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CCAR and the Paradox of Lower Losses

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Abstract

Now in its fourth year, the bank stress-testing process prescribed by the Dodd-Frank Act continues to evolve. Data and reporting templates have been standardized along with the Federal Reserve's process for creating economic scenarios. Banks have invested millions of dollars to upgrade their IT systems and beef up their risk oversight and modeling teams. As evidenced by the Fed's 2014 Comprehensive Capital Analysis and Review report, most banks are now flush with capital as a result of shedding noncore assets and maintaining tight lending standards over the past four years. Now that bank finances and risk management are stronger and data are more reliable, we focus on the quantitative accuracy of the stress tests themselves and their reasonableness vis-à-vis the Great Recession experience.

CCAR and the Paradox of Lower Losses

CRISTIAN DERITIS, MUSTAFA AKCAY, JEFFREY HOLLANDER

Now in its fourth year, the bank stress-testing process prescribed by the Dodd-Frank Act continues to evolve. Data and reporting templates have been standardized along with the Federal Reserve's process for creating economic scenarios. Banks have invested millions of dollars to upgrade their IT systems and beef up their risk oversight and modeling teams. As evidenced by the Fed's 2014 Comprehensive Capital Analysis and Review report, most banks are now flush with capital as a result of shedding noncore assets and maintaining tight lending standards over the past four years. Now that bank finances and risk management are stronger and data are more reliable, we focus on the quantitative accuracy of the stress tests themselves and their reasonableness vis-à-vis the Great Recession experience.

While we focus on bank credit card accounts exclusively in this report, our results can generally be applied to other consumer credit portfolios as well. As a prelude to our conclusions, we find that forecasts derived from an econometric model based on consumer credit report data are consistent with the Fed's results and could be used to quickly produce forecasts under a variety of scenarios. Furthermore, because of changes in the profile and composition of outstanding portfolios, forecast losses at credit card issuers would be significantly lower than what was experienced during the Great Recession if a contraction of

similar magnitude and duration were to hit the economy today (see Chart 1).

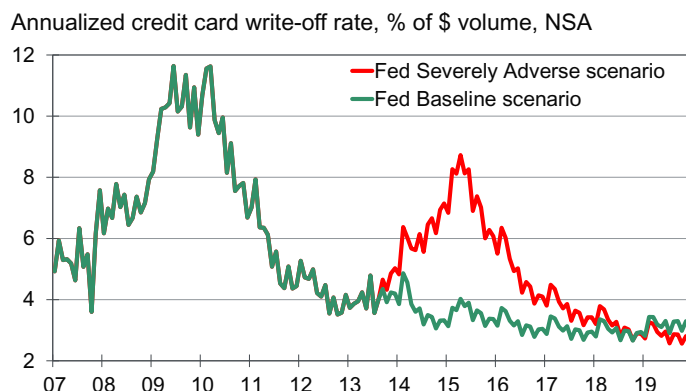
In the sections that follow, we focus on three reasons to expect lower losses under the Fed's Severely Adverse scenario than those experienced during the Great Recession: (1) the Severely Adverse economic scenario is not as severe as the Great Recession, (2) bad accounts have already been purged from bank portfolios with surviving borrowers proving their resilience; and (3) the credit profile of today's portfolios is significantly better than what existed prior to the recession in 2007 given tighter underwriting standards in recent years.

Fed reports on health of banks

The results of the Federal Reserve's latest bank stress tests, released in late March, show that nearly all of the nation's 30 largest banks are well-positioned to survive a deep recession (see Chart 2). Only one did not meet the 5% minimum capital threshold under the Fed's Severely Adverse recession scenarios. However, even this bank was found to have sufficient reserves to survive the Fed's Adverse recession scenario.

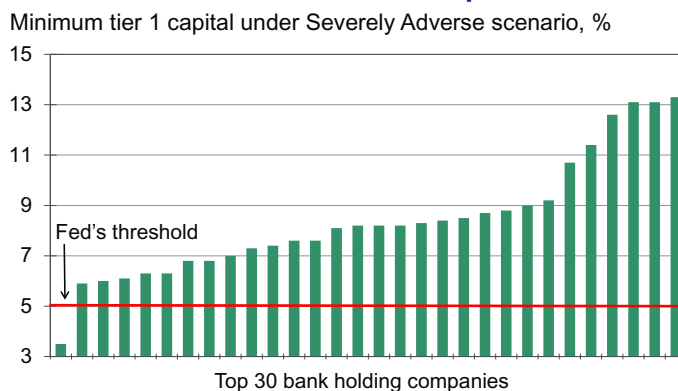
The Fed's Comprehensive Capital Analysis and Review has high stakes. Banks that can demonstrate that they have sufficient capital

Chart 1: Default Rates Rise Under Fed Stress



Sources: Equifax, Moody's Analytics

Chart 2: Most Banks Are Well-Capitalized



Sources: Federal Reserve, Moody's Analytics

even under the darkest economic scenarios stand a good chance of having their capital plans blessed by the regulators. Those that cannot may see their plans to increase dividends or repurchase stock denied.

