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Deposit Stress Testing

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Abstract

The Comprehensive Capital Analysis and Review (CCAR) stress-testing protocol dictates that banks be able to quantify the effects of the Supervisory Stress Scenarios (SSS) on their entire profit and loss statement and balance sheet. Most banks that are subject to the requirements already have models in place for analyzing credit losses, though responses vary in terms of the quality of models and the level of coverage. This year, we feel that attention will increasingly turn to the problem of testing the other factors that can make or break a bank's performance under stress. Notably, banks need a solution for analyzing the liabilities book while also extending analysis to cover the volume and quality of new originations made given the bank's risk appetite and the revenues that flow from both new and existing loans on the asset side of the ledger.

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Moody's CreditCycle clients are ahead of the game in their ability to meet the full requirements of CCAR. The product is perhaps the only available tool that explicitly projects the losses, revenues and other cash flows associated with both legacy and prospective loans as a function of internal and macroeconomic drivers. This allows users to not only forecast the runoff of the existing book but to consistently project the position of the entire book at a future point in time. Risk appetite can be explicitly accounted for since clients can easily run "what if" simulations under a variety of assumptions regarding the bank's willingness to lend given current and future economic conditions. If banks only had an asset book, we could argue that CreditCycle represents a complete CCAR solution.

The liabilities side represents the next frontier in stress testing. The purpose of this article is to explore, in concert with the existing CreditCycle framework, a means of conducting an exhaustive stress test, in the CCAR-style, of a bank with a complex portfolio of assets and liabilities. Focusing on the liabilities side, it is clear that this is made up of a substantial component that is not obviously amenable to medium-range econometric forecasting and stress testing.

To fund their operations, banks will typically source capital from national and international money markets through the issuance of bonds of various stripes and maturities. In an acute stress event, these markets may freeze up suddenly, dramatically restricting the bank's ability to remain liquid. While these events may be triggered by a macroeconomic event of one form or another, the day-to-day or even minute-by-minute nature of these forces makes them unsuited to traditional cyclical analysis. Taking account of these types of market forces fits neatly into the existing Asset and Liability Management structure—we do not see the work presented here as being a replacement for such analysis.

Other liabilities on the bank's books can be analyzed macroeconomically. Considering the deposits held by businesses, governments, households and foreigners, various macroeconomic forces will dictate both the size of the deposit pie and the way the pieces of the pie are distributed among different instruments and among different banks. This paper is concerned with developing models to capture these macro forces and then deploy the derived models in constructing baseline and stressed predictions of deposit balances in various categories.

To do this, we will first develop macro models and conduct a stress test for the entire deposit book of all U.S. commercial banks, at least insofar as it is adequately represented by data from the FDIC's Statistics on Depository Institutions publication. We will then describe how the projections derived at the industry or state level can be applied to deposit data for an individual bank. We would not recommend analyzing banks individually without reference to industry-level trends. In terms of identifying individual bank deposit activity, small-scale market forces are obviously critical. A small change in a bank's pricing structure or in the concentration of its branches could have a large effect on the bank's market share (for better or worse). This would also be true if the bank's competitors made similar strategic moves. While some banks in some countries can undoubtedly exercise significant market power, in a country like the U.S. with a large number of big banks, such market power is less pertinent. We can assume that individual banks cannot meaningfully affect the volume or nature of deposits held in the industry. The degree of banking sector competitiveness may be capable of moving the macro needle slightly in terms of aggregate deposits, but we assume that

this effect is proxied adequately by other macroeconomic series and trends. Rather than having to disentangle the macro effects from the market microstructure effects on deposits for an individual bank, we can simply focus on the macro forces and measure them appropriately. In applying the projections to individual banks, we can then assess how changes in various management policy levers affect the share of the overall deposit pie without being as concerned about the underlying macroeconomic forces.

It will be our contention that all banks are subject to the same industry-level trends while recognizing that individual banks may, for strategic reasons, opt to “swim against the tide” from time to time. An individual bank may have a deposit projection at odds with the industry, though in such cases it should be possible to articulate sound reasons why it differs from the national trajectory.

