

For release on delivery
4:30 p.m. EDT
April 4, 2017

Departing Thoughts

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at

The Woodrow Wilson School

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Princeton, New Jersey

April 4, 2017

Tomorrow is my last day at the Federal Reserve. So in this, my final official speech, it seems appropriate to offer a broad perspective on how financial regulation changed after the crisis. In a moment, I shall offer a few thoughts along these lines. Then I am going to address in some detail the capital requirements we have put in place, including our stress testing program. Eight years at the Federal Reserve has only reinforced my belief that strong capital requirements are central to a safe and stable financial system. It is important for the public to understand why this is so, especially at a moment when there is so much talk of changes to financial regulation.

The Post-Crisis Regulatory Response

To understand the regulatory changes made in response to the 2007 to 2009 financial crisis, it is useful to recall the circumstances with which regulators and legislators were confronted. First, of course, was the sheer magnitude of the impact on the economy, which suffered its worst recession since the Great Depression. Second was the dramatic freezing up of many parts of the financial market, risking successive waves of fire sales that would send asset values plummeting anew. Third was the rapid deterioration of financial firms. Hundreds of smaller banks eventually failed. Bear Stearns, Merrill Lynch, Wachovia, and Countrywide were all close to failure when they were acquired by other financial firms with one or more forms of government support or assistance. American International Group was rescued directly by the government. Lehman Brothers *did* fail, which set off the most acute phase of the crisis.

The impact of Lehman's bankruptcy seemed to confirm fears that failure of the largest financial firms risked the complete implosion of the financial system. This, of course, is the too-big-to-fail problem: government officials may feel compelled to save private financial firms with public (that is, taxpayer) capital. Meanwhile, financing markets had nearly frozen up. Hence the extraordinary government actions that followed. Public capital was injected into all of

the nation's largest remaining banking firms following congressional enactment of the Troubled Assets Relief Program (TARP). The Federal Reserve and the Department of the Treasury provided financing and backstops, respectively, for money market funds and various forms of securitized assets. The Federal Deposit Insurance Corporation extended its guarantees to bank deposits and the senior debt of banks.

These and other measures ultimately proved successful in placing a floor under the downward spiral of the financial system. But it was against the backdrop of the need for massive taxpayer-backed assistance--to firms and to markets more generally--that Congress and financial regulators developed responses to the woefully inadequate capital levels of prudentially regulated firms; the systemic consequences of stress at previously non-prudentially regulated firms such as the free-standing investment banks; the widespread failures of risk management within these firms; the parallel failures in supervision of these firms; and the fragility of a financial system that had become characterized by large amounts of runnable short-term funding.

The first and, to my mind, still the most important element of regulatory strengthening was to increase the amount of capital held by banks to ensure they remained viable financial intermediaries that could finance economic activity. In fact, this effort began as part of the emergency stabilization efforts in early 2009, when we conducted a stress test of the 30 largest banking firms. Where we determined a firm did not have enough capital, we required that it either raise equity in the public markets or take some of the remaining government TARP capital.

The quick action in assessing the firms, recapitalizing them where needed, and sharing the results of the stress tests with the public stands as one of the turning points in the crisis. From there, we pursued a strategy of gradually strengthening ongoing capital requirements.

With a few exceptions, the approach we took from the fall of 2009 onward allowed the banks to use retained earnings to build their capital. We also began development of the first quantitative liquidity regulations to be used in prudential regulation by the U.S. banking agencies. This initiative was, of course, a direct response to the liquidity squeezes encountered during the crisis itself.

The capital and liquidity efforts were well underway by the time Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) in mid-2010. And Congress was, of course, aware of these efforts. So it is perhaps not surprising that the provisions of the Dodd-Frank Act relating to capital set some important qualitative standards for capital regulation rather than addressing capital levels as such.

A law as long and wide-ranging as the Dodd-Frank Act cannot be reduced to a single key premise or concern, excepting its general focus on financial stability and systemic risk.¹ However, with respect to the too-big-to-fail problem, I do think it fair to say--on the basis of both the text itself and its legislative history--that a pivotal choice was to make tighter the prudential regulation of the practices and activities of large banking organizations the presumptive approach to taming too-big-to-fail problems.

The alternative, much discussed at the time and since, would have been a structural approach. One such approach could have been something like the old Glass-Steagall Act separation of commercial banking from investment banking, which *prohibited* rather than simply regulated certain activities in different types of firms. Another structural approach would have been outright size limitation resulting in the breakup of some of the largest financial firms. The

¹ See Daniel K. Tarullo (2012), "Financial Stability Regulation," speech delivered at the Distinguished Jurist Series, University of Pennsylvania Law School, Philadelphia, PA, October 10, www.federalreserve.gov/newsevents/speech/tarullo20121010a.htm.

Dodd-Frank Act does give regulators authority to require divestitures by firms posing risks to financial stability. But these authorities, which contain only the most general of standards, seem intended to be used only if the panoply of other measures in the legislation have failed to contain the too-big-to-fail problem.