An evolving process

The statistical and econometric models employed by individual banks and Fed regulators continue to evolve along with the rest of the stress-testing process. As new datasets become available and new insights into consumer behavior are revealed, quantitative modelers are able to develop new techniques and approaches to capture the sensitivity of loan portfolios to changes in the economic environment.

As the main objective of the Dodd-Frank/CCAR stress-testing exercise is to determine how a bank would fare under an extreme economic environment, analysts will want to select models that are particularly sensitive to changes in employment, house prices, interest rates, supply shocks or other macroeconomic factors that the Fed may wish to shock.

A panel regression or vintage-based analysis may be particularly appropriate for this type of environment, as it provides a consistency with the cross-sectional segments of interest (for example, metropolitan areas or states) with available economic data. The advantages of this approach need to be balanced against a more granular approach wherein the loan products under investigation are heterogeneous or contain features that are not easily aggregated. In these cases, the gains achieved by capturing these nuances at the account level may offset the loss in correlation with broader economic factors. Naturally, the ideal stress-testing approach combines multiple modeling techniques to leverage the strengths of each one.

Focus on credit cards

While there are some key distinctions, credit card portfolios tend to be fairly homogenous, especially after accounting for geography and credit score. Regulations and industry practices have standardized cards to a much greater degree than mortgage

products, which may carry a variety of features. One need look no further than the differences in the application process to confirm this observation. Whereas a mortgage application will require reams of paperwork, a credit card application typically relies on little more than a statement of income and a credit score.

Using credit report information provided by Equifax and available at www.CreditForecast.com, Moody's Analytics has developed a set of econometric models to forecast the balance and performance of credit cards across multiple dimensions: geography (metro area or state), origination quarter or vintage, and credit score band.

In addition to loan age and vintage quality metrics, the models take into account a variety of macroeconomic factors such as unemployment rate, new unemployment insurance claims, house prices (an indicator of household wealth), retail sales, and interest rates¹. As a result, the models' predictions of lower aggregate losses under the Fed's Severely Adverse scenario are driven by differences in vintage or credit quality at the time of origination and changing macroeconomic conditions over time as well as seasoning.

Using the economic scenarios provided by the Federal Reserve for the 2014 CCAR exercise, we examine the forecasts produced by these models and compare them with the results reported by the Fed for the top 30 banks.

Not so stressful

Although the Fed does not design its stress scenarios to necessarily mimic previous economic contractions, a natural

Chart 3: House Prices Fall by Similar Amount

Median house price, \$ ths



Sources: Federal Reserve, Moody's Analytics

comparison to make when evaluating the projected performance of loan portfolios under the Severely Adverse scenario is to the Great Recession. Given the belief that these economic scenarios are similar, the resulting loss rates should be similar as well.

To assess the validity of this naïve assumption, we compare projections for key economic factors under the Severely Adverse scenario with the Great Recession. To the extent they differ, we should expect different loss forecast results.

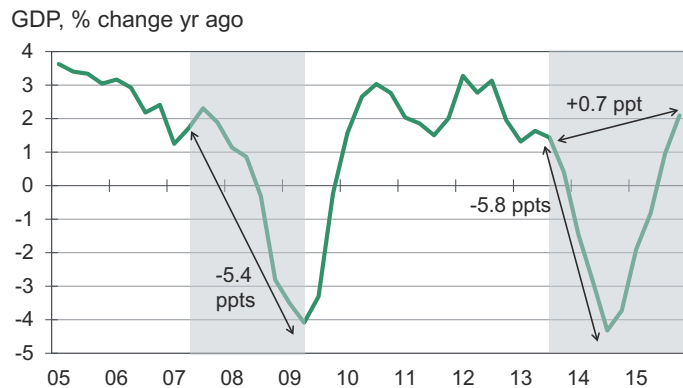
House prices

Starting with the Median House Price Index in Chart 3, we observe that house prices fall by 25% (cumulatively) for the nine quarters specified in the Severely Adverse scenario. This coincides historically with the 23% decline in median prices from March 2007 to June 2009 (nine quarters). Based on this indicator alone, one might expect the two scenarios to produce similar results.

