MOODY'S ANALYTICS

SECTOR IN-DEPTH

3 MARCH 2015

TABLE OF CONTENTS

ANALYST CONTACTS

Danielle Ferry   212-553-7781
Director-Economic Research
danielle.ferry@moodys.com

ABOUT CAPITAL MARKETS RESEARCH

Analyses from Moody's Capital Markets Research, Inc. (CMR) focus on explaining signals from the credit and equity markets. The publications address whether market signals, in the opinion of the group's analysts, accurately reflect the risks and investment opportunities associated with issuers and sectors. CMR research thus complements the fundamentally-oriented research offered by Moody's Investors Service (MIS), the rating agency.

CMR is part of Moody's Analytics, which is one of the two operating businesses of Moody's Corporation. Moody's Analytics (including CMR) is legally and organizationally separated from Moody's Investors Service and operates on an arm's length basis from the ratings business. CMR does not provide investment advisory services or products.

View the CMR FAQ »
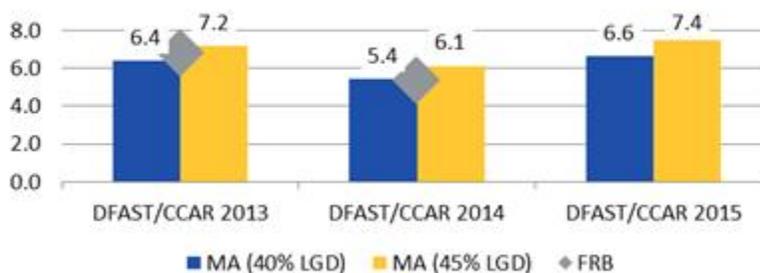*Contact the CMR team* »
Follow us on Twitter »

VIEWPOINTS

Estimating US Credit Risk Under the Fed's CCAR 2015 Severely Adverse Scenario

Highlights

» Stressed EDF measures project that the average default risk of the CCAR banks under the Fed's stress scenarios would maintain its relative advantage over the US banking sector as a whole and would be impacted less severely than following the 2008 recession.

» Since 2012, the results of Moody's Analytics' annual CCAR simulation have been highly indicative of the Fed's expected loss estimates for banks' C&I loan portfolios.

» This year, Moody's Analytics estimates an the aggregate expected loss rate for C&I loans given the CCAR 2015 severely adverse scenario ranging from 6.6% to 7.4%.

» We see some likelihood that the Fed's expected loss estimate will fall closer to the lower end of our range.

Aggregate Expected Loss Rate Under the CCAR 2013, CCAR 2014, and CCAR 2015 Severely Adverse Scenarios, %

Source: Federal Reserve Board; Moody's Analytics' calculations.

Introduction

Each year since the Federal Reserve (Fed) commenced its annual stress tests of the capital reserves of large bank holding companies (BHCs) in the US - CCAR (Comprehensive Capital Analysis and Review) – the Capital Markets Research Group of Moody's Analytics has attempted to anticipate the Fed's results. A key element of these stress tests is the projection of portfolio losses under adverse economic scenarios. For traditional loan portfolios, expected losses (EL) are computed from conditional estimates for probability of default (PD), loss given default (LGD), and exposure at default (EAD). Moody's Analytics' Stressed EDF™ (Expected Default Frequency) measures, which are public firm-level PDs conditioned on hypothetical economic scenarios, are constructed in a similar fashion to the PDs used by the Fed for projecting loss rates on commercial and industrial (C&I) loans during CCAR 2012, CCAR 2013, and CCAR 2014.

In this article we present our fourth annual CCAR simulation for the C&I portfolios of the banks subject to CCAR in which we calculated EL rates using Stressed EDF measures based on the Fed's supervisory scenarios as the PD.[1] Our prior results have been highly indicative of those subsequently published by the Fed.[2] This year we estimated for CCAR 2015 an aggregate expected loss rate for C&I loans ranging from 6.6% to 7.4% depending on the LGD assumption used. For reasons described later on, we see some likelihood that the Fed's expected loss estimate will fall closer to the lower end of our range. Below, we review the CCAR 2015 stress economic scenarios and compare Moody's Analytics' outlook for credit risk among the CCAR banks under the Fed's hypothetical scenarios with that of the US banking sector, generally. Then, we describe our CCAR simulation methodology and results.

CCAR 2015 Supervisory Stress Scenarios

For the purposes of the CCAR and Dodd-Frank Act Stress Test (DFAST), the Federal Reserve publishes three sets of scenarios – a baseline, adverse, and severely adverse scenario. The baseline scenario is provided for benchmarking the results of the stress tests under the stress scenarios, while the adverse and severely adverse scenarios represent alternative downside scenarios. The stress scenarios are constructed to be consistent with the experience of post-war US recessions.[3]

Figures 1 through 7, below, show the quarterly paths of select US economic variables under the adverse and severely adverse scenarios of CCAR 2015.[4] The Fed's scenarios include 16 US variables and as well as several international variables, but those shown here are selected on the basis of their importance in Moody's Analytics' North American Stressed EDF model, their high degree of familiarity among market participants, or both.[5] The data in the charts have been arranged such that t represents the last quarter of historical data and t+1 represents the first quarter of the hypothetical scenarios for future paths of these variables. The scenarios begin in 4Q2014 for CCAR 2015. For reference, the charts also show the historical paths of each variable during and following the 2008 recession, with t+1 corresponding to the first quarter of negative output growth (1Q2008).

