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Banking Trends

Do Stress Tests Reduce Credit Growth?

Stress tests are supposed to ensure your access to credit during the next downturn, but some critics claim that they also limit your access to credit today. We test that theory.

BY EDISON YU

As we approach the 10th anniversary of the nation's first supervisory stress test, some analysts argue that stress tests have gone too far and that large banks have inefficiently restricted credit. This article explores the preliminary evidence about the effects of stress tests on the credit supply. However, before considering the evidence, we need to know how the stress tests work in the U.S. and why the stress tests might reduce credit growth.

What Is a Stress Test?

The goal of supervisory stress tests is to ensure that systemically important banking institutions are adequately capitalized under even very adverse economic conditions. Stress tests use models to estimate a bank's need for capital under these conditions. Among other benefits, stress tests ensure that large banks can provide credit to households and firms in a downturn, thus reducing the severity of the downturn.

To restore public confidence in the largest financial institutions

at the height of the financial crisis in 2009, the Federal Reserve and other banking supervisors implemented the first stress test, the Supervisory Capital Assessment Program (SCAP), which estimated the potential losses that would be incurred by the largest U.S. banks if economic and financial conditions worsened.

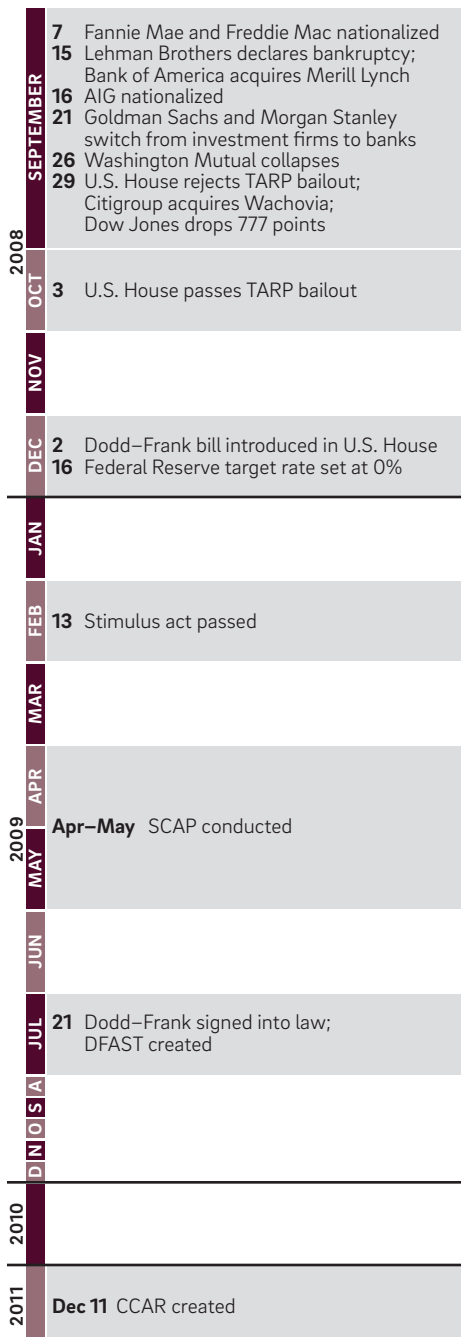
Under SCAP, supervisors determined whether the largest financial institutions in the U.S. had sufficient capital to weather the recession and worsening financial conditions. They assessed 19 financial institutions' capital buffers based on potential macroeconomic scenarios in 2009 and into 2010. Building on SCAP, the U.S. implemented two related stress test programs: the Dodd-Frank Act Stress Test (DFAST) and the Comprehensive Capital Analysis and Review (CCAR) program.

DFAST was created by the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank"), which required annual supervisory stress tests for all financial institutions that met two criteria. First, the institution had to have total consolidated assets of more than \$50 billion. And second, its primary regulator had to be federal. In addition to the supervisory tests, large

FIGURE 1

Stress Test Timeline

The federal government instituted stress tests as part of its response to the 2007–2009 financial crisis. September 2008 to December 2011



banking organizations, or bank holding companies (BHCs), are also required to run internal stress tests.

Congress raised the threshold of the supervisory tests to \$100 billion in 2018. As of that change, BHCs with consolidated assets between \$100 billion and \$250 billion are now only subject to periodic supervisory stress tests.¹ (Banks with total consolidated assets of more than \$250 billion are still subject to annual supervisory stress tests.)

