel III capital requirements), and the others are on track to meet these requirements as they are phased in over time.

Although the stress tests focus on the largest banks, the medium-sized and smaller banks outside of the 18 CCAR firms have also improved their aggregate capital position considerably since the SCAP. For that group of banks, aggregate tier 1 common equity stood at 12.4 percent of risk-weighted assets in the fourth quarter of 2012, more than 4 percentage points higher than at the end of 2008.

Another key lesson of the crisis, given the intense funding pressures experienced by many financial institutions during the period, is the importance of maintaining adequate liquidity – that is, a stock of cash and unencumbered high-quality liquid assets that can be converted easily into cash. Here too, the news is mostly positive, as the broader banking system – including both larger and smaller banks – has generally improved its liquidity position relative to pre-crisis levels. For example, banks' holdings of cash and high-quality liquid securities have more than doubled since the end of 2007 and now total more than \$2.5 trillion. However, in the area of liquidity and funding, continued improvement is still needed on some dimensions. Notably, supervisors will continue to press banks to reduce further their dependence on wholesale funding, which proved highly unreliable during the crisis. And, in analogy to the need for effective capital planning, banks of all sizes need to further strengthen their ability to identify, quantify, and manage their liquidity risks.

The evolution of stress testing

Let me turn now to the evolution of stress testing as a supervisory tool. The main benefits of stress tests for supervision have not changed much since the SCAP was conducted in 2009. First, stress tests complement standard capital ratios by adding a more forward-looking perspective and by being more oriented toward protection against so-called tail risks; by design, stress tests help ensure that banks will have enough capital to keep lending even under highly adverse circumstances. Second, as applied by the Federal Reserve, the stress tests look horizontally across banks rather than at a single bank in isolation. This comparative approach promotes more-consistent supervisory standards. It also provides valuable systemic information by revealing how significant economic or financial shocks would affect the largest banks collectively as well as individually. Third, the disclosures of stress test results promote transparency by providing the public consistent and comparable information about banks' financial conditions.

The basic methodology of our stress testing has also not changed materially since the SCAP. We continue to take a multidisciplinary approach, drawing on a wide range of staff expertise. To begin the process, our economists create a hypothetical macroeconomic scenario that incorporates an assumed sharp deterioration in economic and financial conditions. Supervisors estimate each bank's expected losses and revenues and we use these estimates to project post-stress capital levels and ratios under that hypothetical scenario. The estimated capital ratios are then compared with regulatory benchmarks. We use a common scenario for all firms; for the firms with the largest trading activities, we supplement the basic scenario with a market-shock scenario that incorporates market turbulence of severity similar to that of the latter half of 2008.

⁴ On an individual firm basis and taking into consideration planned capital actions – that is, capital raises or distributions – all but 1 of the 18 firms evaluated this year had post-stress capital ratios above the regulatory minimum.

Although the basic goals and approach of stress testing have remained largely unchanged since the SCAP, the implementation has evolved and improved from year to year. For example, we have continued to refine the formulation of the hypothetical scenarios that form the basis of the stress tests. As explained in a statement we released in the fall, the severely adverse scenario is designed to reflect, at a minimum, the economic and financial conditions typical of a severe post-World War II U.S. recession.⁵ In devising recession scenarios, we draw on many of the same macroeconomic modeling tools used in making monetary policy. Of course, not all significant risks facing banks are tied to the business cycle. Accordingly, our scenarios now generally incorporate not only the typical consequences of a severe recession but also, simultaneously, other adverse developments such as an exceptionally large decline in house prices, sharp drops in the value of stocks and other financial assets, or a worsening of global economic conditions more severe than might normally be expected to accompany a deep recession in the United States.

Importantly, in specifying the severely adverse scenario, we seek to avoid adding to the procyclicality of the financial system. In other words, in applying stress tests, we do not want to inadvertently set a standard that is easier to meet in good times (when banks should be preparing for possibly tougher times ahead) than in bad times (when banks need to be able to use accumulated capital to support lending). Accordingly, we will want to ensure that the stress scenario remains severe in an absolute sense even when the economy is strong and the near-term risks to the outlook seem relatively modest.

We have also improved our tools for estimating projected bank losses, revenues, and capital under alternative scenarios. The original SCAP was supervisors' first attempt to produce comprehensive and simultaneous estimates of the financial conditions of the nation's largest banking firms, and the required data and analytical methods were developed under great time pressure. Of necessity, when projecting losses and revenues under alternative SCAP scenarios, supervisors relied on the firms' own estimates as a starting point. Although we scrutinized and questioned the firms' estimates and made significant adjustments based on our own analysis, for that inaugural round of stress tests, it was not possible to produce completely independent estimates.