Both of the Fed's stress scenarios describe typical, developed economy recessions, with real GDP contraction, rising unemployment, disinflation, and falling asset prices. The adverse scenario is a milder version of the severely adverse scenario, which is broadly similar in severity to the 2008 recession. Peak to trough, the severely adverse scenario envisions declines of 4.7% in real GDP, 58.2% in stock prices, and 25.7% in home prices versus 4.3%, 47.5%, and 28.5%, respectively, during the 2008 recession. However, the economy deteriorates somewhat more rapidly in the severely adverse scenario than it did in 2008 and 2009. During the 2008 recession, it took 6 quarters before output and stock prices hit bottom and 12 quarters before the unemployment rate peaked. In the severely adverse scenario, output declines for 5 quarters and stock prices for 6 quarters, and the unemployment rate peaks after 7 quarters.
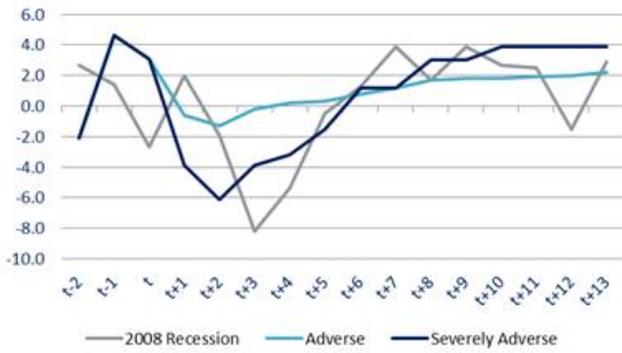
Figure 1   Real GDP, q/q SAAR, %

Figure 2   Unemployment Rate, %
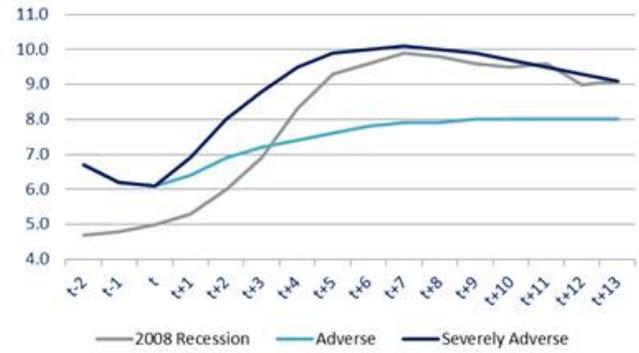

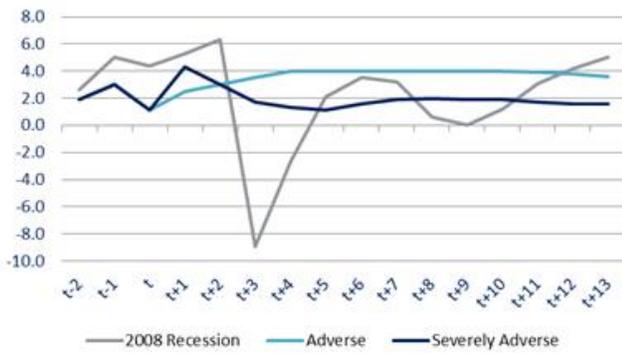Figure 3   CPI Inflation Rate, q/q SAAR%
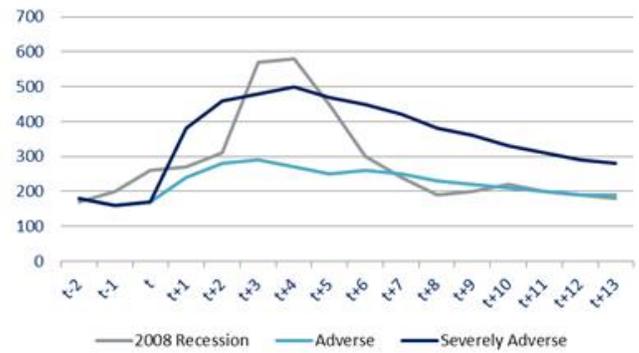

Figure 4   Baa Corporate Spread to 10Y UST, bps
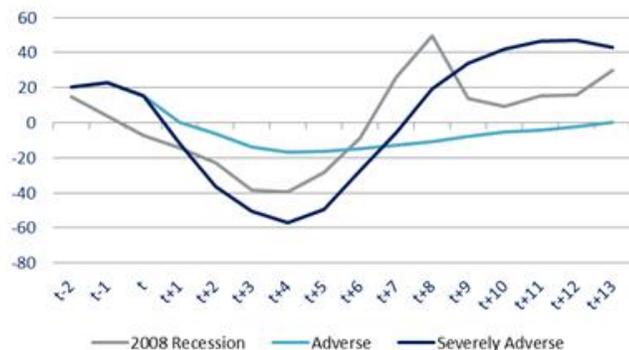
Figure 5   DJ Total Stock Index, y/y, %

