Estimating the Implicit Capital Charges in the Stress Tests

08.02.21

Francisco Covas

202.589.2413

Francisco.Covas@BPI.com

The extent to which stress tests distort or may impede bank lending is an important question that has produced an active debate for some time. A research note published by The Clearing House (TCH) in 2017 developed a methodology to derive the implicit capital charges in the stress tests.[1] The analysis showed that the implied capital requirements in the stress tests are elevated for some portfolios, and the higher capital charges could be reducing credit availability to more cyclically sensitive borrowers. Most notably, it showed that the stress tests resulted in significantly higher capital requirements for small business lending than those suggested by bank internal models or the Basel standardized approach to credit risk. Other research, including some written by Federal Reserve economists, reached similar conclusions (see here, here and here).

Not all research concurred with the conclusion that stress tests are having an impact on bank lending. For instance, Greenwood, Hanson, Stein, and Sunderam (2017) (hereafter, Greenwood et al.) also attempted to estimate the implicit capital charges in the stress tests and concluded that "the stress test is not particularly stressful on individual lending activities at the margin." In this note, we revisit the derivation of the capital charges in the stress tests using more granular data from the stress tests that were unavailable back in 2017.[2] The results show that capital charges in the stress tests are considerably higher than the capital requirements estimated by Greenwood et al. and those set by Basel's standardized approach. More precisely, we show that the implicit capital charges for credit card, commercial real estate and commercial and industrial loans in the stress tests are substantially higher than the 2.5-percent Basel capital conservation buffer they replace under the U.S. framework. As a result, U.S. banks face substantially higher capital requirements than smaller banks not subject to the stress tests, which contributes to large banks being driven out of certain asset classes.

Another important result is that the implicit capital charges are time-varying and are estimated to change materially each year. Those changes could not only be driven by revisions in the Federal Reserve's design of the stress scenarios but also by changes in bank portfolios or even updates to the Federal Reserve's own models, which are not fully publicly disclosed. One useful future addition to the stress test disclosures would be for the Federal Reserve to disclose how much of the change in the maximum decline in a bank's common equity tier 1 capital ratio from one year to the next is being driven by each of those three factors. Those would be relatively easy to implement and would enhance our understanding of how banks' capital requirements adjust over time.

The TCH research note also showed that the implicit capital charges in the Federal Reserve's stress tests were higher than those obtained under banks' own models as part of company-run stress tests. As a result, the higher capital charges in the stress tests are also being driven by the specification of supervisory models and not just the severity of stress scenarios. In this post, we do not use banks' own model results. Limiting the analysis to banks that disclose the information

[1] See Covas, Francisco; "The Capital Allocation Inherent in the Federal Reserve's Capital Stress Test," January 2017.
[2] In particular, the analysis needed the supervisory projections of net interest income and noninterest expense under stress conditions. The Federal Reserve started releasing this information in the 2019 DFAST.

required to estimate the capital charges under the methodology of the note would considerably reduce the sample of banks since some of the smaller stress-tested banks are not required to publish their own stress test results every year. We leave the analysis of capital charges in the stress tests based on banks' own models for a future post.

BACKGROUND

Estimating the implicit capital charges in the stress tests using publicly available data is challenging, because the data available are not very granular. Recently, the Federal Reserve began releasing more granular information on pre-provision net revenue (PPNR) projections that allows for a more accurate derivation of the implicit capital charges in the stress tests. This note updates the estimated implied capital charges in the stress tests using those disclosures. In addition, we adjust the methodology to reflect the new stress capital buffer framework that combines the results of the stress tests with the capital requirements under the Basel standardized approach.

The note published by TCH estimated the capital charges in the stress tests using a "top-down" approach that relied on the results of a nonlinear regression model. By contrast, the methodology proposed by Greenwood et al. uses a "bottom-up" approach. Each approach has its own advantages and disadvantages. A useful feature of the TCH approach is that it can estimate the implicit capital charges for small business loans in the stress tests, given its reduced form approach. The bottom-up approach is more structural than the approach used in the TCH note, but can only estimate the capital charges for loan portfolios included in the Fed's disclosures. The more structural approach has some benefits, because it is more explicit in terms of the assumptions used to derive the implied capital charges.