An argument could be made that a 25% decline starting at the end of 2013 would not have as large an impact on consumer behavior as the 23% decline from March 2007. Homebuyers who purchased in 2013 would experience the full effect, but the impact on earlier buyers would be cushioned by the rise in prices from 2012 to 2013. For example, a home purchased in March 2007 would fall in value by 33% cumulatively at the end of 2015. While psychologically damaging, the marginal impact of the additional decline in value would be lower than the impact of the initial 23% decline.

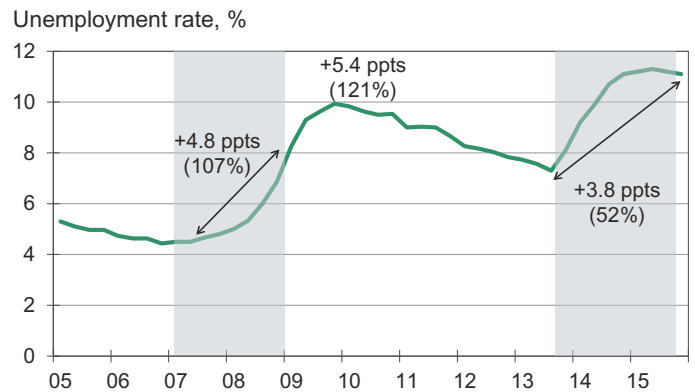
¹ Additional details on the structure and specification of the models are available in "New Perspectives on Consumer Credit From Credit Forecast" by Mustafa Akcay, Sergiy Stetsenko and Cristian deRitis, Regional Financial Review, May 2012.

Chart 4: Similar GDP Declines, Faster Recovery



Sources: BEA, Moody's Analytics

Chart 5: Unemployment Rise Less Severe



Sources: BLS, Moody's Analytics

Putting these specific dynamics aside for the time being, our working assumption is that the house price declines defined by the Great Recession and Severely Adverse scenario are effectively the same.

GDP

Examining the growth rate in real GDP over the same March 2007 to June 2009 time period, we observe that the magnitude of the drop in output is 0.4 percentage point worse under the Severely Adverse scenario on a cumulative basis (see Chart 4). However, the scenarios differ significantly in their timing. Whereas during the Great Recession the year-over-year change in GDP declined for two years before rebounding, the Severely Adverse scenario has GDP recovering more swiftly. Within the course of nine quarters, GDP grows by 0.7 percentage point from its initial value under the Severely Adverse scenario, making it less stark than the Great Recession.

Unemployment rate

The most dramatic differences between the Severely Adverse and Great Recession scenarios are observed in the unemployment rate series. Unemployment is the most important economic factor when forecasting credit card portfolios, so any deviation in the scenarios along this dimension will have a direct impact on projected losses.

The unemployment rate rose by 4.8 percentage points from March 2007 to June 2009 from 4.5% to 9.3% (see Chart 5). Conversely, the Severely Adverse scenario

forecasts an increase of 3.8 percentage points over nine quarters. Although the peak level of the unemployment rate is higher under the Severely Adverse scenario at 11.3%, the increase is less severe on both an absolute and a relative basis. For credit card portfolios, it is the flow of borrowers into unemployment that impacts delinquency performance more than the stock of unemployed, making the Severely Adverse scenario less detrimental than the Great Recession.

Furthermore, in the Great Recession the unemployment rate rose for nearly an additional year before peaking. Conversely, the Severely Adverse scenario has the unemployment rate starting to descend gradually within the nine-quarter period.

Prime rate

Finally, the prime rate, to which many credit cards are indexed, shows a different pattern as well (see Chart 6). During the Great Recession the prime rate fell by 5 percentage points as the Fed engaged in monetary easing. Under the Severely Adverse scenario, the prime rate remains unchanged at just over 3%. Given lower payment burdens throughout the period, borrowers would

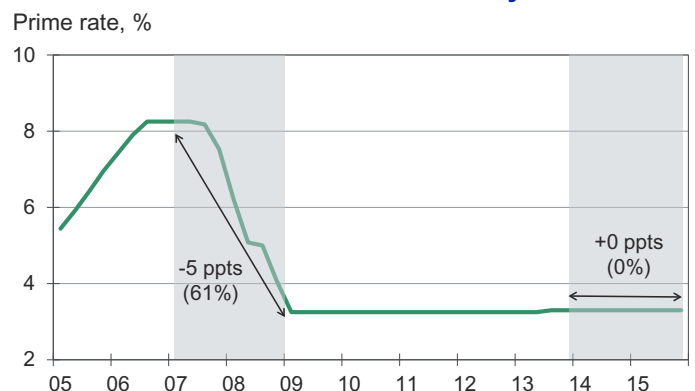
be expected to perform better under the Severely Adverse scenario.