The Economics of Macro Deposits

In this paper, we estimate a series of reduced form specifications to capture the cyclical dynamic features of the U.S. deposit book. Our aim is to then apply the SSS Scenarios and thus derive stressed predictions for deposits. Ideally, from an analytical standpoint, we would estimate a true structural model but, given the data we have at our disposal here, it will be very difficult to isolate the distinct supply- and demand-side components separately. Further, given that our primary focus is to compute accurate stressed predictions conditional on a specific downside scenario, capturing such features may even be detrimental to our task. A true structural specification would involve making the broader macroeconomy endogenous within the model, but this is not possible when such economic series have already been proscribed for us by the Fed. Our aim is not to develop a model for policy analysis, involving reactions and feedbacks, but to produce one that can offer a rewarding and effective CCAR-style stress test.

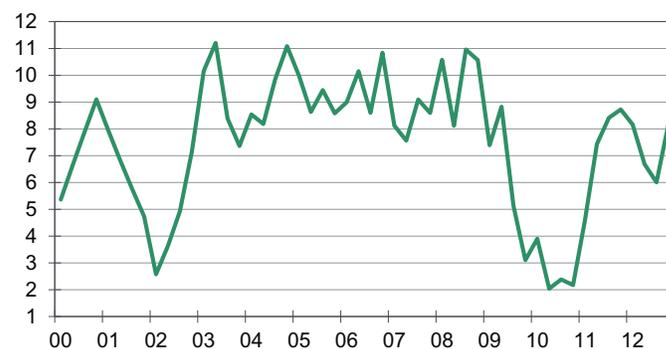
Considering the underlying structural characteristics will, however, help guide us toward an appropriate reduced form specification. In general we would expect bank de-

posits to be quite procyclical. If the economy is growing strongly, and if corporate profits and income growth are high, this should translate into across-the-board growth in disposable income, some of which will be saved or stored in deposit accounts. The rate of inflation is also pertinent since nominal account sizes will tend to grow faster if prices are moving higher. Consumers and businesses may, however, store their accumulated wealth in the form of a large variety of different assets, only a subset of which is deposit accounts held by banks. Consumers may hold stocks or bonds, houses, other fixed assets or, indeed, bank accounts and CDs. They may even choose to stuff \$100 notes into coffee cans and bury them in the garden. Businesses will often hold a lot of cash, as has been true of late, and they have the choice of investing the proceeds in new staff or equipment, returning cash to investors, or hoarding funds in bank accounts to be able to grow their businesses once demand in the economy picks up. The bottom line here is that while overall economic activity and prices need to be considered, alternative investment possibilities that draw wealth from bank accounts to other assets need to be taken into account as well. In a growing economy with strongly performing stock and real estate markets, household and business wealth may be deployed in assets that are higher risk than standard bank accounts.

The actions of the FOMC and financial markets also play a big role here. If interest rates are low and the yield curve shallow, as they are at present, we would expect the nature of deposits to be rather different from the case where short-term rates are high and the yield curve steep. Additionally, the actions of the Fed in managing the economy at the Zero Lower Bound (ZLB) may also have important effects on depositor behavior. To capture these peculiarities we consid-

Deposit Growth Slows in Recessions

Total deposits, commercial banks, % change yr ago



Sources: FDIC, Moody's Analytics

er the differential behavior of deposits when the economy is liquidity-trapped as opposed to situations where it is free to roam.

The last key consideration is the exchange rate and the behavior of international investors. The U.S. is clearly a safe haven for foreign investors during troubled economic times. In circumstances where foreign money is flowing into the U.S., we would expect to see some upward pressure on deposit levels, though this will, in an important sense, be self-equilibrating. A rising exchange rate should gradually reduce the desirability of parking funds in U.S. accounts for foreigners.