Thus, at least in the first instance, the Dodd-Frank Act forgoes structural solutions, which might have been cleaner conceptually, but perhaps much more complicated as a practical matter. Instead, it imposes a host of restrictions and requirements. So we have counterparty credit limits, risk retention requirements, incentive compensation constraints, resolution planning requirements, and others. These new statutory measures were meant to, and do, coexist with the capital and liquidity requirements put in place by the banking agencies under their pre-existing authority, as enhanced by the Dodd-Frank Act. An important corollary of this basic approach was that the Dodd-Frank Act requires that many of these regulations be progressively more stringent as applied to firms of greater systemic importance.

From this perspective, then, it is not surprising that the Dodd-Frank Act implementation has been a major undertaking, that banks (and sometimes supervisors) feel overwhelmed by the breadth of the resulting compliance effort, and that there is some overlap among some of the regulations. This outcome was, in effect, the price of the largest banks not being subject to a direct structural solution such as breakup.

None of this is to say that the Dodd-Frank Act got the mix of restrictions just right. To the contrary, it would have been surprising for such a major piece of legislation passed in the immediate aftermath of the crisis to have done so. Usually, a law like the Dodd-Frank Act would have been followed some months later by another law denominated as containing technical corrections, but also usually containing some substantive changes deemed warranted by

analysis and experience. But partisan divisions prevented this from happening. And the novelty of many of the forms of regulations adopted by financial regulators, either in implementing the Dodd-Frank Act or under existing authorities, almost assures that some recalibration and reconsiderations will be warranted on the basis of experience.

So there are clearly some changes that can be made without endangering financial stability. Foremost among these are the various bank size thresholds established in the Dodd-Frank Act or in agency regulations for the application of stricter prudential requirements. For example, as I have said for several years now, we have found that the \$50 billion in assets threshold established in the Dodd-Frank Act for banks to be “systemically important,” and thus subject to a range of stricter regulations, was set too low. Similarly, the \$10 billion asset threshold for banks to conduct their own required stress tests seems too low. And the fact that community banks are subject at all to some of the Dodd-Frank Act rules seems unnecessary to protect safety and soundness, and quite burdensome on the very limited compliance capabilities of these small banks.

Beyond the thresholds issue, though, are there statutory provisions or regulations whose substance could be adjusted to better match economic or compliance costs with financial stability benefits? Again, it would be very surprising if this did not prove to be the case over time. It would also be surprising if we did not find areas in which rules needed to be strengthened in order to achieve financial stability goals, particularly as financial markets change. Generally, I think it is a bit early to judge the balance of costs and benefits of many of the new rules. Some are not yet fully implemented. Firms are still in the process of adjusting to the new rules. And it is still somewhat difficult to determine, for example, what should be considered “normal” levels of liquidity or lending, insofar as the pre-crisis period was one in which high levels of both

lending and liquidity proved unsustainable. Moreover, given the healthy increases in lending over the last several years and the record levels of commercial bank profits recorded in 2016, it would seem a substantial overreach to claim that the new regulatory system is broadly hamstringing either the banking industry or the economy.

But there are areas where I think the case for change has become fairly strong. The Volcker rule is one. During the debates on what became the Dodd-Frank Act, former Chairman Paul Volcker offered a fairly straightforward proposal: no insured depository institution or affiliate thereof should be permitted to engage in proprietary trading. It seemed then, and seems now, like an idea that could contribute to the safety and soundness of large financial firms. However, several years of experience have convinced me that there is merit in the contention of many firms that, as it has been drafted and implemented, the Volcker rule is too complicated. Achieving compliance under the current approach would consume too many supervisory, as well as bank, resources relative to the implementation and oversight of other prudential standards. And although the evidence is still more anecdotal than systematic, it may be having a deleterious effect on market making, particularly for some less liquid issues.

There are three problems--two in the statute and one in the regulatory approach--that I think are related. The first statutory problem is that five different agencies are involved. While the statute does not require a single regulation agreed upon by all five, it understandably calls for coordination and consistency in rulemaking and implementation. The joint or parallel rulemaking among multiple agencies required in various parts of the Dodd-Frank Act has advantages and disadvantages that differ across subject matter. Here, though, the disadvantages seem to dominate. Because almost any effort to distinguish market making from proprietary trading, for example, is impossible to sensibly reduce to a formula or precise rule across all

traded instruments, there is ongoing and substantial need for context-specific, data-heavy judgment. Efforts to achieve consistency in treatment across agencies have been both time-consuming and, at times, unsuccessful.

The second problem is that the approach taken in the regulation in pursuit of consistency was one that essentially contemplated an inquiry into the intent of the bankers making trades to determine, for example, whether the trades were legitimate market making. The agencies knew this approach would be complicated when we adopted it, but it seemed the best way to achieve consistency, at least over time. I think the hope was that, as the application of the rule and understanding of the metrics resulting from it evolved, it would become easier to use objective data to infer subjective intent. This hasn't happened, though. I think we just need to recognize this fact and try something else.

Had there been an obviously better approach, we would have taken it five years ago. My suspicion is that it lies in reviewing and monitoring the trading limits established on all trading desks. As contemplated in the statute, capital requirements might also be used as a complementary tool, such as by requiring progressively higher amounts of capital as trading inventories age--a pretty good indicator that market making is morphing into proprietary trading. Whether a consistent approach can be developed while five agencies continue to be involved is not clear, but it is certainly worth trying.