For all of the reasons cited above, we conclude that while the Severely Adverse scenario does represent a nasty recession, it is not quite as austere as what was experienced during the Great Recession. This is largely due to the starting point and history prior to the start of each recession. The Great Recession was preceded by a bubble period such that economic indicators had much more room to fall. The Severely Adverse scenario starts with an economy that is already operating below potential. The marginal impact of economic shocks is lower as a result.

Quality control

In addition to differences in economic scenarios, we need to control for differences in the quality and seasoning of the loan portfolios at the start of the Great Recession and

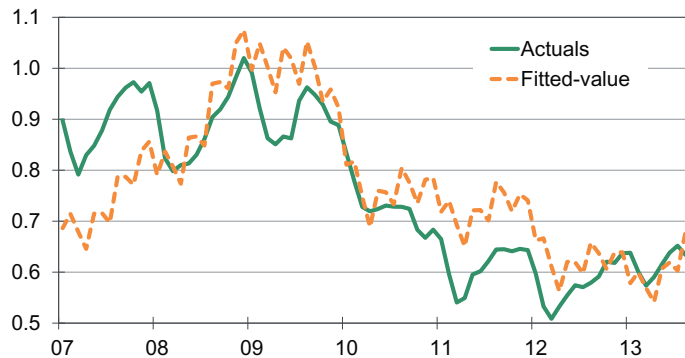
Chart 6: Prime Rates Flat in Severely Adverse



Sources: Federal Reserve, Moody's Analytics

Chart 7: Model Fit for 30-Day Delinquency Rate

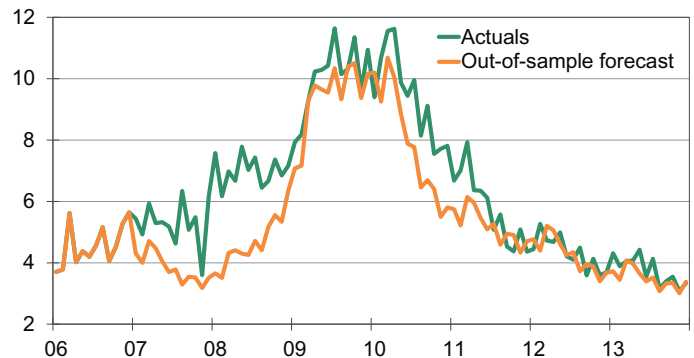
Delinquent, % of number, NSA



Sources: Equifax, Moody's Analytics

Chart 8: Dynamic Back Test for Write-Off Rate

% of dollar, annualized, NSA, forecast period: Jan 2007-Dec 2013



Sources: Equifax, Moody's Analytics

Severely Adverse scenarios. Significant differences in profile can lead to forecasts that are substantially higher or lower than they otherwise would be.

We begin our investigation by considering the in-sample fit of our econometric models. Chart 7 provides a comparison of fitted and actual values for the 30-day+ delinquency rate model in aggregate. While the model is fit on a vintage-credit score segment basis, we find that the economic factors included in the model are sufficient to capture the elevated levels of delinquency during the Great Recession. Additional vintage and credit score subsegments were examined to verify that the in-sample model performance was acceptable.

Next we consider an out-of-time fit test for the 2007-to-2013 time period. In this exercise we first estimate models for performance using all available history, from July 2005 to December 2013. Using this model but no forward credit performance information, we forecast all of the performance metrics from December 2007 to December 2013 using solely realized economic variables. The idea here is to isolate forecast errors due to forecasting the economy from errors that are due to the credit models themselves. Within this framework we find that the models predict the Great Recession peak write-off rate with a margin of error of less than 7% (see Chart 8). That is, the cumulative loss rate over the forecast horizon is 7% less than the realized cumulative loss rate.

Finally, we run an out-of-sample, out-of-period back test wherein we re-estimated all

model parameters using data from July 2005 to March 2013. Using realized economic data from March 2013 to September 2013, we generate a forecast using this model and compare the results with realized performance in Chart 9. Based on these results, we confirm that the model parameters are stable and produce forecasts within the hold-out period with a cumulative error rate of less than 8%.

Comparing downturns with a pairwise vintage comparison

We focus on a pairwise comparison of loan cohorts to decompose the lower loss rates forecast for the Severely Adverse scenario relative to the Great Recession. First, we identify two time segments at similar points in the business cycle. We use the unemployment rate as our primary business cycle indicator given its high correlation with credit card performance.