However, a key limitation of the structural approach is that it requires an estimate of the PPNR associated with each major loan portfolio under stress. Back in 2017, the Federal Reserve did not disclose the projections for the subcomponents of PPNR. Greenwood et al. instead used the realized PPNR under normal economic conditions. That proxy is problematic, given that PPNR under baseline economic conditions is typically higher than PPNR under stress. For example, net interest income is higher when times are good because of stronger loan demand and higher interest rates. As a result, that assumption likely understated the implicit capital charges in the stress tests. The Clearing House methodology avoided this problem by using a nonlinear model that maps portfolio characteristics to the post-stress CET1 capital ratio. The disadvantage with TCH's approach was that the estimated capital charges could be inaccurate if the regression model were specified incorrectly.

OVERVIEW OF THE METHODOLOGY

Greenwood et al. show that when the results of the stress tests are integrated directly into the ongoing capital requirements via the stress capital buffer, the capital charge for each asset can be represented as:

$$K_i = k \times \omega_i + \text{Net Loss Rate}_i \quad (1)$$

where k is the capital requirement, ω_i is the risk weight of the asset, and net stress losses represent the after-tax net loss rate, defined as:

$$NLR_i = (1-\tau)(Loss_i - PPNR_i), \quad (2)$$

where i = 1,…,7, representing each of the seven loan portfolios reported in the supervisory stress tests (see columns in Table 1). The tax rate is represented by τ. Losses and pre-provision net revenue are derived from the supervisory results and explained in more detail below.

The methodology for estimating the net loss rate or portfolio-specific SCB uses the following assumptions. First, as in Greenwood et al., the tax rate is assumed to be zero, because bank profits are typically below zero under stress.[3] Second, loan losses for each major loan portfolio ($Loss_i$) are taken directly from the supervisory DFAST disclosures. Third, pre-provision net revenue ($PPNR_i$) is defined as net interest income from a given loan category minus noninterest expense for that category.

The analysis departs from Greenwood et al. in several important ways. First, it lets net interest income for each loan category equal projected net interest income under stress, instead of under normal conditions. To allocate stressed net interest income to each asset class, we use the composition of net interest income for each bank under normal conditions. Second, to estimate the noninterest expense attributable to a particular loan category, the analysis assumes the costs associated with originating and holding the loan are equal to each bank's efficiency ratio under stress, defined as the ratio of noninterest expenses to revenues times the loan portfolio amount. The DFAST disclosures also have the inputs required to estimate each bank's efficiency ratio under stress. Lastly, the estimation of the capital charges does not take into account the level of the allowance for credit losses at the start of the stress tests. Some banks will have a lower aggregate SCB than the one implied by our portfolio-specific SCBs because they start the stress tests with a higher allowance for credit losses.

RESULTS

The estimation of the portfolio-level SCB is carried out at the bank level and weighted by each bank's loan size in the corresponding category to arrive at aggregate results. Table 1 outlines the steps required to estimate the portfolio-specific SCB. The table results are derived using the projections published in the June 2020 stress tests.

Using this methodology, aggregate projected losses for commercial and industrial (C&I) loans were 7.2 percent, while net interest income attributable to C&I was projected to be 8.2 percent. Assuming an average efficiency ratio of 71.5 percent, the implied stress capital buffer is calculated as 7.2 – (1 – 0.715) * 8.2 or 4.9 percent. The stress capital buffer for C&I loans is therefore almost twice as high as the fixed 2.5-percent capital conservation buffer. In other words, if a bank's loan book only included C&I loans, its SCB would be estimated at 4.9 percent.

The capital buffer is also considerably higher than the CCB for credit card loans (9.5 percent), other consumer loans (3.9 percent), and commercial real estate (CRE) loans (3.4 percent). By contrast, the capital charges for both types of residential loans are considerably lower under the stress tests. As shown in Table 1, the net income for those loans is about the same as the income from C&I loans, while the reported loss rate is quite low.

[3] This assumption also helps simplify the analysis. In practice, banks can use deferred tax assets to lower future taxable income, so negative taxes can increase capital in some cases.