The third problem, also in the statute, is that the Volcker rule applies to a much broader group of banks than is necessary to achieve its purpose. As I have said before, the concerns underlying the Volcker rule are simply not an issue at community banks.² Many regional banks

² See Daniel K. Tarullo (2014), "A Tiered Approach to Regulation and Supervision of Community Banks," speech delivered at the Community Bank Symposium, Chicago, IL November 7, www.federalreserve.gov/newsevents/speech/tarullo20141107a.htm.

have few or no trading assets of any sort, so proprietary trading is obviously not a concern there either. While the regulatory agencies have tried to tailor the rules so as to avoid burdening these banks, even the process of figuring out that the rules do not constrain them is a compliance cost that should be eliminated. One approach would be to exempt all banks with less than \$10 billion in assets and other banks that report less than some nominal amount of trading assets.

Capital Regulation

Let me now turn to capital. The history of financial regulation over the last several decades is in many respects defined by an increasing emphasis on capital requirements and, specifically, higher minimum ratios based on a more rigorous definition of what constitutes loss-absorbing capital. This tendency can be explained by the fact that capital is a particularly supple prudential tool. As activity and affiliation restrictions on banks have been loosened, and as the integration of traditional lending with capital markets has created new financial products at a rapid pace, capital requirements can provide a buffer against losses from *any* activities.

No single measure of capital is sufficient to ensure an adequate buffer however. Simple leverage ratios are a good check on banks becoming too debt dependent, but they encourage more risk-taking, insofar as they impose the same capital charge for every asset, no matter how risky. Standardized risk-based capital ratios implement the intuitively appealing notion that a bank's capital should depend on the riskiness of its assets. But the grouping of individual loans and securities into necessarily broad categories of risk weights (e.g., residential mortgages) can be arbitrated. And a firm holding lots of assets that look very low-risk in normal times can be vulnerable if its total leverage is high during stress periods. Models-based capital requirements can better distinguish among risks to some degree, and they can be made more forward-looking than static leverage or risk-based ratios. But, to the extent that banks' internal models are used, it

is difficult to monitor whether banks are intentionally or unintentionally running models that understate their risks. And, of course, they are subject to the usual limitations of models that are based only on past experience and correlations.

In the post-crisis period, we have continued the previous U.S. practice of using complementary leverage ratio and standardized risk-weighted capital requirements, though at higher levels and with more reliance on common equity as the preferred measure of true capital strength on a going concern basis. We have added a stress test, now based on a supervisory model. We, along with some other jurisdictions that are home to banks of global systemic importance (G-SIBs), have also applied surcharges to the leverage and risk-weighted requirements of such banks. The rationale for this feature of our capital regime is that the potential negative externalities caused by the stress or failure of a G-SIB warrant a higher level of capital.³ Graduated capital surcharges have the additional policy benefit of providing these firms with an incentive to reduce the size and scope of their activities so as to present lesser risk to the financial system.

The U.S. banking agencies based post-crisis capital requirements on historical loss experiences so as to require banks to have a capital buffer that could absorb losses associated with a significant economic downturn and remain viable financial intermediaries in the eyes of customers, counterparties, and financial markets.⁴ But our researchers, like those at some other

³ As implemented in the United States, the surcharge for G-SIBs was calibrated to provide a sufficient amount of additional capital to sufficiently reduce the chances of a G-SIB's failure so that the impact of its failure, discounted by the probability of that failure occurring, would approximately equal the impact of the failure of a large bank holding company that is not a G-SIB, discounted by the somewhat higher probability of its failure (because its capital ratio is lower without a surcharge). For a fuller explanation of this "expected impact" approach, see Board of Governors of the Federal Reserve System (2015), "Calibrating the G-SIB Surcharge," white paper (Washington: Board of Governors of the Federal Reserve System, July 20), www.federalreserve.gov/aboutthefed/boardmeetings/gsib-methodology-paper-20150720.pdf.

⁴ See, for example, Daniel K. Tarullo (2011), "The Evolution of Capital Regulation," speech delivered at The Clearing House Business Meeting and Conference, New York, NY, November 9, www.federalreserve.gov/newsevents/speech/tarullo20111109a.htm.

official-sector entities, have been using more formal economic analysis to estimate the level of capital requirements that best balances the benefits associated with reduced risk of financial crisis with the costs of banks funding with capital rather than debt. A recent study by three Federal Reserve Board researchers concludes that the tier 1 capital requirement⁵ that best achieves this balance is somewhere in the range of 13 percent to 26 percent, depending on reasonable choices made on some key assumptions.⁶ By this assessment, current requirements for the largest U.S. firms are toward the lower end of this range, even when one takes account of the de facto capital buffers imposed on most firms in connection with the stress test.

This assessment, when added to our original historically-based approach and the methodology used in developing the capital surcharges, suggests strongly that a reduction in risk-based capital requirements for the U.S. G-SIBs would be ill-advised. In fact, one might conclude that a modest increase in these requirements--putting us a bit further from the bottom of the range--might be indicated. This conclusion is strengthened by the finding that, as bank capital levels fall below the lower end of ranges of the optimal trade-off, the chance of a financial crisis increases significantly, whereas no disproportionate increase in the cost of bank capital occurs as capital levels rise within this range. In other words, in trying to avoid a future financial crisis, it is wise to err somewhat toward the higher end of the range of possible required capital levels for this group of firms.