The Federal Reserve conducts DFAST using its own independent models to project a bank's income, loan loss, and capital level over a nine-quarter planning horizon under three different hypothetical scenarios of the aggregate economy. The three scenarios—baseline, adverse, and severely adverse—hypothesize future economic outcomes, including recessions of different magnitudes. For example, in the severely adverse scenario, the U.S. falls into a deep recession with a large increase in unemployment and sharp declines in asset prices.

Each bank subject to the supervisory stress tests submits detailed information about its balance sheet to the Federal Reserve. For each hypothetical scenario,

See **Changes in DFAST Thresholds.**



See **Stress Test Scenarios.**



the Federal Reserve forecasts the bank's pre-provision net revenue and the potential amount of losses due to adverse economic conditions.² After calculating taxes and capital distributions such as dividends, the Federal Reserve projects banks' regulatory capital ratios over the nine quarters of the test. The Dodd-Frank Act requires the Federal Reserve to publicly disclose the DFAST results, but it does not require any supervisory actions for banks whose projected capital falls below regulatory minimums.

The more comprehensive CCAR program applies to the biggest and most complex financial institutions, with assets of at least \$100 billion. Through 2019, CCAR, like DFAST, has been conducted annually by the Federal Reserve to ensure that the largest and most complex financial institutions have sufficient capital to continue normal operations in times of economic and financial distress. In 2019, the 18 largest financial institutions were subject to CCAR.

CCAR includes both a quantitative assessment and a qualitative assessment. The quantitative assessment starts with banks submitting financial information and their capital plans to the Federal Reserve. The assessment includes tests run by the banks and the supervisory tests run by the Federal Reserve. The quantitative assessment uses the projections of income

Changes in DFAST Thresholds

The thresholds of stress test requirements have changed more than once. In 2009, banks with consolidated assets over \$100 billion were subject to the SCAP. Nineteen banks underwent the 2009 supervisory stress test.

Originally, Dodd-Frank required all financial institutions with total consolidated assets of more than \$50 billion and whose primary regulator is a federal financial agency to be subject to annual supervisory stress tests. In addition, banks with assets over \$10 billion are required to run internal stress tests. In May 2018, Congress passed the Economic Growth, Regulatory Relief, and Consumer Protection Act, which increased the asset thresholds for the stress tests. Effective from the 2019 stress test cycle, banks with assets less than \$100 billion are no longer subject to stress tests. Banks with assets between \$100 billion and \$250 billion are subject to periodic supervisory stress tests, while banks with assets of over \$250 billion are subject to annual supervisory stress tests and are required to conduct periodic internal company-run stress tests. As a result, the number of banks tested in the DFAST program decreased from 35 in 2018 to 18 in 2019.

This article focuses on the effects of supervisory stress tests, but some of the cited articles use information about the internal stress test results for their statistical analysis.

from DFAST and incorporates banks' planned capital actions, such as dividend payments and stock repurchases. A quantitative objection is based on whether a bank maintains capital ratios above regulatory minimums under both the projections by the Federal Reserve and the bank's own projections.³ In the qualitative assessment, the Federal Reserve evaluates how the banks identify, measure, and determine capital needs for their material risks. Until 2019, the Federal Reserve could issue an objection to the banks' capital plan based on either the quantitative or the qualitative assessment, but as of 2019 the Federal Reserve has eliminated the qualitative component for most banks.⁴ Unlike under DFAST, supervisory actions can be taken if the Federal Reserve objects to a bank's capital plan under CCAR. When this happens, the bank may not make any capital distribution without the Federal Reserve's permission.⁵ (See Figure 2.)

Unlike a point-in-time capital requirement, the supervisory stress tests look to the future. Financial regulations such as Basel III typically require banks to maintain a sufficient current percentage of their balance sheet as capital. The stress tests, on the other hand, focus on future capital planning, ensuring banks have sufficient capital to maintain lending during a major shock to the economy or firms.

How Do Stress Tests Affect Lending?

To avoid receiving a CCAR objection from the Federal Reserve, a bank needs to hold more capital or reduce its assets to keep its capital ratio above regulatory minimums.⁶ A bank can increase its capital holdings by either selling more stock, reducing capital distribution, or increasing retained earnings. Alternatively, a bank can reduce its total assets by making fewer and smaller loans and buying fewer and smaller securities. If a bank chooses not to increase its capital holding, then it must reduce the size of its assets to avoid a CCAR objection, potentially reducing lending to households and firms. (See Figure 3.)