The first segment we identify consists of 12 quarters during which the unemployment rate increased from 4.5% in the first quarter of 2007 to 10% in the fourth quarter of 2009. Cards originated during this period provide us with a historical benchmark. We define the forecast comparison segment

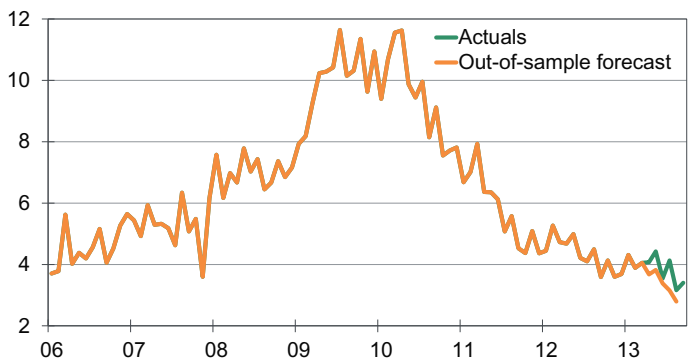
by the 12 quarters from the third quarter of 2012 to the second quarter of 2015 (see Chart 10).

Investigating sensitivity of loss rates to macroeconomic conditions with this procedure has two virtues. First, this method enables us to compare a forecast period with actual historical performance. The vintages that were originated in the first segment present a view of realized loan performance under a recession. Vintages in the second segment are forecasts of loan performance under the Severely Adverse scenario.

Second, this method enables us to assess the performance of loss rate models according to the macroeconomic conditions at the time of origination. Based on our research, we find that even though macroeconomic conditions may weaken by a similar margin over time, different conditions at the time of origination carry permanent effects on future performance. For example, loans with identi-

Chart 9: Out-of-Period Test for Write-Off Rate

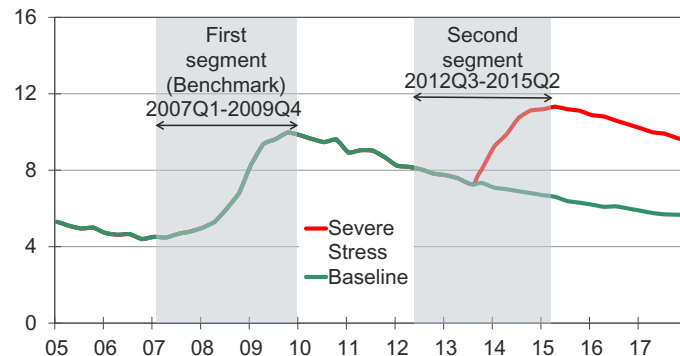
% of dollar, annualized, NSA, forecast period: Mar 2013-Sep 2013



Sources: Equifax, Moody's Analytics

Chart 10: Segment Selection for Comparison

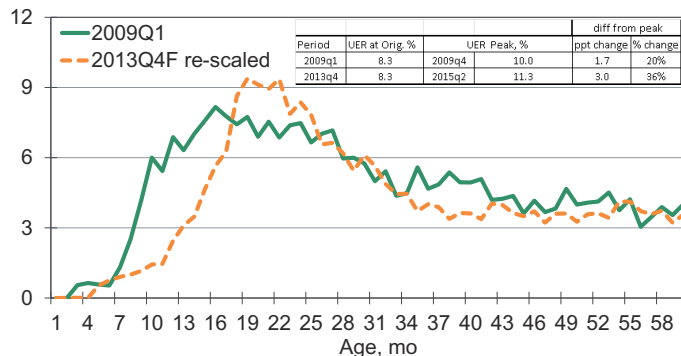
Equal time segments based on unemployment rate, %



Sources: Equifax, Moody's Analytics

Chart 11: Similar Origination Conditions

Annualized write-off rate, % of \$ volume, NSA



Sources: Equifax, Moody's Analytics

cal credit scores will perform differently at different points in the business cycle as the odds ratios of credit scores shift along with the economy. Hence, a borrower with a 700 credit score in the middle of an economic expansion will pose a greater risk than a borrower with a 700 credit score in the middle of a contraction (*ceteris paribus*). The 700 score would be fairly easy to achieve in the first case and fairly difficult in the latter.

To control for the change in the credit quality profile, we assume that vintages originated in the hypothetical future recession have the same credit score distribution as the historical vintage used in the comparison. By controlling for the credit score distribution and selecting vintages of similar age when the recession starts, we are able to isolate the impact of macroeconomic conditions on the loss rate.

The rest of the paper summarizes the results from the pairwise vintage analysis². We first provide write-off rate comparisons controlling for origination conditions and economic deterioration and then explore the impact of seasoning on performance. Finally, we put these components together and provide a full comparison to the Fed's Baseline and Severely Adverse forecasts.