⁵ The post-crisis amendments to the banking agencies' capital regulations strengthened the definition of tier 1 capital by having at its core common equity tier 1 capital, the most loss-absorbing form of capital comprised primarily of common equity and related surplus, retained earnings, accumulated other comprehensive income, and limited amounts of common equity tier 1 minority interest. Specifically, tier 1 capital consists of common equity tier 1 capital plus additional tier 1 capital instruments which include qualifying non-cumulative preferred stock, related surplus, and limited additional amounts of tier 1 minority interest.

⁶ Simon Firestone, Amy Lorenc and Ben Ranish (2017), "An Empirical Economic Assessment of the Costs and Benefits of Bank Capital in the U.S.," Finance and Economic Discussion Series 2017-034 (Washington: Board of Governors of the Federal Reserve System), www.federalreserve.gov/econres/feds/files/2017034pap.pdf.

On the other hand, it seems reasonably apparent that the increased granularity of the standardized risk-weighted capital requirements put in place after the crisis, while necessary to deal with the range of risks in larger banks, is unduly complicated for community banks. It's not that these requirements have increased appreciably the amount of capital community banks hold, but more that the complexity of compliance and reporting imposes costs that are disproportionately much greater for these banks, given that they have much smaller balance sheets over which to amortize the associated costs. For this reason, I believe we should be moving toward a much simpler capital regime for community banks. The federal banking agencies have already taken some steps in this direction, and they can take a few more. But it may be helpful to amend the law so as to make clear that the agencies would have the flexibility to create a simple capital regime applicable only to community banks.

There has been much discussion of late of the leverage ratio requirement, from multiple perspectives. There are proposals to make a higher leverage ratio requirement either mandatory or optional for banks, which would then be relieved of risk-weighted capital requirements and many other prudential regulations. There are also those who have questioned the relative cost-benefit tradeoff of the "enhanced supplementary leverage ratio," the 2 percent surcharge applicable to all eight U.S. G-SIBs.

Increasing the current 4 percent or 5 percent leverage ratio requirement to, say, 10 percent would certainly yield a very well-capitalized set of banks based on the *current* balance sheets of large banks. But one needs to look at the dynamic effects of such a requirement. Since a higher leverage ratio would also make banks less profitable, and with the constraints of risk-based capital and liquidity requirements lifted, they would be strongly incentivized to change the composition of their balance sheets dramatically, shedding safer and more liquid assets like

Treasuries in exchange for riskier but higher-yielding assets.⁷ After all, with a leverage ratio as the only significant constraint, the regulatory cost of holding a short-term Treasury bill is identical to that of a junk bond. It is this very limitation of a leverage ratio that led to the creation of a complementary risk-based capital requirement in the 1980s. To truly assure the safety and soundness of the financial system, a leverage ratio serving as the sole or dominant form of prudential regulation would probably have to be set considerably higher, at a level where the impact on financial intermediation could be quite substantial.

As to the impact of the 2 percent enhanced supplementary leverage ratio, our experience leads me to believe that it may be worth changing to account for the quite different business operations of the G-SIBs, particularly those in the custody business. The complementarity of risk-based capital requirements and leverage ratios suggests that there should be some proportionality between the two. This is, of course, the current situation with respect to the standards applicable to non-systemic banks, with the leverage ratio requirement being sensibly set somewhat below the risk based requirement. However, with the additional standards applicable only to the eight systemically important firms, we have a sliding scale of risk-based surcharges but an across-the-board 2 percent leverage ratio surcharge.

In practical terms, the asymmetry is most significant for the two banks that are dominantly custodial and transactional in nature, rather than lending and trading firms. These banks have had the lowest risk-based surcharges of the eight G-SIBs--currently 1-½ percent--but their leverage surcharge is 2 percent. This is especially problematic for their operations, since they prudently reinvest custody customer deposits into safe and liquid assets.

⁷ Some market observers and participants believe that current capital requirements have impinged somewhat on market liquidity for Treasuries. While this claim is hard to prove with existing data, particularly given the difficulties of determining optimal levels of liquidity, it seems reasonable to assume that a very high leverage ratio would seriously constrict market making in Treasuries.

I think it would be sensible for the banking agencies to consider altering the enhanced supplementary leverage ratio requirement so that it would be set with an eye toward the risk-based surcharge. One, but certainly not the only, way to do this would be for the enhanced supplemental leverage ratio to be 1 percent for the firms with a 1 percent to 1-½ percent risk-based surcharge, 1-½ percent for those with a 2 percent or 2-½ percent risk-based surcharge, and 2 percent for those at 3 percent or above.

An alternative approach to mitigating the distortionary effects of the leverage ratio requirements is to exclude certain “riskless” assets from the denominator. Some central bankers around the world have been arguing to exclude central bank reserves from the leverage ratio denominator, on the ground that they are “safe” and that including them may make monetary policy harder to execute in a period of unusually large central bank balance sheets. But this would defeat the whole purpose of a leverage ratio, which is to place a cap on total leverage, no matter what the assets on the other side of the balance sheet may be. Cash holdings, for example, are not excluded. This proposal would also create a classic slippery slope risk, which was illustrated during a discussion in which I participated last year. When a central banker raised the idea of excluding reserves, a finance ministry official mused aloud that perhaps sovereign debt should also be excluded.