Figure 6   CBOE VIX

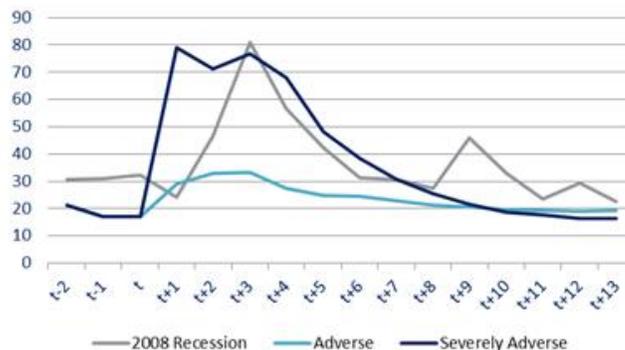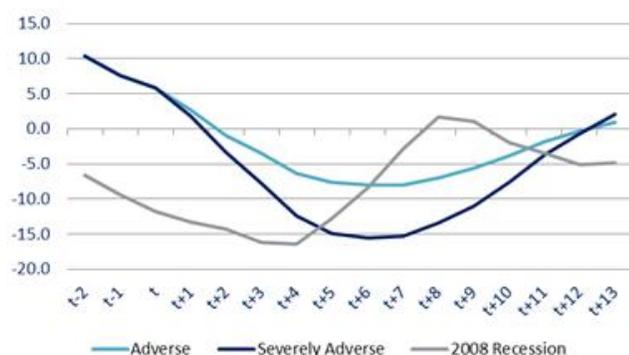Figure 7   House Price Index, y/y, %

Source: Federal Reserve Board; Moody's Analytics calculations.

Credit Risk Under the CCAR 2015 Scenarios: CCAR Banks Versus the US Banking Sector

Moody's Analytics' EDF and Stressed EDF measures provide one way to gauge the credit risk of publicly listed companies. EDF measures are firm-level probability of default estimates that combine a fundamentals-based approach to credit analysis with forward-looking asset valuations embedded in global equity markets.[6] Stressed EDF measures are conditional one-year forecasts for EDF measures. The Moody's Analytics Stressed EDF model for North America combines the historical, structural relationships between distance-to-default (DD) – which represents the distance between a firm's asset value and the value of its liabilities that would trigger a default – and 11 macroeconomic drivers with hypothetical future paths of those drivers.[7],[8] This yields projections of each firm's probability of defaulting within the next one year, conditional on the realization of the economic scenario. Stressed EDF measures, then, can be used to assess future default risk under alternative economic paths.

Of the 31 banks participating in CCAR 2015, one (Ally Financial) went public only recently, and seven are US subsidiaries of foreign entities. Figures 8 through 11 examine the EDFs and Stressed EDFs of the remaining 23 BHCs relative to all US banks and S&Ls.

Figure 8 shows that the CCAR banks have historically had lower default probabilities, on average, than US banks and S&Ls. In fact, the median EDF for CCAR banks has been overwhelmingly lower than the EDF for banks and S&Ls at the 25th percentile. As the financial crisis of 2008-2009 unfolded, the median EDF of the large, systemically important banks subject to CCAR (some of whom were directly involved in the crisis) veered north of the median for the banking sector overall, but recovered quickly in relative terms. Although still higher than its pre-crisis low, the median EDF of the CCAR banks in September 2014 was just 0.04%, slightly less than one-third that of all US banks and S&Ls.

Whether conditioned on the Fed's baseline, adverse, or severely adverse scenarios, the median Stressed EDF of the CCAR banks projects an ongoing relative advantage. The median Stressed EDF of the overall US banking sector rises to 0.9% and 3.4%, respectively, in the adverse and severely adverse scenarios – straddling the highs of 2009-2010 – while the median Stressed EDF of the CCAR banks rises to 0.2% and 0.5%, respectively. Notably, the CCAR banks, several of which received government bailouts and many of which have likely been incentivized to increase their capital cushions in light of DFAST and CCAR, are not projected to repeat their EDF peaks under either the adverse or severely adverse scenarios.