However, over the past four years, considerable progress has been made in data collection and in the development of independent supervisory models. For our most recent supervisory stress tests, we collected and analyzed loan- and account-level data on more than two-thirds of the \$4.2 trillion in accrual loans and leases projected to be held by the 18 firms we evaluated this year. Those detailed data include borrower, loan, and collateral information on more than 350 million domestic retail loans, including credit cards and mortgages, and more than 200,000 commercial loans. Currently, the Federal Reserve uses more than 40 models to project how categories of bank losses and revenues would likely respond in hypothetical scenarios. The improvements in data and models have increased our ability to distinguish risks within portfolios. Importantly, these supervisory models are evaluated by a special model validation group made up of experts within the Federal Reserve who do not work on the stress tests. We have also created a Model Validation Council made up of external experts to provide independent views and advice.⁶ These ongoing efforts are bringing us close to the point at which we will be able to estimate, in a fully independent way, how each firm's loss, revenue, and capital ratio would likely respond in any specified scenario.

⁵ See the proposed "[Policy Statement on the Scenario Design Framework for Stress Testing \(PDF\)](#)" of the Board of Governors of the Federal Reserve System (Nov. 15, 2012).

⁶ See Board of Governors of the Federal Reserve System (2013), [Dodd-Frank Act Stress Test 2013: Supervisory Stress Test Methodology and Results \(PDF\)](#), Appendix B: Models to Project Net Income and Stressed Capital (Washington: Board of Governors, March), pp. 37–47; and Board of Governors of the Federal Reserve System (2012), "[Federal Reserve Announces the Formation of the Model Validation Council](#)," press release, April 20.

Another innovation since the SCAP is the increased supervisory focus on banks' internal capital planning practices, which are reviewed as part of CCAR. We see the requirement that banks with assets of \$50 billion or more submit annual capital plans to the Federal Reserve as a critical enhancement.⁷ While regulatory minimums and supervisory expectations provide floors for acceptable capital levels, the firms and their boards of directors are responsible for assessing their own capital needs over and above the minimums. Our supervisors scrutinize their practices and assess their capacity to fulfill that responsibility. In particular, we require firms to formulate their own scenarios that capture the risks that they face, and to assess potential losses and revenues under both the supervisory scenarios and their internal scenarios over a nine-quarter horizon. In CCAR, our qualitative assessment of a firm's capital planning is integrated with the quantitative results of both the supervisory and company-run stress tests.

The Federal Reserve continues to increase the transparency of our stress testing process, the results of the exercises, and our assessments of banks' capital planning. The original SCAP set a new standard of supervisory transparency in disclosing bank-by-bank estimates of stress losses by type of exposure. This departure from the traditionally confidential treatment of supervisory information, as I noted earlier, was intended to restore public confidence by providing much-needed information about banks' potential losses and capital needs. In last month's results, in addition to projected losses and revenues, we disclosed for the first time whether we had objected to each firm's capital plan.⁸ Also for the first time, banks were required to disclose their own estimates of stressed losses and revenues. The disclosures by banks give investors and analysts an alternative perspective on the test results; they also help them form judgments about banks' appetites for risk and their risk-management practices, particularly their abilities to measure losses in a severe downturn. Even outside of a period of crisis, the disclosure of stress test results and assessments provides valuable information to market participants and the public, enhances transparency, and promotes market discipline.

In the four years since the SCAP, the Federal Reserve's stress testing program has been expanded and strengthened through both statute and regulation. The Dodd-Frank Act widened the scope of stress testing to all bank holding companies with \$50 billion or more in total consolidated assets (approximately 11 companies in addition to the original SCAP participants) and to nonbank financial companies designated by the Financial Stability Oversight Council as systemically important, and therefore subject to consolidated supervision by the Federal Reserve. Dodd-Frank also requires these companies to conduct their own stress tests twice a year. In October, the Federal Reserve Board adopted rules implementing these requirements.⁹ The 11 additional companies with assets of \$50 billion or more will be subject to DFAST and CCAR for the first time next year.

While no institutions below \$50 billion in assets are subject to supervisory stress testing or the requirements of CCAR, the Dodd-Frank Act does require that institutions with between \$10 billion and \$50 billion in assets conduct their own stress tests.¹⁰ The initial tests by these

⁷ A capital plan describes a firm's capital planning strategies and its processes for measuring potential capital needs both under expected and stressed operating environments and for ensuring that it is holding adequate capital to be able to continue to function even under stress. See Board of Governors of the Federal Reserve System (2011), "[Capital Plans](#)," final rule (Docket No. R-1425), *Federal Register*, vol. 76 (December 1), pp. 74631–48.

⁸ See Board of Governors, "[Federal Reserve Announces Results of CCAR](#)," in note 3.

⁹ See Board of Governors of the Federal Reserve System (2012), "[Supervisory and Company-Run Stress Test Requirements for Covered Companies](#)," final rule (Docket No. 1438), *Federal Register*, vol. 77 (October 12), pp. 62377–96.