Controlling for origination conditions

In this exercise, we pick two origination vintages such that they were originated at a time when the economic conditions

were similar. For example, the 2009Q1 and F2013Q4 vintages are both originated at a time when the unemployment rate is 8.3%. As discussed in the previous sections, we impose the origination score distribution from the 2009Q1 vintage on the F2013Q4 vintage and then generate a forecast under the Severely Adverse scenario.

Chart 11 compares historical write-off rates (for 2009Q1) and forecasts (for F2013Q4). While the rates are of similar size and shape, the differences are attributable to differences in the economy after origination. For the 2009Q1 vintage, the unemployment rate increased by 1.7 percentage points or nearly 20%, from 8.3% to a peak level of 10%. However, for the F2013Q4 vintage, the unemployment rate increased by 3 percentage points, or nearly 35%, to a peak of 11.3%.

Based on this example, we conclude that the model is capable of generating losses of similar magnitude to the Great Recession given similar economic conditions. The fact that the aggregate loss forecast for the Severely Adverse scenario is lower than the Great Recession is a function of the profile mix and differences in the economic scenario rather than lack of model sensitivity to economic conditions.

Controlling for economic deterioration

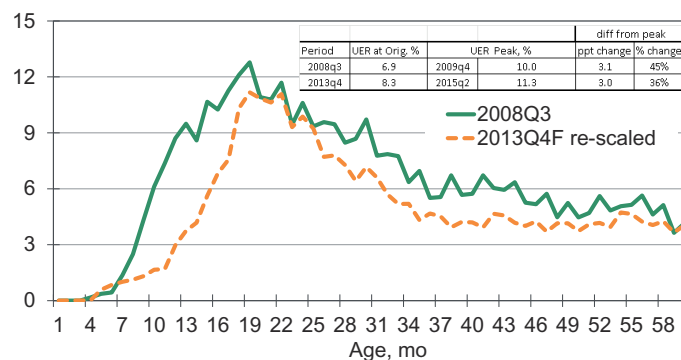
Next, we investigated the impact of the economy after origination by selecting two vintages such that the deterioration in economic conditions over time is similar in an absolute sense. The 2008Q1 and F2013Q4 vintages both experience a 2.7-percentage point increase in the unemployment rate from origination.

In chart 12, we observe that the historical and forecast write-off rates are of similar magnitude and shape for the two vintages. However, the F2013Q4 vintage is forecast to have a lower default rate, as the economy at the time of origination is weaker than in 2008Q1. As a result of issuers tightening standards in this environment, the quality of accounts originated will be stronger after controlling for the credit score distribution.

We perform a similar exercise in Chart 13 with the exception that we target a similar

Chart 12: Similar Absolute Economic Decline

Annualized write-off rate, % of \$ volume, NSA

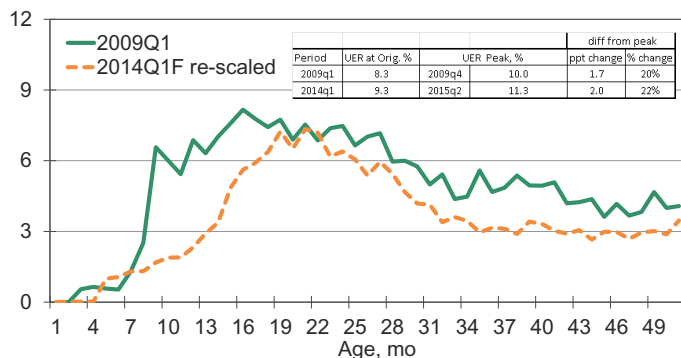


Sources: Equifax, Moody's Analytics

² A sampling of the pairwise vintage comparisons is presented in the paper, but comparisons for all 12 vintage pairs are available upon request.

Chart 13: Similar Relative Economic Decline

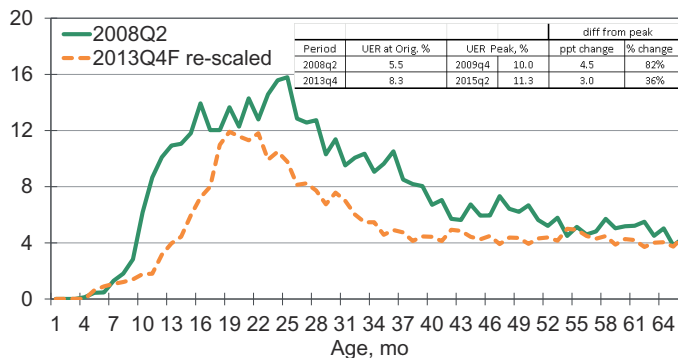
Annualized write-off rate, % of \$ volume, NSA



Sources: Equifax, Moody's Analytics

Chart 14: Similar Seasoning

Annualized write-off rate, % of \$ volume, NSA



Sources: Equifax, Moody's Analytics

relative change in the unemployment rate rather than the absolute change. In this case both the 2009Q1 and F2014Q1 vintages experience a 20% increase in the unemployment rate from origination to peak. Again the economic differences at origination explain the differences in performance. With the unemployment rate lower at origination for the 2009Q1 vintage (at 8.3%), the forecast write-off rate is higher because of relatively weaker underwriting.