Figure 8   1-Year EDF of CCAR Banks vs. US Banks and S&Ls
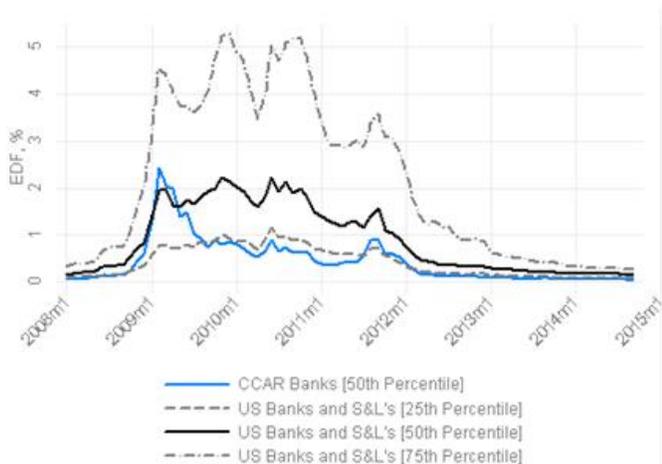
Figure 9   Baseline Scenario Stressed EDF for CCAR Banks vs. US Banks and S&Ls
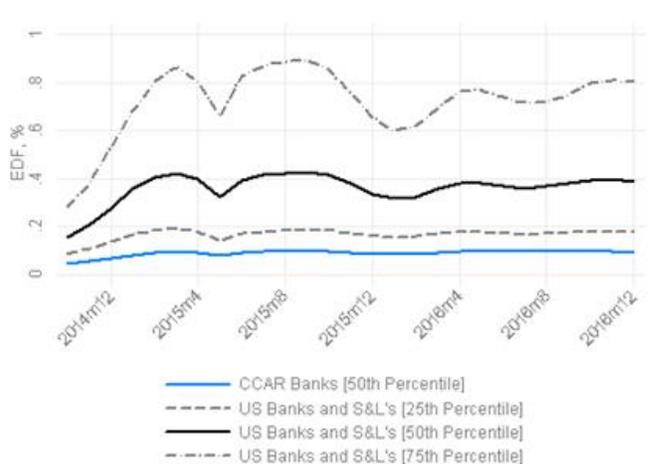
Figure 10   Adverse Scenario Stressed EDF for CCAR Banks vs. US Banks and S&Ls
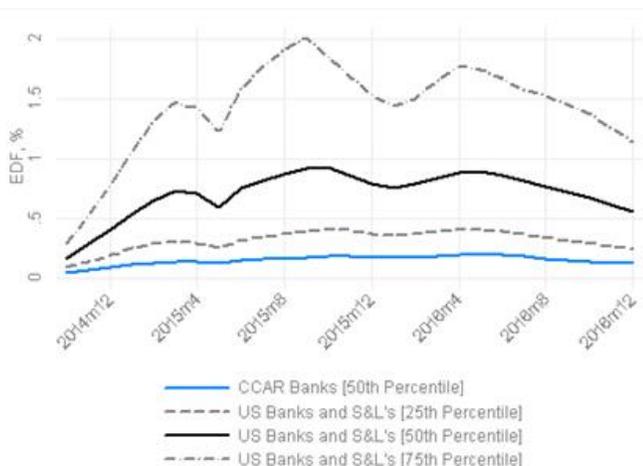
Figure 11   Severely Adverse Scenario Stressed EDF for CCAR Banks vs. US Banks and S&Ls
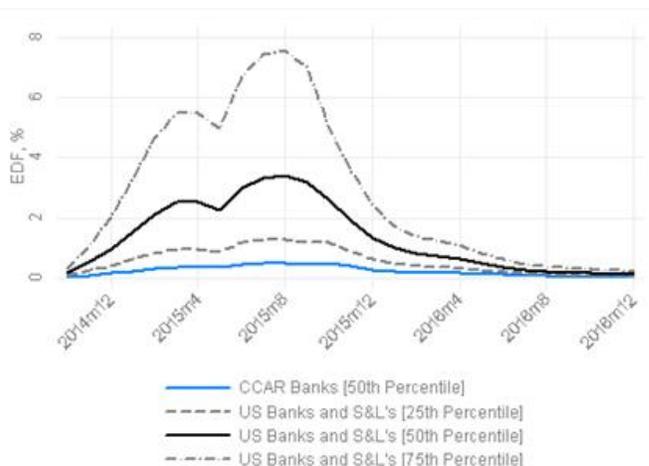
Source: Moody's Analytics.

Expected Loss Rates for C&I Portfolios Under the CCAR 2015 Severely Adverse Scenario

Finally, we turn to using Stressed EDF measures in CCAR calculations of estimated expected loss for C&I portfolios. For the past three years, we have simulated the C&I portfolios of the BHCs subject to the CCAR and estimated expected loss rates using Stressed EDF measures based on the Fed's supervisory scenarios as the PD. Our results have been highly indicative of those subsequently published

by the Fed. For example, our February 2014 analysis based on the CCAR 2014 severely adverse scenario anticipated an aggregate C&I loss rate exactly equal to the Fed's published rate.

The general methodological framework we used in our CCAR 2015 simulation remains the same as in past years. We created pseudo-portfolios of US entities for each bank calibrated to recent C&I loan performance data and then calculated expected loss as the product of Stressed EDFs conditioned on the Fed's stress scenarios, LGD, and EAD. We assumed equally weighted, static exposures and repeated the analysis for varying LGD assumptions.[9] Since it forms the basis for the supervisory and company-run stress test results typically made public in March and scrutinized by market participants, we focus on results for the severely adverse scenario.