But stress tests may also prompt a bank to shift the composition of its portfolio. In an economic downturn or during financial distress, banks typically lose more money on riskier loans. Thus, banks that have riskier loans on their portfolio must keep more capital on hand in order to pass the stress test. Since holding more capital is costly, stress tests encourage banks to avoid risky borrowers and make safer loans even in good times.

One important goal of stress tests is to ensure that banks can continue their normal operations in a time of distress, when higher loan losses reduce bank capital. The higher capital provision during good times takes into account the potential capital needed due to loan losses in a time of distress. This can help a bank absorb the larger losses and smooth the credit

supply during an economic downturn. So there should be more available credit during a time of distress than would be the case without the stress tests. Thus, it is important, when assessing the impact of stress tests on lending, to also consider the potential effects of stress tests on lending *during an economic downturn*.

Some critics argue that the stress tests have gone too far and inefficiently limit the credit supply, especially to risky but profitable borrowers. After all, banks are in the business of taking and managing risks, not just making ultrasafe loans.⁷ Other critics argue that the stress tests might increase risky bank lending.⁸ By subjecting a bank to a stress test, regulators may be signaling that the bank is too big to fail. This may lead to moral hazard: Because the bank believes itself to be too big to fail, it increases lending to riskier borrowers. In addition, due to the higher capital requirement of the stress tests, banks may search for higher-interest returns by making riskier loans in order to compensate for the higher capital costs.

So far we have focused on the impact of stress tests on bank lending. But not all loans are made by banks subject to the stress tests, or, for that matter, by banks. The overall aggregate impact of stress tests on lending depends on the extent to which borrowers can obtain credit from smaller banks or nonbank lenders instead of from larger banks. For example, if borrowers could get all their mortgages from fintech lenders such as Quicken Loans rather than from banks, mortgages overall may be unaffected even as banks make fewer mortgage loans.

Recent empirical work tests these claims.

Empirical Evidence

A fast-growing body of empirical literature studies the impact of stress tests on bank lending. And many of these studies try to find out whether stress tests impede credit growth. These papers use different methods and focus on different loan markets, such as mortgages, commercial and industrial lending, and small-business loans.

However, regardless of method or focus, it is challenging to study the effects of stress tests on bank lending. Supervisory

Stress Test Scenarios

The stress test scenarios are determined by the Federal Reserve each year and are published in its stress test annual reports.²¹ The scenarios consist of macroeconomic conditions that could occur in a downturn. The 2019 supervisory stress test scenarios include trajectories for 28 variables. These variables capture economic activity, asset prices, and interest rates in the U.S. and foreign economies and financial markets. For example, the severely adverse scenario used in 2019 is characterized by a severe global recession, with the U.S. unemployment rate increasing to 10 percent, real GDP dropping by 8 percent, and the U.S. stock market falling by half.

Each stress test scenario is not a forecast but rather a hypothetical scenario designed to assess the strength of banks and their resilience to an adverse economic environment. The scenarios used by the Federal Reserve change over time. For example, the 2013 DFAST supervisory stress test included 26 variables in the severely adverse scenario.

FIGURE 2

Comparison of DFAST and CCAR

	DFAST	CCAR
RULE OF LAW		
	Legal requirement	✓
REGULATORY ENFORCEMENT		
	Regulatory enforcement	✓
COMPONENTS		
	Quantitative component	✓
QUALITATIVE COMPONENT		
	Qualitative component	✓
FREQUENCY AS OF 2019		
	Annual test	✓ if > \$250bn
CAPITAL PLANNING ASSUMPTIONS		
	Occasional test	✓ if \$100bn–\$250bn
DIVIDENDS		
	Fixed at previous year	Current capital plan
STOCK REPURCHASES		
	Stock repurchases	Current capital plan

* Banks with \$100 billion or more in assets are subject to the qualitative component; banks with \$250 billion or more in assets are subject to both the qualitative and quantitative components.

FIGURE 3

Responding to CCAR

Banks have two options for responding to CCAR's capital requirement.

Banks must maintain a ratio of capital-to-assets above a certain threshold. For this example, 10%...

If not, an underfunded bank has two options to bring itself within regulations.

BANK A
Ratio: 10%



BANK B
Ratio: 2%



BANK B
Option 1 Increase capital
Ratio: 2% → 10%



BANK B
Option 2 Reduce assets
Ratio: 2% → 10%



stress tests were first implemented right after the financial crisis, when many banks were losing money and the economy and regulations were changing, so it is difficult to isolate the effects of the stress tests by simply comparing lending outcomes before and after they were implemented. Furthermore, regulators only stress-test larger banks, making it difficult to identify which differences in lending outcomes are due to stress tests and which are due to the different sizes of these banks.