Stress Testing

Raising the minimum ratios in leverage and risk-based capital standards, requiring that qualifying regulatory capital be truly loss absorbing, and setting higher requirements for the most systemically important banks have been important steps toward the goal of a well-capitalized, and thus safer, financial system. But the stress testing system begun during the crisis, and continually refined since, has been the key innovation in capital regulation and supervision and

makes those other measures more effective. The success of the 2009 stress test in restoring confidence in the financial system during the crisis encouraged Congress to make stress testing a required and regular feature of large-firm prudential regulation.

As the term suggests, stress tests evaluate the capacity of banks to absorb losses that may be associated with major economic adversity and remain not only technically solvent, but also viable financial intermediaries. They are explicitly forward-looking, in that they involve creating unlikely but plausibly severe economic scenarios and then modeling the likely impact of those scenarios on bank assets and earnings. The Federal Reserve has tied the results of stress tests into capital regulation by requiring that bank capital distributions be consistent with maintaining viability in the event the severe scenario were to materialize. That is, dividends and share repurchases cannot bring the bank's capital level below the sum of minimum capital requirements and the amount of losses that could be sustained in the stress event. By looking at the impact of such scenarios on the considerable part of the financial industry accounted for by the larger bank holding companies subject to the requirement, the Federal Reserve's approach gives insight into how substantial economic or financial shocks would affect the financial system and the real economy.

One virtue of stress testing is that it allows a forward-looking assessment of potential losses that is customized to the portfolios and business models of each bank, while still being consistent across the banks. The Federal Reserve uses independent supervisory models to estimate losses and revenues under stress, both to achieve more comparability across the results for different banks and to preclude any temptation for banks to game their own models. This linkage of stress testing to bank capital requirements has been a good way for regulators to regularize exercise of their broad statutory discretion to set individual capital requirements on a

bank-by-bank basis.⁸ Banks subject to the supervisory stress tests have generally found it to be their binding capital constraint. This is as it should be, insofar as stress testing is meant to help set capital requirements for when they will most be needed--that is, in a serious economic downturn.

From the first stress test performed in the winter of 2009, the Federal Reserve has publicly disclosed progressively more information about its supervisory model, the scenarios, and the results. During the crisis, disclosure was intended to help restore confidence in the banking system. Our continuation and expansion of disclosure helps market participants, analysts, academics, and the public better evaluate both the condition of the banks and the rigor of supervisory oversight. It thus serves the dual purpose of market discipline and government agency accountability.

To serve its important financial stability purpose, stress testing must never become static. As the financial system evolves, with the creation of new products and new correlations among asset price movements, the supervisory model must account for these changes. And as salient risks to the financial system arise, the scenarios must test for these new risks. Apart from the inherent need for adaptation, though, there is one respect in which the Federal Reserve's stress testing program is incomplete and other respects in which it is still in transition from a crisis and post-crisis measure to a permanent and central feature of prudential oversight.

The significant way in which the stress testing program is incomplete is that it has only limited features with which to assess the condition of participating banks from a macroprudential perspective.⁹ For example, it generally does not directly take account of second-round effects of

⁸ See 12 USC 3907(a) (1).

⁹ The stress testing program does have some macroprudential elements, which have been modestly enhanced in recent years. For example, we vary the market shock over time to reduce the incentive for firms to correlate their

stress on the financial system, such as the possible fire sale of assets by financial firms in need of capital or funding, which can further depress asset values of other firms below levels resulting from the initial economic or financial shock.¹⁰ These effects are harder to model but very important for a stress test designed to achieve financial stability objectives. The Federal Reserve has begun a research program to try to develop, over the next few years, sound macroprudential elements to incorporate into the stress test alongside some of the countercyclical features that have already been added.

The transition of stress testing from crisis program to a permanent feature of prudential oversight is unfinished in both Federal Reserve regulations and supervisory practice. The de facto capital requirements produced by the stress test have not been fully integrated into, and reconciled with, other applicable capital rules. Thus, for example, our stress testing program assumes that a firm will continue to make its planned capital distributions during a stress period even though the regulatory capital rules now include a capital conservation buffer to limit such distributions. As to supervision--because the failure of a firm to meet Federal Reserve expectations with respect to its capital risk-management and planning processes can lead to a “qualitative” objection to its capital distribution plans--firms (and, at times, perhaps supervisors) have placed more emphasis on these matters than on other issues raised in the supervisory process throughout the year.

It is probably worth noting at this juncture that one of the features of the stress testing program that some banks have found most troubling is that it culminates in the annual

asset holdings or adopt correlated hedging strategies that are treated relatively favorably under one particular market shock scenario.