For the CCAR 2014 analysis, we made several enhancements to the methodology that complicate direct comparisons between that year's analysis and the prior year's CCAR 2013 analysis.[10] Therefore, at that time, we re-ran the CCAR 2013 simulation using the updated methodology.[11] We are now able to compare the results of three years of Moody's Analytics CCAR analyses (for 2013, 2014, and 2015).[12]

Stressed EDF measures are monthly conditional forecasts for the probability that a firm will default within the next one year given a hypothetical economic scenario. We calculated cumulative stressed PDs by converting Stressed EDFs from monthly to quarterly frequency, de-annualizing them, and chaining them together over the 9 quarters from 4Q2014 through 4Q2016. The Fed's aggregate EL rate for CCAR 2013 of 6.8% lay equilaterally between our estimates of 6.4% and 7.2% based on LGD assumptions of 40% and 45%, respectively. Its aggregate EL rate for CCAR 2014 was exactly equal to our 40% LGD estimate of 5.4%. An LGD assumption of 40-45% is likely appropriate for approximating the Fed's aggregate EL rate on a going forward basis, although later on we discuss the reasons we see some likelihood that the Fed's estimate will fall closer to the lower end of our estimate range.

Generating the BHCs' pseudo portfolios of C&I exposures is a key step in our analysis. The compositions of the banks' C&I portfolios are not public, but the Federal Reserve publishes loan performance data in its Bank Holding Company Performance Reports each quarter.[13] We used C&I default rates (90+ days past due + nonaccruals) corresponding to the "as of" date for CCAR data submissions (September 30, 2014 for CCAR 2015) to assign each pseudo portfolio a target mean EDF. These mappings are shown in Figure 12 for the 31 BHCs participating in CCAR 2015.[14]

Figure 12   Default Rate to EDF Mapping
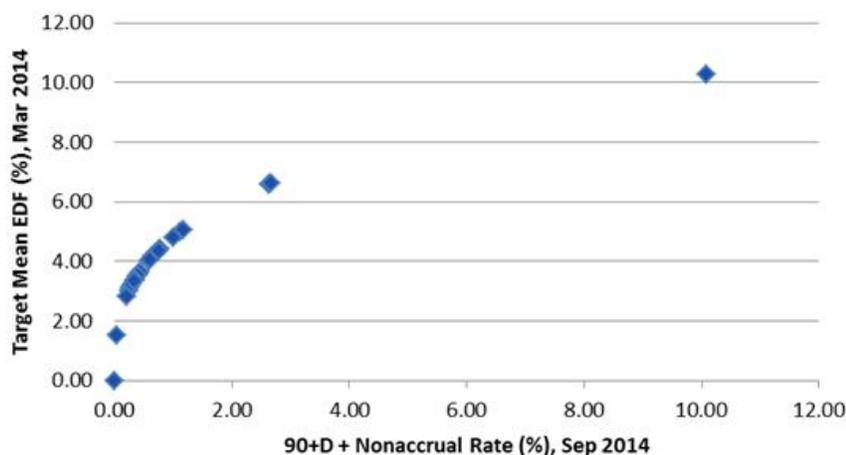
Source: Federal Reserve Board; Moody's Analytics calculations.

We performed Monte Carlo simulations in which we repeatedly generated diverse pseudo portfolios of C&I exposures and calculated their 9-quarter cumulative expected loss rates. Each portfolio was generated by randomly selecting 2,000-3,000 entities from the universe of US firms with Stressed EDF measures such that its mean EDF matched our target for the bank being modeled. An unavoidable assumption that has import for understanding BHC-level differences between our estimates and the Fed's is that the

pseudo portfolios are diverse across industry and credit rating buckets in a manner broadly consistent with the larger population from which they were drawn.

Table 1 provides summary statistics for the Monte Carlo simulations. We ran a maximum of 1,000 simulations for each bank, but, as shown in the last column of the table, not all simulations successfully produced pseudo portfolios with the targeted mean EDF. In general, each pseudo portfolio had an average of a little more than 2,000 loans and none had fewer than 1,000 loans.[15]

Table 1   Monte Carlo Simulation Summary Statistics

	AVG # LOANS PER PSUEDO PORTFOLIO	MIN # LOANS PER PSUEDO PORTFOLIO	MAX # LOANS PER PSUEDO PORTFOLIO	AVG # SUCCESSFUL SIMULATIONS
CCAR 2015	2126	1011	3228	876
CCAR 2014	2136	1316	3102	942
CCAR 2013	2276	1262	3673	893

Each BHC's mean of the 9-quarter expected loss rate through 4Q2015 from these simulations is shown in Figure 13. The analysis was performed for two different LGD assumptions: 40% and 45%. Our simulations using Stressed EDF measures suggest that the C&I portfolios of Discover, Goldman Sachs, and Morgan Stanley would be least robust to the Fed's severely adverse scenario while the C&I portfolios of State Street, Deutsche Bank, and SunTrust would be least impacted. We caution, however, that the reliability of our individual bank results depend critically on how accurately our pseudo portfolios resemble their actual portfolios. Our prior CCAR simulations have revealed that BHCP C&I default rates – which provide the foundation for our pseudo portfolio generation process – do not always correlate well with the Fed's expected loss rates. One reason for this may be that "C&I" is defined differently for the BHCP reports and for CCAR, and this matters for some banks more than others. Another likely factor is sector concentrations. Two portfolios with similar point-in-time default rates but with different sector allocations could yield markedly different expected losses under a stress scenario. Comparisons of these results with those using select CCAR banks' actual C&I portfolios suggest that portfolio composition does in fact play a key role.