Comparison of Stress-Tested and Non-Stress-Tested Banks

Despite these empirical challenges, some papers compare lending growth and loan characteristics between stress-tested banks and non-stress-tested banks.

In their 2018 paper, Viral Acharya and his coauthors compared banks subject to stress tests with those that were not. They focused on the syndicated loan market and used DealScan data on syndicated loan origination from 2004 to 2014.⁹ They found that banks subject to stress tests reduced their credit supply (particularly credit to relatively risky borrowers) and that banks subject to stress tests extended smaller loans, shortened loan maturities, and charged higher spreads. This is all consistent with banks lowering the risk of their loan portfolios. They found similar results using the bank-level data from the Call Reports.¹⁰ In addition, by using the data on small-business loans collected under the Community Reinvestment Act (CRA), they found that stress-tested banks originated fewer small-business loans. Because small-business loans are riskier, they argued, the stress-tested banks' decision to reduce small-business lending was evidence that stress tests reduce the supply of risky lending. In the last empirical exercise of the paper, the authors showed that bank-level measures of risk, such as the tier 1 capital ratio, improved after a bank was subjected to stress tests.¹¹

In their 2017 working paper, Paul Calem and his coauthors also compared stress-tested banks to non-stress-tested banks, but they focused on mortgage markets. They used Home Mortgage Disclosure Act (HMDA) data and studied jumbo-loan origination activities of banks from 2009 to

2014. From the banks' perspective, jumbo mortgage loans are riskier because they cannot be sold to government sponsored enterprises (GSEs) such as Freddie Mac and Fannie Mae. (By definition, a jumbo loan is larger than what a GSE is willing to buy.) Accordingly, they are not subject to the GSEs' underwriting standards and are usually held in the bank's loan portfolio. They found that, immediately following the 2011 CCAR stress test, banks subject to supervisory stress tests originated fewer jumbo mortgages as a total share of the banks' mortgages and had lower jumbo mortgage approval rates. In particular, the paper estimated that stress-tested institutions' share of jumbo mortgage originations was 5 to 7 percentage points lower in 2011. But the effects are not statistically significant for the other years.¹² They argued that the subsequent effects were small because banks had become better capitalized and hence the supervisory stress tests were no longer binding.

In his 2018 paper, Francisco Covas explicitly addressed the concern that the stress-tested banks are also the largest banks, which are subject to a range of capital requirements.¹³ He showed that, for most banks, the capital requirements imposed by the stress tests are higher than other capital requirements, such as the point-in-time risk-based capital requirement imposed by Basel III for some classes of loans.¹⁴ In particular, the capital charges imposed under the stress tests are particularly stringent for small-business loans and residential mortgages, so Covas suggested that stress-tested banks might shift lending away from small-business loans and mortgages. By using Call Report data from 2011 to 2016, he found that growth in small-business lending was significantly slower for banks after they were subject to stress tests. In particular, he estimated that the U.S. supervisory stress tests led to a 4 percentage point reduction in the annual growth of small-business loans secured by nonfarm, nonresidential properties.

Using an Instrument to Isolate the Effects of Stress Tests

Although it seems intuitive to compare lending outcomes of stress-tested and

non-stress-tested banks, drawing accurate conclusions can be difficult because other factors are at play. Banks subject to stress tests are primarily very large, and it is possible that these big banks differ from smaller banks in other aspects that also affect lending growth. The different lending outcomes between large and small banks may thus be due to those other factors and not to the stress tests. Simply comparing stress-tested and non-stress-tested banks without accounting for these other factors may lead to biased estimates.

Papers that use this comparison approach attempt to deal with this problem by taking into account a host of observable factors. However, the statistical problem may persist if their statistical analysis fails to capture unobserved variables. For example, larger banks are subject to other, stricter regulatory requirements, such as higher leverage requirements and living-will requirements. Some of these stricter requirements are difficult to measure and quantify, but they could affect the lending supply, making it difficult to isolate the effects of stress tests.

To address this concern, a second group of papers constructed an instrument that measures how strongly the regulations pressured each stress-tested bank to adjust its lending behavior.¹⁵ In their 2018 working paper, William Bassett and Jose Berrospide constructed a measure called the capital gap, which is the difference between the capital level required according to the supervisory stress tests and the level of capital from the bank's own stress-test model. The larger the capital gap, the more additional capital banks need to hold to pass the supervisory stress tests.