¹⁰ See Board of Governors of the Federal Reserve System (2012), "[Annual Company-Run Stress Test Requirements for Banking Organizations with Total Consolidated Assets over \\$10 Billion Other Than Covered Companies](#)," final rule (Docket No. 1438), *Federal Register*, vol. 77 (October 12), pp. 62396–409.

firms will begin this year and will be completed by March. While we believe that stress testing will help medium-sized institutions better understand the risks they face, we tailored our rule for these institutions to take account of differences in size, complexity, and business models. We specifically exempted community banking organizations with \$10 billion or less in total assets from the requirement that they run their own stress tests as those institutions cannot reasonably be expected to have the resources that larger banks devote to stress testing.¹¹

Benefits and challenges of stress testing

As already noted, stress testing has a number of important benefits as a supervisory tool. From a microprudential perspective, the CCAR provides a structured means for supervisors to assess not only whether banks hold enough capital, but also whether banks are able to rapidly and accurately determine their risk exposures, an essential element of effective risk management. The cross-firm nature of the stress tests also helps supervisors identify outliers – both in terms of results and practices – that can provide a basis for further, more targeted reviews.

From a macroprudential perspective, the use of a common scenario allows us to learn how a particular risk or combination of risks might affect the banking system as a whole – not just individual institutions. This experience with stress testing has indeed been very useful for our efforts to better monitor and evaluate potential systemic risks. For example, in our macroprudential work, as in our stress tests, we tend to rely on horizontal examinations and comparative studies, as opposed to firm-by-firm assessments; we use multidisciplinary, specialized teams to supplement the work of on-site examiners; and we have increased our use of modeling and quantitative methods, using data drawn from different institutions and time periods. All of these features are apparent in the workings of our Large Institution Supervision Coordinating Committee, which provides coordinated oversight of the supervision of systemically important firms. We have also extended the lessons of systemwide stress testing to analysis of factors other than capital: For example, we recently completed a horizontal review of liquidity positions and liquidity risk-management practices at some of the largest CCAR firms. Like the CCAR review of capital planning, this review was a multidisciplinary effort that used quantitative information – in this case, detailed data on firms' liquidity positions – as well as qualitative information on liquidity risk-management practices.

Notwithstanding the demonstrated benefits of comprehensive stress testing, this evolving tool also presents challenges. For example, even as we continue to explore ways to enhance the transparency of the models we use to estimate banks' projected revenues and losses, we have chosen not to publish the full specification of these models. As a result, we hear criticism from bankers that our models are a "black box," which frustrates their efforts to anticipate our supervisory findings. We agree that banks should understand in general terms how the supervisory models work, and, even more importantly, they need to be confident that our models are empirically validated and sound. I mentioned our internal efforts at model validation, which have increased the quality and accuracy of our models. We have also begun to host an annual stress test modeling symposium, which provides a venue for regulators, bankers, academics, and others to share their views. Over time, we expect banks to better understand the basic elements of the supervisory models, rendering them at least somewhat less opaque.

At the same time, it is reasonable to worry that, with increased disclosure of supervisory models, firms would see a declining benefit to maintaining independent risk-management systems and would just adopt supervisory models instead. Doing so would certainly make it

¹¹ See Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, and Office of the Comptroller of the Currency (2012), "[Agencies Clarify Supervisory Expectations for Stress Testing by Community Banks](#)," press release, May 14.

easier to “pass” the stress tests. However, all models have their blind spots, and such an outcome risks a “model monoculture” that would be susceptible to a single, common failure. The differences in stress test results obtained by supervisors’ and banks’ own models can be informative, and we do not want inadvertently to destroy the healthy diversity or innovation of the models and other risk-management tools used in the banking industry.

Another challenge is that our stress scenarios cannot encompass all of the risks that banks might face. For example, although some operational risk losses, such as expenses for mortgage put-backs, are incorporated in our stress test estimates, banks may face operational, legal, and other risks that are specific to their company or are otherwise difficult to estimate. It is important for banking firms to consider the potential for losses from these other classes of risks as systematically as possible, and supervisors also account for these risks as best they can. Of course, unforeseen events are inevitable, which is why maintaining a healthy level of capital is essential.

Conclusion

As I have discussed today, the banking system is much stronger since the implementation of the SCAP four years ago, which in turn has contributed to the improvement in the overall economy. The use of supervisory stress tests – a practice now codified in statute – has helped foster these gains. Methodologically, stress tests are forward looking and focus on unlikely but plausible risks, as opposed to “normal” risks. Consequently, they complement more conventional capital and leverage ratios. The disclosure of the results of supervisory stress tests, coupled with firms’ disclosures of their own stress test results, provide market participants deeper insight not only into the financial strength of each bank but also into the quality of its risk management and capital planning. Stress testing is also proving highly complementary to supervisors’ monitoring and analysis of potential systemic risks. We will continue to make refinements to our implementation of stress testing and our CCAR process as we learn from experience.

As I have noted, one of the most important aspects of regular stress testing is that it forces banks (and their supervisors) to develop the capacity to quickly and accurately assess the enterprise-wide exposures of their institutions to diverse risks, and to use that information routinely to help ensure that they maintain adequate capital and liquidity. The development and ongoing refinement of that risk-management capacity is itself critical for protecting individual banks and the banking system, upon which the health of our economy depends.