Figure 13   Expected Loss Rate for 31 BHCs Under the CCAR 2015 Severely Adverse Scenario, %
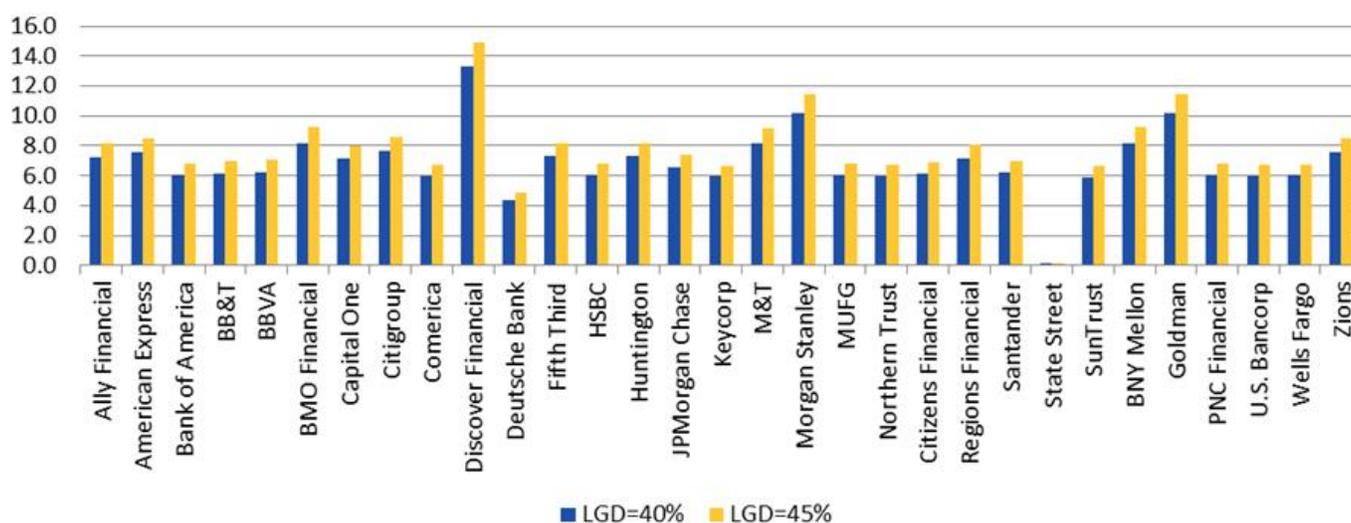
Source: Moody's Analytics calculations.

Figure 14   Aggregate Expected Loss Rate Under the CCAR 2013, CCAR 2014, and CCAR 2015 Severely Adverse Scenarios, %
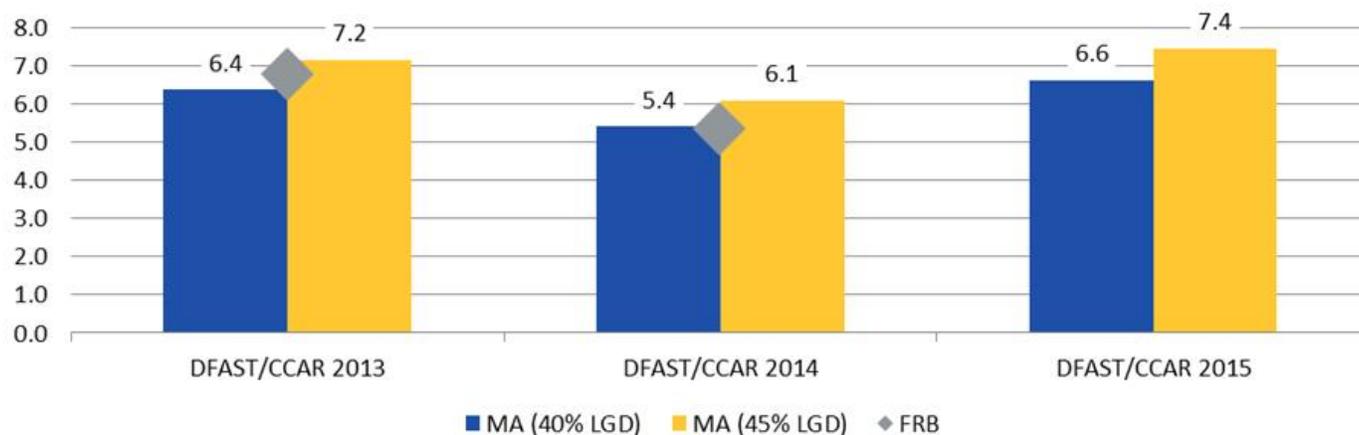
Source: Federal Reserve Board; Moody's Analytics calculations.

We calculated aggregate expected loss rates by weighting individual bank ELs by total C&I exposures. These are shown for CCAR 2013, CCAR 2014, and CCAR 2015 in Figure 14. As long as there is no systematic pattern to compositional differences between our pseudo portfolios and banks' actual portfolios, BHC-level differences between our expected loss rates and the Fed's due to composition should cancel out in the aggregate. This has borne out in our prior analyses for CCAR 2012, CCAR 2013, and CCAR 2014.