Note that this measure avoids the problem of comparing the largest banks to smaller banks and is also quite specific to the stress-testing exercise, so the effect of the shortfall is plausibly distinct from other supervisory requirements. The authors also argued that banks have a limited ability to manage this gap, because the models used for the supervisory tests by the Federal Reserve are not disclosed to the banks. Hence the capital shortfall is likely to be random and not correlated with other confounding factors, such as the size of the bank, which might affect lending outcomes. The randomness of the capital gap that a bank faces is thus useful in statistical analysis for isolating the effects of stress tests on lending growth.

Bassett and Berrospide used balance sheet data from the Call Reports from 2013 to 2016 and found no significant relationship between loan growth and the capital gap. This does not support the notion that the supervisory stress tests are reducing loan growth. In addition, they found a small effect of the capital gap on improving lending standards, as measured by the Senior Loan Officer Opinion Survey on Bank Lending Practices. Thus, the authors also found no evidence for greater risk-taking.

Kristle Cortés and her coauthors use a similar approach in their forthcoming article. They calculate the stress-test exposure of a bank as the difference between the starting capital level of a test period and the lowest capital level implied by the severely adverse scenario of the supervisory stress test. They argue that a larger value of the exposure indicates a bigger expected decline in a bank's equity capital should an economic downturn occur, and that this would increase the likelihood that the regulators will pressure the bank to hold more capital. Then they examine

the effects of the stress-test exposures on small-business loan growth. They argue that the exposure measure is unlikely to be correlated with unobserved factors, as the exposure measure is driven by a bank's entire loan portfolio, and small-business lending is a small fraction of a bank's portfolio.

Using the 2012-2015 data on small-business lending provided under the CRA, Cortés and her coauthors find that banks with larger stress-test exposure reduced the subsequent supply of the riskier small-business loans in counties with more employment risk.¹⁶ But they do not find evidence that stress tests affected the supply of small-business loans in safer counties with less employment risk. The paper then investigates the characteristics of small-business loans, using data from the Survey of Terms of Business Lending (STBL) from 2013 to 2016. They show that banks with larger stress-test exposure charged higher interest rates and shortened the maturity of riskier small-business loans, evidence that the tested banks reduced the riskiness of their small-business loans.

Aggregate Effects on Credit Supply

With the exception of Bassett and Berrospide, the papers above found evidence that banks more affected by the supervisory stress tests reduced their credit supply, and none of the papers found evidence that these banks increased risk-taking. These banks, however, are not the only bank lenders—the vast majority of medium-size and small banks are not subject to the stress tests. Indeed, banks are not the only lenders—for example, firms may borrow from finance companies or sell bonds that are held by insurance companies and other intermediaries. Perhaps the stress tests have simply shifted borrowing away from stress-tested banks to other banks and to nonbank lenders.

To examine the impact of stress tests on the overall credit supply, the last group of papers studied the impact of stress tests on lending in a geographic area in which large banks, small banks, and nonbank lenders compete to provide loans to both businesses and households. Studying the impact of stress tests in a county, for example, allows the researchers to capture the substitution across types of lenders within the county. If they find that a bank subject to the supervisory stress test reduces the credit supply in the county, but that the overall credit supply in the county does not change, they can infer that borrowers are able to obtain credit through non-stress-tested banks or other lenders.

Cortés and her coauthors found no reduction of small-business lending by banks in counties with more exposure to stress tests, while small banks not subject to stress tests increased their market share among all banks.¹⁷ So the total quantity of small-business loans made by banks did not appear to decrease.

The data used by Cortés and her coauthors don't permit an examination of substitution from bank lending to nonbank lending. In some markets, particularly for residential mortgages, nonbank lenders have taken a significant market share in the postcrisis years.¹⁸ Although they did not isolate the effects of the stress tests from other factors affecting the largest banks, Brian Chen and his coauthors were able to provide some evidence about this margin by using a unique dataset of nonbank loans through PayNet Inc. They found that the share of originations of

small-business loans by the four largest banks fell from 2010 to 2014, while the market shares for both smaller banks and nonbanks increased relative to those four largest banks.¹⁹

Taken together, the evidence suggests that small-business lending has shifted from larger banks to smaller banks or nonbanks while not affecting the overall credit supply at the county level. This implies that the overall vulnerability of the market hasn't changed but has shifted, although further research is needed to test this hypothesis.