¹⁰ See, for example, Fernando Duarte and Thomas M. Eisenbach (2013), “Fire-Sale Spillovers and Systemic Risk,” Federal Reserve Bank of New York Staff Report no. 645 (New York: Federal Reserve Bank of New York, October), www.newyorkfed.org/medialibrary/media/research/staff_reports/sr645.pdf.

announcements of whether the Federal Reserve objects to each participating bank's capital plan-- an event that still garners considerable investor and public attention.¹¹ The potential for embarrassing, public objections to their plans has been disconcerting to some banks, which pointed out that--by design--they were not given the supervisory model for calculating post-stress minimum capital levels and that they might not be able to predict when supervisory concerns with some aspects of their capital planning processes would ripen into a public objection.

It is certainly the case that this feature of our stress testing program was intended to, and has, focused the minds of banks' senior management on their capital positions and capital planning processes. Motivating management with the stress test was appropriate in a time when capital needed to be built up and when serious shortcomings of pre-crisis risk management at many large U.S. banks needed to be remedied. To be honest, I was stunned in my first few months at the Federal Reserve to find out that many of these banks were unable to aggregate their total exposure to particular counterparties across the many parts of the bank in anything like a reasonable time. Some firms did not have ready access to basic information about the location and value of collateral that they held. As recently as a couple of years ago, we were still seeing some significant problems with data and modelling reliability in banks' internal risk-management processes.

Still, the question was always how long we would need this highly focused set of annual determinations. Several years ago we took a first step to reduce the potential for a quantitative objection by giving any bank whose planned distributions would have brought it below the post-

¹¹ An objection can be forthcoming either because the bank's proposals for capital distributions would leave it with less capital than our modeling determines is necessary were the severely adverse scenario to be realized or because our supervisors have found substantial flaws in a bank's capital planning and capital risk-management processes.

stress minimum capital requirements a short time in which to adjust its plan.¹² Last fall, I gave a speech in which I previewed the Board’s additional thinking on this subject, following the Board’s year-long review of the stress testing program.¹³ One point was our intention to remove the “qualitative” part of the annual stress testing exercise for participating banks with less than \$250 billion in assets. We have since done just that, in recognition of the fact that these firms had generally met the supervisory expectations for capital planning and risk management put in place after the crisis. In that speech I also indicated that the Board of Governors was considering a significant revision to our stress testing program that would both integrate it into other applicable capital requirements and begin to reduce the amount of attention directed at the annual announcement of stress test results.

The proposal for what our staff has called a “stress capital buffer” (SCB) would simplify our capital regime by replacing the existing 2.5 percent fixed capital conservation buffer applicable to all banks with a buffer requirement equal to the maximum decline in a firm’s common equity ratio under the severely adverse scenario of the stress test.¹⁴ This change would, of course, apply only to the roughly 30 banks that participate in the supervisory stress test. This buffer would be recalculated after every year’s stress test. Then, through the succeeding year, a bank would have to observe the constraints on capital distributions written into our point-in-time capital requirements if its capital ratio fell below the sum of our minimum capital requirement and the applicable stress capital buffer.

¹² This change did not lead to any reduction in the post-stress capital requirements. It simply gave the firm an opportunity to reduce its planned capital distributions so that they would not lead to a quantitative objection.

¹³ For more information on the Federal Reserve’s recent review of the Comprehensive Capital Analysis and Review (CCAR) program, see Daniel K. Tarullo (2016), “Next Steps in the Evolution of Stress Testing,” speech delivered at the Yale University School of Management Leaders Forum, New Haven, CT, September 26, www.federalreserve.gov/newsevents/speech/tarullo20160926a.htm.

¹⁴ The SCB would be floored at 2.5 percent such that if a firm’s maximum common equity tier 1 capital ratio decline under the severely adverse scenario is less than 2.5 percent, its SCB would be 2.5 percent.

Because the capital surcharge on the eight G-SIBs already exists as a part of our regular capital rules, the stress capital buffer approach would effectively add the surcharge to our estimates of the amount of capital needed under stress. The surcharges were put in place because the material distress or failure of a G-SIB would have an adverse impact on the financial system as a whole that is far greater than the impact on the financial system of the distress or failure of a non-G-SIB firm.¹⁵ Accordingly, G-SIBs should face capital surcharges that compel internalization of those external costs. Because the difference in the external costs of the distress or failure of a G-SIB as compared to a non-G-SIB is likely to be at least as high during times of macroeconomic and financial market stress as during ordinary times, there is no reason why the G-SIB surcharge should not be a part of the post-stress capital regime. A complementary point is that the extra buffer required by the G-SIB surcharge reflects the fact that even the best-conceived annual stress scenarios cannot capture all tail risks in the financial system.¹⁶

The SCB proposal would thus raise somewhat the capital requirements of the eight G-SIBs. This outcome is consistent with analysis of the costs and benefits of capital requirements that I discussed earlier, as well as the rationale for surcharges.¹⁷ It is also consistent with the intuition, itself having some analytic backing, that because Congress decided against fundamental structural measures to deal with the too-big-to-fail problem, we should err

¹⁵ Board of Governors, “Calibrating the G-SIB Surcharge.”

¹⁶ An argument against inclusion of the G-SIB surcharge offered by some is that macroprudential risks facing G-SIBs are lower in the aftermath of a financial crisis. We looked into this argument and concluded that experience actually shows that there is no lower probability of another serious reversal in a year following an initial serious reversal.