Moody's Analytics' CCAR 2015 analysis estimates a 9-quarter aggregate expected loss rate for C&I loans between 6.6% and 7.4%. This is higher than our CCAR 2014 estimate range of 5.4% to 6.1% and higher than the Fed's CCAR 2014 EL rate of 5.4%. On the face of things, it is also somewhat surprising given that default rates and PDs were lower in September 2014 than one year earlier. However, average Stressed EDFs under the severely adverse scenario are higher for CCAR 2015 than CCAR 2014, owing to differences in the specifications of the two severely adverse scenarios. While the GDP contractions and unemployment climbs are nearly identical, the severely adverse scenario of CCAR 2015 is in other respects more severe than that of CCAR 2014, particularly on the basis of several macrofinancial risk factors important to corporate risk.

Figures 15 and 16 highlight two such examples – the CBOE VIX and the annual change in the Dow Jones Total Stock Index. As in Figures 1 through 7, t represents the last quarter of historical data and t+1 represents the first quarter of the hypothetical scenarios for each variable. We show the first four quarters of the CCAR 2014 and CCAR 2015 severely adverse scenarios. Although the VIX is not included in the current Stressed EDF model for North America, equity market growth (as measured by the S&P 500) is an important risk driver. [16] Another important driver is the 12-month lag of corporate profit growth (Figure 17). Figures 15 through 17 highlight that on certain metrics, the severely adverse scenario of CCAR 2015 is more severe than that of CCAR 2014. This has the effect of driving Stressed EDFs, on average, higher under CCAR 2015 than under CCAR 2014. Consequently, expected losses are also higher under CCAR 2015 in our analyses.

Figure 15   CBOE VIX
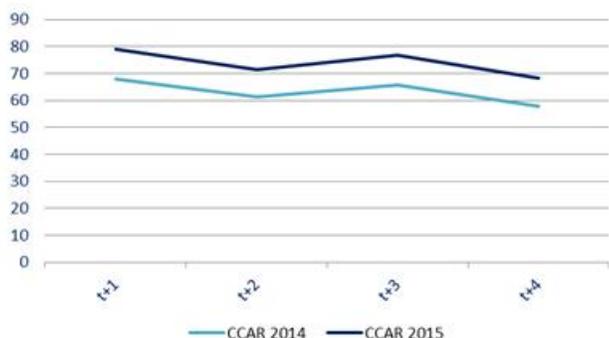
Figure 16   DJ Total Stock Index, y/y, %
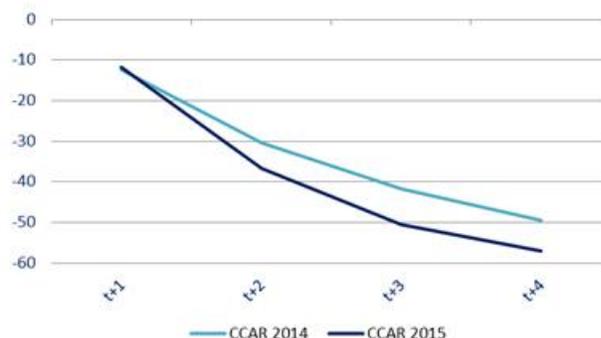
Figure 17   Corporate Profits (12-month lag), y/y, %

Source: Federal Reserve Board; Moody's Analytics' calculations.

It is not known publicly which macroeconomic risk drivers are included in the Fed's stressed PD model for C&I exposures, but the Fed has noted in the past the importance of the VIX and the Baa spread. Since corporate profit growth is not among the 16 domestic variables the Fed employs to define the DFAST scenarios, it seems reasonable to assume it is not included in the Fed's stressed PD model for C&I. This, combined with the fact that last year's EL rate published by the Fed was in line with our 40% LGD-based EL estimate, suggests there is some likelihood that the Fed's CCAR 2015 EL rate will be closer to the lower end of our range than the higher end.

Summary

This year, the Fed's annual bank stress test covered 31 large bank holding companies. Moody's Analytics' Stressed EDF measures project that the average default risk of the CCAR banks under the Fed's stress scenarios would maintain its relative advantage over the US banking sector as a whole and would be impacted less severely than following the 2008 recession. Although related, the credit risk of the CCAR banks themselves and the credit risk of the debtors to the CCAR banks, however, are different concepts. This year, Moody's Analytics estimates for the aggregate expected loss rate for C&I loans given the CCAR 2015 severely adverse scenario (for the 9 quarters through 4Q2016) range from 6.6% to 7.4%, depending on the LGD assumed, and there is some likelihood that the Fed's CCAR 2015 EL rate will be closer to the lower end of this range. We caution that Moody's Analytics' estimated loss rates for individual banks are subject to greater uncertainty than our aggregate expected loss rates. There are many ways that individual bank portfolios might differ in composition from our simulated portfolios that could impact these estimates. However, we found 70%, 67%, and 67% correlations between Moody's Analytics' and the Fed's bank-level expected loss rates for CCAR 2012, CCAR 2013, and CCAR 2014, respectively.[17]

Moody's Related Research

Ferry, D. H. Stressed EDF Model Development, Implementation, & Validation. Moody's Analytics Modeling Methodology. February 2014.