Conclusion

So far, empirical work in the literature has shown post-financial-crisis stress testing tends to reduce the credit supplied by banks more affected by the tests, with the reduction mostly in riskier loans. In addition, there is evidence that the reduction in the credit supplied by the large banks is mostly offset by smaller banks or nonbanks, leading to no overall reduction in the credit supply.

Whether this is optimal for financial stability depends on whether increasing the smaller banks' or nonbanks' share of the loan market reduces systemic risk. Stress tests are supposed to bolster the financial stability of the banking system by increasing the capital buffer of the largest banks. If we believe that smaller banks and nonbanks pose less systemic risk to the financial system, shifting credit or riskier lending from large to smaller institutions may improve financial stability.²⁰ We have not experienced an economic downturn since the stress tests were implemented, so all the empirical work so far uses data collected during an economic expansion. Stress-testing's effectiveness in ensuring financial stability and lending during a downturn will be tested in the next recession. Future research is needed to examine the efficacy of the stress tests during an economic downturn. 

Notes

- 1** Bank holding companies are the entities subject to the supervisory stress tests. I will call them banks for the remainder of the article.
- 2** Pre-provision net revenue (PPNR) is defined as net interest income (interest income minus interest expense) plus noninterest income minus noninterest expense. The projection of PPNR includes projected losses due to operational-risk events and expenses related to the disposition of real-estate-owned properties. See "Dodd–Frank Act Stress Test 2019: Supervisory Stress Test Results" for more details.
- 3** Before publishing the quantitative test results, the Federal Reserve provides each bank with a onetime opportunity to adjust its planned capital distributions after it receives the Federal Reserve's preliminary estimates of the bank's poststress capital ratios. The original submitted capital plan, the adjusted capital plan, and the decision of an objection on the final capital plan are published after the adjustment. See "Comprehensive Capital Analysis and Review 2019: Assessment Framework and Results" for more information.
- 4** The qualitative component still exists for some banks and in some circumstances. For example, if a bank becomes subject to supervisory stress tests for the first time and has not been subject to a qualitative assessment before, the bank would still have to be reviewed by the Federal Reserve through the CCAR qualitative assessment.
- 5** A bank that receives an objection from the Federal Reserve on its capital plan is colloquially described as "failing" the stress test.
- 6** Capital ratio is defined as capital divided by its risk-weighted assets. To increase that capital ratio, the bank needs to either increase the numerator (capital) or reduce the denominator (assets).
- 7** See the 2017 Clearing House report, for example.
- 8** See the 2018 paper by Viral Acharya and his coauthors for a detailed discussion of the potential impacts of stress tests on credit supply.
- 9** Syndicated loans are large corporate loans to large corporations. They are often funded by a group of lenders, hence the name. For more information, see Edison Yu's 2018 article.
- 10** The quarterly Consolidated Report of Condition and Income (or Call Report) is a report filed with regulators by banks in the U.S. The report summarizes a bank's financial information, including its balance sheet, regulating ratios, and loan portfolios.

11 The tier 1 capital ratio is the ratio of a bank's core capital, such as equity and retained earnings, to its risk-weighted assets. It is a key measure of a bank's financial health.

12 These years include 2009, when SCAP was conducted, and 2011–2014, when CCAR was carried out.

13 For example, the largest banks are subject to extra capital charges because they are systemically important, the so-called SIFI surcharge.

14 He estimated the stress-test models used by the Federal Reserve and found that post-stress-test capital requirements are more stringent than the point-in-time capital requirements of Basel III. The models used by the Federal Reserve are not publicly released and hence needed to be approximately estimated in the paper.

15 Formally, a regression has an endogeneity problem if the explanatory variable is correlated with the error term of the regression (or unobserved variables). The regression-with-endogeneity problem can lead to biased estimators. An instrument can be used to solve this problem. An instrumental variable is one that is not correlated with the error term of the regression but is correlated with the explanatory variable of interest.

16 Employment risk is measured as the sensitivity of the county unemployment rate to the national unemployment rate.

17 The exposure variable is the average bank exposure in a given county.

18 For example, Greg Buchak and his coauthors, in their forthcoming article, find that the nonbank share of the U.S. mortgage market nearly doubled from 2007 to 2015.

19 The four largest banks are Bank of America, Citigroup, JPMorgan Chase, and Wells Fargo.

20 See Kohn and Liang (2019) for more details.

21 See 2019 Supervisory Scenarios for Annual Stress Tests Required under the Dodd–Frank Act Stress Testing Rules and the Capital Plan Rule for more details.

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