From this exercise we conclude that there is path dependence in the loss forecasts such that the starting point has a substantial influence on the outcome. While the Great Recession started with a booming economy, the Severely Adverse scenario begins with a recovering economy operating below potential. Accounts originated in 2013 will have gone through a more rigorous underwriting process than accounts originated in 2007. As a result, a high credit score in 2013 will be more meaningful than a similar score in 2007 when the economy was booming and credit flowed easily.

Less favorable starting conditions in 2013 drive the forecasts under the Severely Adverse scenario downward after controlling for the credit profile and economic path post-origination. Layering on the fact that the composition of credit card portfolios is more heavily skewed toward higher credit borrowers who tend to transact, the losses forecast under the Severely Adverse scenario should be lower than those experienced during the Great Recession.

Controlling for seasoning

Differences in the age or seasoning of the portfolio can have an impact on portfolio performance as well. In each of the previous charts we note a clear maturation curve with all vintages reaching a peak level of defaults in 12 to 24 months from account opening. As a result, a portfolio of more established borrowers may be expected to outperform a younger portfolio.

To investigate the impact of seasoning, we compare two vintages that were originated in the first quarter after the start of their respective recessions: 2008Q2 in the case of the Great Recession and F2013Q4 in the case of the Severely Adverse scenario.

In Chart 14, we note that the 2008Q2 vintage performed worse as a result of the combination of a stronger economic environment at origination (leading to weaker fundamentals and underwriting) and a much worse economic scenario with unemployment rising 4.5 percentage points or 82% from the initial value of 5.5%.

The onset of the Great Recession and the Credit Card Accountability, Responsibility and Disclosure Act of 2009 prompted lenders to close millions of dormant accounts to reduce their risk exposures. The average age of active accounts rose as a result of this activity putting downward pressure on losses.

Over the past three years, issuers have been adding accounts again, but the newer accounts have been skewed toward more affluent borrowers with higher credit scores. As these borrowers are more likely to use their

credit cards for transactional convenience, their activity has minimal impact on the age of outstanding balances. As a result, the loss forecasts for outstanding card balances do not rise as dramatically under the Severely Adverse scenario.

Putting it all together

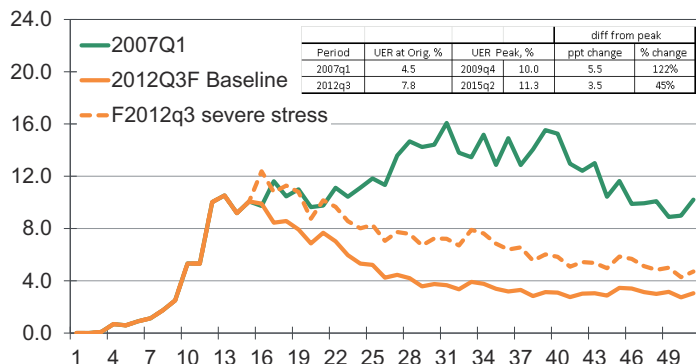
Finally, we compare the performance of an isolated historical vintage to the Fed's Baseline and Severely Adverse scenarios. That is, we consider the 2007Q1 vintage and follow it for 15 months, at which point we subject it to the Fed's scenarios. We then compare the forecasts under these scenarios to realized history noting that differences in origination conditions and the post-origination economic scenario will both impact performance.

We find that the historical performance was nearly 50% worse relative to the Severely Adverse scenario, which is consistent with the differences in the economic scenarios after 15 months (see Chart 15). Whereas the unemployment rate went from 4.5% to 10% historically, it increased by "only" 3.5 percentage points under the Severely Adverse scenario, contributing to lower losses. Relative to the Fed's Baseline scenario, however, this represents a significant increase in the default rate from an annualized value of 4% to 15%.