¹⁷ Some have argued that incorporating the G-SIB surcharge into post-stress capital expectations is not warranted because doing so would be duplicative of the stress test’s global market and counterparty default shocks, which apply only to G-SIBs, and because post-crisis resolvability measures have lessened the likelihood that a G-SIB would fail. The first argument reflects a misunderstanding of CCAR’s shocks, which apply only to G-SIBs because G-SIBs are the only firms in CCAR for which these exposures are material and are not designed to capture the adverse impact that a G-SIB failure would have on the financial system as a whole, as the G-SIB surcharge is. The second argument fails to acknowledge that making the largest firms more resolvable and strengthening their resiliency are two separate goals.

somewhat on the side of higher capital requirements for these firms. Indeed, there are some academics and others who continue to make a case for even higher capital requirements.

The inclusion of the surcharges would allow the Federal Reserve to relax some of the conservative assumptions currently made in the stress test without lowering the overall post-stress capital requirements for G-SIBs.¹⁸ While conservative assumptions were appropriate coming out of the financial crisis in the early days of the stress test, the SCB and its inclusion of the surcharges would offer an opportunity to update these assumptions without reducing the overall capital requirements for G-SIBs. At the same time, relaxing these assumptions would result in a modest decline in the effective capital requirements of the non-G-SIB participating banks when, as I hope and expect, the Board of Governors moves forward with a rulemaking implementing the SCB idea.¹⁹

Adoption of the SCB should remove a bit more of the drama originally associated with the annual announcement of the stress test results. But some would remain, particularly given the possibility of a qualitative objection, even where the supervisory model shows that the firm would have enough capital to remain a viable intermediary in the event something like the severely adverse scenario came to pass. Although the largest firms, unlike those with less than \$250 billion in assets, are not yet generally meeting all supervisory expectations around stress testing and capital planning, they have each made substantial progress since 2009. With a few exceptions, the issues observed during recent Comprehensive Capital Analysis and Review

¹⁸ This would likely include replacing the supervisory model's current assumption that a firm's balance sheet increases during the severely adverse scenario with a simpler assumption under which a balance sheet and risk-weighted assets remain constant and relaxing the assumption that all of a firm's planned dividends and share repurchases would proceed during CCAR's two-year planning horizon. Instead, given the SCB's continuous constraint on distributions, we would assume a firm will maintain its dividends for one year while reducing its share repurchases.

¹⁹ Based upon data from the 2015 and 2016 CCAR exercises, Federal Reserve staff estimates that the SCB would reduce by at least \$10 billion the aggregate amount of common equity tier 1 capital the non-G-SIBs would need to maintain to avoid limitations on capital distributions.

(CCAR) cycles are less fundamental than those we were seeing even a few years ago. So I think the time may be coming when the qualitative objection in CCAR should be phased out, and the supervisory examination work around stress testing and capital planning completely moved into the normal, year-round supervisory process, even for the G-SIBs.

Coupled with adoption of the SCB, and the changes in modeling and assumptions associated with that proposal, the elimination of the qualitative objection process would integrate the process and substance of stress testing into the rest of the Federal Reserve's prudential oversight activities. In doing so, it should alleviate the apprehension of banks that they may be subject to objections to their capital plans that are both very public and hard to fully anticipate. The SCB itself would continue the Federal Reserve's efforts to tier prudential requirements even among larger banks, with the G-SIBs having somewhat higher capital requirements commensurate with the damage their failure would inflict on the broader economy, and the regional banks subject to modestly lower requirements than those that effectively apply at present.

Having just described some good directions for the evolving stress testing regime, let me comment on what I regard as some ill-advised ideas circulating in current policy discussions. One is to detach the stress test from any limitations on capital distributions. This would, in effect, make the stress test simply an informational exercise for supervisors and markets and would, accordingly, presumably be treated less seriously by all concerned. Were we to do so, the very virtues of the stress test that I recounted earlier would be lost, as we would return to using only general, backward-looking risk weights. Of course, it would also reduce capital requirements for the largest banks, which may be one of the motivations for the idea.

I have heard two arguments for this idea. One is that Congress did not require that the stress test be used to limit capital distributions. The other is that it is somehow an unacceptable encroachment on the prerogatives of bank boards of directors to limit their discretion to declare dividends or authorize stock repurchases.

While Congress did not explicitly call for stress tests to be used to assure adequate capital levels in larger banks, it did call for increasingly stringent capital measures as the systemic importance of banks increased. Section 165 of the Dodd-Frank Act, which contains the stress testing requirement, is singularly focused on achieving financial stability objectives. Moreover, as I noted earlier, Congress in the 1980s gave the federal banking agencies authority--within their discretion--to set capital requirements individually for specific banks. Again, as noted earlier, using stress tests to do so is not only wholly within that discretion. It is a more regularized way of doing so than an ad hoc judgment on a bank-by-bank basis.

The argument that bank boards should not be constrained in making capital distributions amounts to an argument that there should be no capital regulation, since even traditional capital regulations limited boards from, say, declaring a dividend that would take the bank below minimum capital levels. And those who make this argument seem to have forgotten that some banks continued to pay dividends in 2007 and 2008 even as their situations became increasingly precarious.