Table 1: Estimation of the Portfolio-Specific Stress Capital Buffer							
	Commercial and Industrial Loans	Commercial Real Estate Loans	First-Lien Mortgages	Junior Lien Mortgages and HELOCs	Credit Card Loans	Other Consumer Loans	Other Loans
1. Projected Losses[a]	7.2	6.3	1.8	3.1	17.3	6.9	3.7
2. Net Interest Income[b]	8.2	10.2	8.5	9.0	27.3	10.6	4.4
3. Efficiency Ratio[c]	71.5%						
4. Implied Stress Capital Buffer[d]	4.9	3.5	–1.1	0.5	7.5	3.5	2.6

Source: Federal Reserve Board, BPI calculations (see text for details).

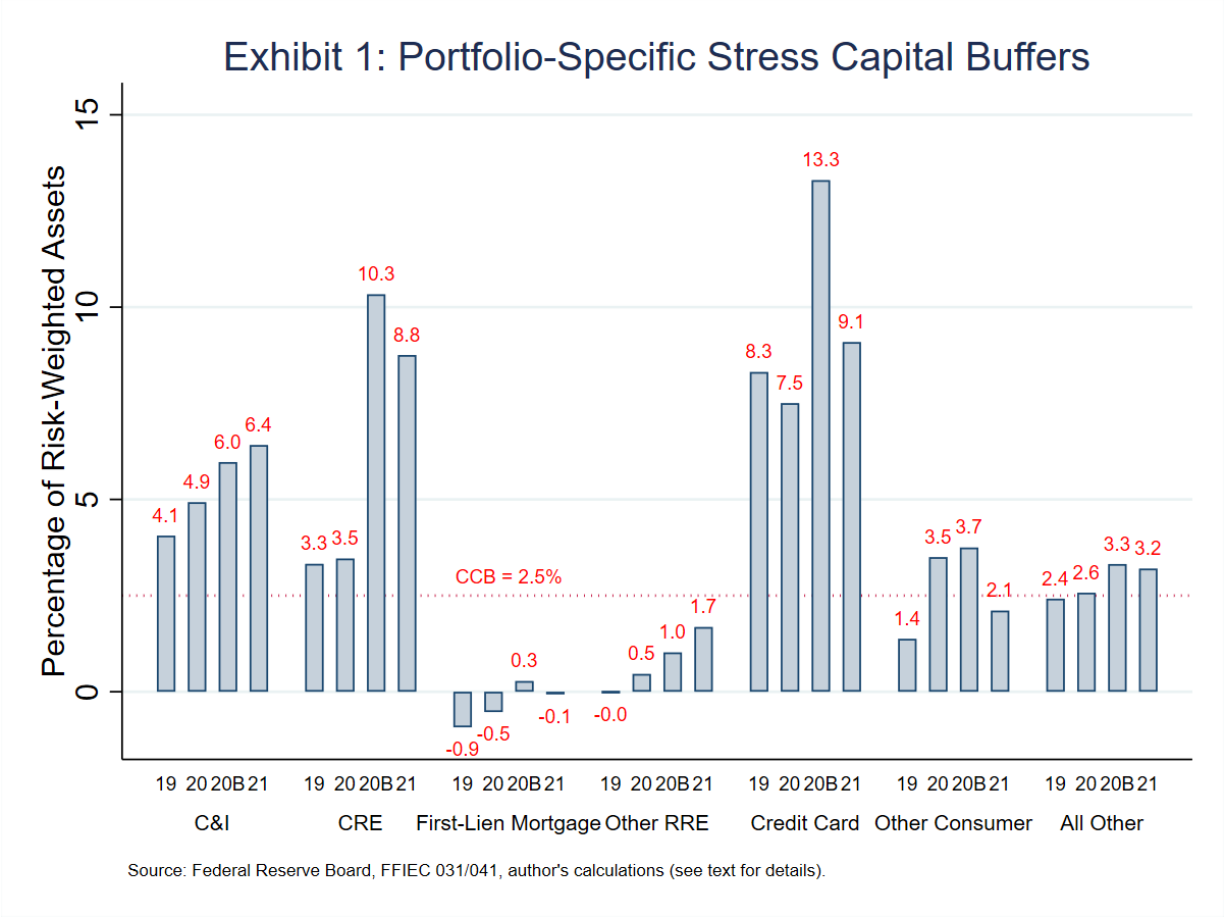
Notes: *a.* Projected losses under the severely adverse scenario in DFAST 2020, weighted by loan size.
b. Calculated as projected net interest income in DFAST times the share of interest income of each loan, as reported on each bank's Call Reports.
c. Defined as the ratio of noninterest expense to the sum of net interest income and noninterest income, as projected under the severely adverse scenario in DFAST 2020.
d. Defined as projected losses reported in line 1 less [net interest income × (1 – efficiency ratio)] reported in lines 2 and 3, respectively.