Chart 15 supports the conclusions drawn from all of the previous exercises: The combination of weaker economic conditions at origination and a better post-origination scenario contribute to forecasts for relatively better per-

Chart 15: Comparing Scenarios

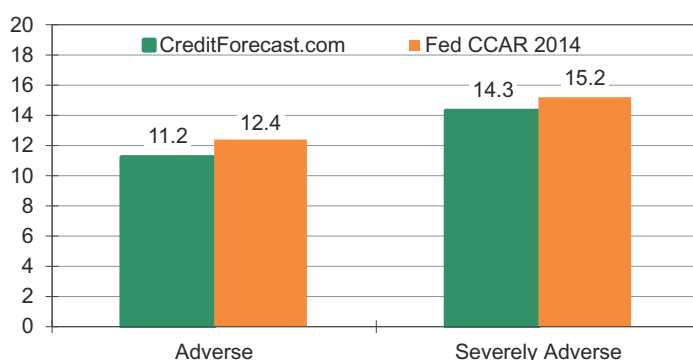
Annualized write-off rate, % of \$ volume, NSA



Sources: Equifax, Moody's Analytics

Chart 16: Losses Under CCAR Stress Scenarios

Cumulative Credit Card Loss Rate, % of avg \$ volume, NSA



Sources: Federal Reserve, Equifax, Moody's Analytics

formance under the Severely Adverse scenario than experienced during the Great Recession.

Comparing with the Fed

According to the Federal Reserve results for the 2014 Comprehensive Capital Analysis and Review, the Fed is expecting the total cumulative loss rate across the credit card portfolios of the top 30 banks to be 15.2% in the first nine quarters following the Severely Adverse shock (see Chart 16).

The CreditForecast models predict a cumulative loss rate of 14.3% over the same time period and scenario. Not only are the predictions close, but the difference is explained by several differences in the underlying dataset and analysis. First of all, the Fed does not include loans held for sale or investment in its calculations. Second, smaller lenders such as

community banks and credit unions that are not included in the CCAR program will tend to have higher credit quality portfolios because of the special relationship they have with their customers and members. As the CreditForecast database covers all credit cards regardless of issuer, the loss forecasts would be expected to be somewhat lower.

Next recession will not be as great

In light of our analysis, analysts and regulators should not be surprised that forecasts of future losses on credit card portfolios are lower than what was experienced during the Great Recession. The economic scenario depicted by the Severely Adverse scenario is not as dire. Most high-risk accounts have already been written off or otherwise purged from credit card portfolios as a result of

shifts in regulation and risk appetite. Tight underwriting practices over the past few years have not allowed these riskier accounts to return. While this could change somewhat as lenders decide to loosen standards and book somewhat lower-quality accounts, the Credit CARD Act will prevent the highest-risk accounts from returning.

Finally, we find that econometric models estimated on nationwide credit report information generate forecasts that are reasonably close to those generated by the Federal Reserve. These models offer several advantages in terms of their transparency and ease of use and could be used by individual banks and other financial analysts to quickly and efficiently produce forecasts under a variety of economic scenarios for validation and benchmarking purposes.

About the Authors

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Cristian deRitis is a senior director at Moody's Analytics where he manages a team of economists focused on consumer credit modeling and analysis for banks, investors, utilities, and other financial institutions. He provides regular commentary to clients and the media on the state of consumer credit markets and small businesses. He has an interest in housing markets and housing policy and has written extensively on the future of the U.S. housing finance system.

Before joining Moody's Analytics, Cris managed a team of mortgage modelers and econometricians for Fannie Mae and taught courses in advanced econometric techniques at Johns Hopkins University. He received a PhD and an MA in economics from Johns Hopkins University for his work on income inequality and technological change. He graduated from the Honors College at Michigan State University with a bachelor's degree in economics.

Mustafa Akcay

Mustafa Akcay is an assistant director with Moody's Analytics, where he develops forecasts for CreditForecast and analysis in consumer credit. He is a regular contributor to Dismal Scientist, Regional Financial Review and Macro Precis. He also covers Turkey and contributes to the analysis in global economy. Mustafa has an M.S. in economics from the University of Wisconsin-Madison and a master's in Public Affairs from the University of Texas at Austin. He is a PhD candidate in economics in Temple University. His fields of interest are macroeconomics, econometrics, banking and financial institutions.

Jeffrey Hollander

Jeffrey Hollander is a director with Moody's Analytics with overall responsibility of helping financial institutions manage risk, forecast and stress-test their business, and meet regulatory challenges. He is a frequent presenter at a variety of seminars and trade shows and consults regularly with the most prominent banks and specialty lenders in best practices in forecasting and stress-testing. Jeff's 16-year career includes senior management positions in the areas of risk management, loss forecasting, portfolio management, and account origination strategies.

About Moody's Analytics

Economic & Consumer Credit Analytics

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