Another unwise idea would be to give the supervisory model to the banks. Some have argued that it is only fair to do so, because otherwise banks cannot know exactly what their capital requirements will be. For example, if a bank doesn't know with precision what capital charge will effectively be applied to a certain class of home equity loans, it will be handicapped in deciding how many such loans to offer, and on what terms.

In fact, observation of the stress test results over time has given the banks--as well as analysts and other outside parties--a reasonable idea of the loss functions and other elements of the supervisory model. And the Federal Reserve has increased over time the amount of information it discloses about its stress test models. But there are very good reasons not to publish the model itself. In the first place, remember why this exercise is called a stress *test*. This is not a case of using a model to set a regulation that stands on its own as a constraint, and then testing to see if there is compliance with the rule. There, the model is essentially the reasoning by which the regulation was set. Even in a case where the test is independent of the regulatory end, risks exist, as we saw in the Volkswagen case, where the company is said to have designed its cars to pass the required emissions test but not to actually achieve the regulatory goal of reduced emissions.

In the financial area, the dangers of disclosure are much greater. We are trying to evaluate what may happen to a bank's assets under stress. If a bank has the model, it will be able to optimize its balance sheet for the day on which the stress test is to apply by shifting into assets for which relatively lower loss functions apply. But it can then shift those assets back over succeeding days or weeks. Thus, the test will give a misleading picture of the actual vulnerabilities of the firm. In this and other ways, banks would use the models to guide changes in their behavior that do not change the risk they pose to financial stability, but do change the measured results of the stress test. Regulators and academics have long recognized that this type of behavior by banks, known as regulatory capital arbitrage, has been a persistent threat to financial stability. Additionally, giving the firms the model will likely encourage increased

correlations in asset holdings among the larger banks--a trend that increases systemic risk, since everyone will be exposed should those asset classes suffer reversals.²⁰

Releasing the computer code used in the model projections would repeat a serious error made a quarter century ago. In 1992, Congress established revised capital standards for the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), the centerpiece of which was a stress test. However, for reasons that foreshadowed many of the arguments adduced today, all the details of the model were made public and any changes went through the standard notice and comment process. As a result, the government-sponsored enterprises (GSEs) and the public clearly understood the model. With the model in the hands of the GSEs, even a scenario of the severity of the 2006 to 2008 experience produced only mild losses for them. Of course, this result stands in stark contrast to the actual losses, which were sufficient to drive them into conservatorship in September 2008.

In short, we should recognize that what might appear to be a reasonable transparency measure in publishing the models will in fact result in less protection for the financial system. Thus, if the model were to be published, I would suggest that the minimum required capital levels would need to be materially increased in order to take account of the dynamics I just described.²¹

²⁰ Incentives toward greater asset correlations can be a concern even with a non-disclosed supervisory stress test model, since banks can approximate relevant risk loss functions based on their experience and observation of supervisory results. That is why the stress test and scenarios need to be regularly modified to take account of changing risks and correlations. It is also another reason why development of macroprudential features of the stress test is important. Finally, it is a reason to continue to require firms to conduct their own internal stress tests.

²¹ Some have also suggested that the stress tests have caused banks to change the way they allocate credit to various types of borrowers. At one level, this could be said of any risk-based capital standard including the old Basel I standards. However, this criticism fundamentally mischaracterizes the nature and purpose of stress tests, which is to determine whether a bank can remain a going concern and continue to make loans through a severe recession, like the one we experienced from 2007 to 2009. To achieve these goals, the Federal Reserve's projections of stressed losses are highly sensitive to the full range of risks posed by the underlying assets, especially the risk that the asset will perform poorly during a downturn. The standard in stress testing is therefore whether lending practices are sustainable during tough times or not, as was the case in the 2007 to 2009 recession and other credit crises.

There are a couple of ways to respond to bank concerns without courting these dangers. One would be to add some granularity in the definition of asset categories subject to a specific loss function. At times, some banks have felt that the breadth of certain categories of assets used by the supervisory model means there is a good bit of divergence in the risks associated with assets within the same category. The other would be for the Federal Reserve to publish a set of hypothetical portfolios with the model-implied losses on these portfolios. To that end, staff have been working on “control portfolio” level disclosures. These would permit a fairly accurate inference of the expected losses on any given set of assets. At the same time, they would not permit participants to game the models by scrutinizing them for the precise points where they were weakest.²²

Conclusion

Much as I would have liked to touch upon important topics such as the need for credible resolution mechanisms for large banks and for adaptable regulatory processes to respond to new forms of shadow banking, I needed to be selective in drafting this speech. I concentrated on capital regulation because it is the single most important element of prudential financial regulation. The new features of G-SIB surcharges and stress testing help guard against a severe new financial crisis and contain the too-big-to-fail problem. As proposals for regulatory change swirl about, it is crucial that the strong capital regime be maintained, especially as it applies to the most systemically important banks. Neither regulators nor legislators should agree to

²² The negative effects of such a disclosure regime are exemplified by the now-infamous cutoff of many securitization programs at FICO scores of 620. Because of the transparency of the pre-crisis models used by credit rating agencies, loan originators understood that by getting their riskiest borrowers to improve their credit scores to 620, they could be included in various securitization programs.

changes that would effectively weaken that regime, whether directly or indirectly. It would be tragic if the lessons of the financial crisis were forgotten so quickly.