As noted, our estimates of capital charges under stress are higher than those obtained by Greenwood et al., because we can use the Federal Reserve's stressed PPNR projections, which are considerably lower than revenues under normal economic conditions. For instance, the net loss rate for C&I loans is estimated to be 4.9 percent, whereas it is 2.7 percent in that study. Also, many of the net loss rates are negative in Greenwood et al., while Table 1 only shows first-lien mortgage loans as having a negative net loss rate.[4]

UNEXPLAINED VARIABILITY IN STRESS TEST RESULTS

As noted earlier, the portfolio-specific buffers are expected to change over time with the stringency of the scenarios, changes in bank portfolios, and changes to nonpublic Federal Reserve models. Exhibit 1 shows the variation in portfolio-specific SCBs since DFAST 2019. Projections for PPNR subcomponents are unavailable before 2019, making it challenging to accurately estimate the net interest income component of each loan under stress conditions. It is evident from Exhibit 1 that there is material variation in the portfolio-specific capital buffers of stress-tested banks over the last two years. For example, the more stringent treatment of CRE losses in the December 2020 stress tests increased the implied SCB for CRE loans from 3.5 percent in the June 2020 stress tests to 10.3 percent in the December 2020 tests. The implicit SCB for CRE loans is estimated to have declined to 8.8 percent in DFAST 2021.

[4] The results presented here should also be interpreted as a lower bound for the estimates of the portfolio-specific capital buffers, since DFAST disclosures only include loan losses and revenues at the end of the planning horizon. This assumption underestimates the portfolio-specific SCB, because most banks reach their minimum CET1 capital ratio before the end of the nine quarters.



Source: Federal Reserve Board, FFIEC 031/041, author's calculations (see text for details).

Credit card loans have also experienced a significant increase in the portfolio-specific SCB during the COVID event, from 7.5 percent to 13.3 percent. Similarly to CRE, the implied stress buffer for credit card loans declined materially in DFAST 2021. It would be very useful to understand how much of the decline in the implied stress capital buffer of credit card loans was driven by changes in banks' own portfolios versus updates to the supervisory models.

Furthermore, the capital buffer for C&I loans has also been rising steadily over the past four stress tests, consistent with an increased focus on heightened stresses in corporate debt markets. It would useful to see how banks are adjusting the risk in their portfolios in response to the increased stringency in the Fed's scenarios (and possibly supervisory models). Meanwhile, capital charges for residential real estate loans have remained well below the 2.5-percent fixed surcharge but have been rising over this period. One of the main reasons why the SCB associated with first-lien mortgage loans is so low in the stress tests is because mortgage loans held by banks were originated to borrowers with very low default probabilities. For instance, the house price path assumed in the severely adverse scenario remains quite severe and mimics the decline in home prices seen during the 2007–2009 financial crisis. So an important reason why the implicit SCB for first-lien mortgage loans is so low is because banks hold very safe mortgages on their books.

CONCLUSION

In this note, we derive portfolio-specific SCBs for banks subject to the stress tests. We use the Greenwood et al. methodology and further disclosures by the Federal Reserve to show that portfolio-specific SCB for C&I, CRE and credit card loans are well above the 2.5-percent flat capital conservation buffer included in the Basel Framework. Therefore, banks that want to reduce their stress capital buffer are incentivized to reduce their C&I, CRE and credit card loan exposures, thereby curtailing credit availability to small businesses and for borrowers with less-than-pristine credit scores.

In addition, the analysis shows significant time-series variation in the portfolio-specific SCBs. Therefore, it would be important to further analyze this variation and for the Federal Reserve to report how much of that variability is explained by the annual revisions to the supervisory stress scenarios, changes in bank portfolios and updates to the supervisory models.