Ferry, D. H. Validating the Stressed EDF Model for Public Firms in North America. Moody's Analytics Modeling Methodology. May 2014.

Endnotes

1   The BHCs participating in CCAR 2015 are: Ally Financial, Inc.; American Express Company; Bank of America Corporation; BB&T Corporation; BBVA Compass Bancshares, Inc.+; BMO Financial Corp.+; Capital One Financial Corporation; Citigroup Inc.; Comerica Inc.; Discover Financial Services; Deutsche Bank Trust Corporation*+;Fifth Third Bancorp; HSBC North America Holdings Inc.+; Huntington Bancshares Inc.+; JPMorgan Chase & Co.; Keycorp; M&T Bank Corp.; Morgan Stanley; MUFG Americas Holding Corporation*+; Northern Trust Corp.; Citizens Financial Group, Inc.+; Regions Financial Corporation; Santander Holdings USA, Inc.+; State Street Corporation; SunTrust Banks, Inc.; The Bank of New York Mellon Corporation; The Goldman Sachs Group, Inc.; The PNC Financial Services Group, Inc.; U.S. Bancorp; Wells Fargo & Company; and Zions Bancorp. Those marked by a "*" are new to CCAR in 2015. Those marked by a "+" are US subsidiaries of foreign entities.

2   Ferry, D. H., An Integrated Approach to Stress Testing Corporate Credit Risk, Moody's Analytics ViewPoints Paper, June 2012; Ferry, D. H., Assessing Moody's Analytics' 2013 CCAR Estimates for C&I Loan Losses, Moody's Analytics ViewPoints Paper, March 2013; and Ferry, D. H., Estimating US Credit Risk Under the Fed's CCAR 2014 Severely Adverse Scenario, Moody's Analytics ViewPoints Paper, February 2014.

3   Board of Governors of the Federal Reserve System, Policy Statement on the Scenario Design Framework for Stress Testing, Federal Register, Vol. 78, No. 230, November 2013.

4   Board of Governors of the Federal Reserve System, 2015 Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rule, October 2014.

5   The macroeconomic inputs to the Stressed EDF model overlap with many, but not all of these. For variables included in the Stressed EDF model but not in the Fed's scenarios, we rely on interpretations that MA's Economics and Consumer Credit Analytics unit produce to be consistent with the Fed's scenarios. Since the purpose of these charts is to compare some of the variables in the Fed's scenarios exactly as the Fed defined them, we show the DJ Stock Index. However, note that the Stressed EDF model employs the S&P 500 rather than the Dow Jones as a measure of asset prices.

6   For a detailed explanation of the methodology behind the Public Firm EDF model, see: Sun et al, Public Firm Expected Default Frequency Credit Measures: Methodology, Performance, and Model Extensions, June 2012.

7   A one-to-one mapping function converts distance-to-default to a default probability (EDF). Moody's Analytics' DD-to-EDF mapping is calibrated to yield default probability levels that are highly correlated with historical default rates.

8   For a detailed explanation of the methodology behind the Stressed EDF model, see: Ferry et al, Stressed EDF Credit Measures for North America, May 2012.

9   Our over-simplified EAD and LGD assumptions are necessitated by our lack of actual portfolio data. However, they also serve to highlight the impact of predicted changes in the stressed PDs on expected loss estimates.

10 See Ferry (February 2014) for a comparison of the earlier methodology with the current version.

11 The methodological enhancements did not qualitatively alter our conclusions regarding the outcome of the 2013 stress test.

12 Unfortunately, we lack the archived Stressed EDF measures necessary to re-run the CCAR 2012 analysis with the updated methodology.

13 Available at www.ffiec.gov/nicpubweb/nicweb/nichome.aspx .

14 Long-run correlations are strongest between monthly default rates at time t and EDFs at time t-6. Therefore, we mapped September 2014 default rates to March 2014 EDFs.

15 There is one exception: BHCP reports indicate that State Street has a very small, highly performing C&I portfolio with default rates of 0%. We generate its pseudo portfolio by selecting all entities with EDF<0.05%. This represents 359 loans for CCAR 2013, 568 loans for CCAR 2014, and 760 loans for CCAR 2015.

16 A proxy for the VIX, the 30-day moving average of S&P 500 volatility, is included in the current Stressed EDF models for Western Europe, Japan, and Australia & New Zealand and is be included in a recent revision of the Stressed EDF model that will become available in CreditEdgeTM in early May 2015.

17 CCAR2013 correlation excludes Goldman Sachs' results, which were an outlier. CCAR 2014 correlation excludes State Street results because the Fed's EL rate of 6.9% was incongruous with publicly available default rates of 0%.

AUTHORS

Danielle H. Ferry, PhD   1.212.553.7781
Director - Economic Research
danielle.ferry@moodys.com

MOODY'S
ANALYTICS