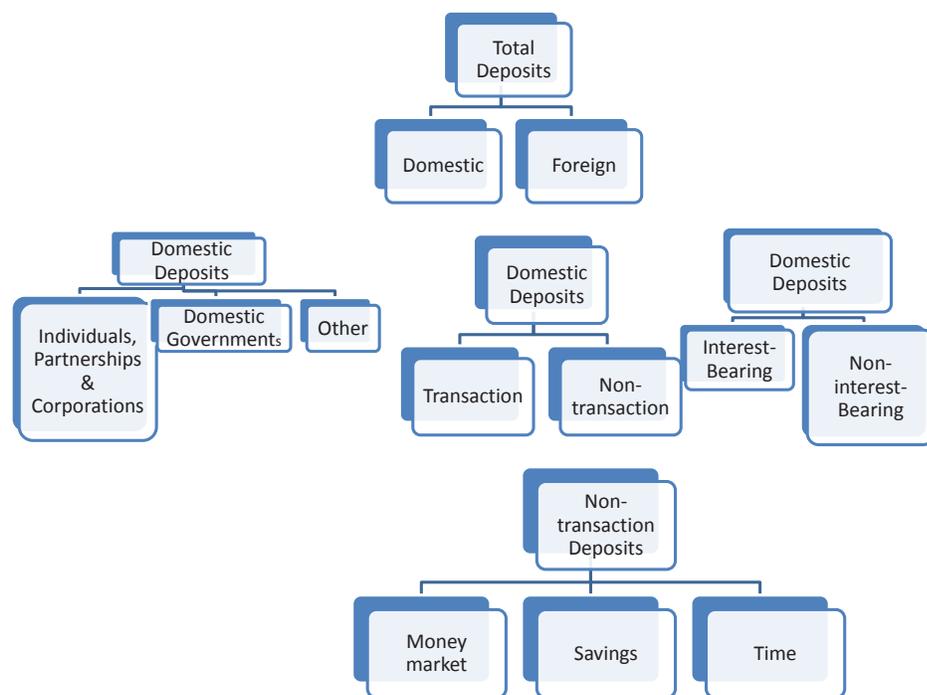
The macro drivers we consider are thus nominal GDP, the federal funds rate, 10-year and 30-year Treasury yields, the West Texas Intermediate oil price, median house prices, a broad exchange rate index for the U.S. dollar, corporate profits, and business fixed investment. One driver that was considered but ultimately excluded was the S&P 500 share price index, which was intended to be used as an indicator of alternative investment options. We found, however, that the assumed instant declines in the index under both the adverse and severely adverse scenarios had too profound an impact on resultant deposit projections. Corporate profitability is thus used in its place. The other driver considered is a dummy for the ZLB and various interactions with exchange rates, interest rates and nominal GDP. We expect there to be some nonlinear behavior in deposits both as the Fed retreats to the bound historically and as the bound is broken in a recovering economy. Under the ad-

verse scenario, indeed, short-term rates are raised instantly and we expect this to have a strong impact on both the scale and nature of deposits.

A Structural Model of Industry Deposits

The data published quarterly by the FDIC provide a clear snapshot into the position and performance of the overall banking sector. The data are quarterly and stretch back to 1994 although the first few years are provided only at an annual frequency. On the deposit side, we have overall deposits from all sources held by U.S. commercial banks (see Chart 1) and this is then broken down in a large number of different ways. First off, there is a breakdown between deposits held by the banks domestically and those held in foreign accounts (about 13% of total deposits). The domestic deposits are then broken down further. In terms of the identity of the depositors, the largest component of domestic deposits is obviously held by individuals, partnerships and corporations (about 93% currently) with the rest made up of deposits held by federal, state and local governments, foreign banks and foreign governments, and other private banks. Of these, the domestic government component is the largest and most interesting because such deposits tend to grow in importance during recessions. We treat the remaining categories, which make up about 2% of all deposits, as minutiae and do not model them explicitly. Other useful series provided, not specifically related to deposits, are bank assets—both fixed and financial—and the size of the bank-related workforce. These factors, while not the primary focus here, are modeled endogenously with deposits to ensure that a causal relationship is not assumed.

The strategy we employ involves first modeling overall deposits and then considering the share of the deposit pie that can be attributed to each sub-category. We have a model for total deposits that relates its growth rate to a number of economic drivers, financial market indicators and bank-related aggregate statistics. This model includes lags of various lengths and is estimated using linear regression. We model the share of total deposits that are domestic using a



logistic functional form, and we generate the coefficient estimates using a GLM estimator. Foreign deposits are derived via an identity relating total deposits to the sum of foreign and domestic. Using similar modeling strategies, we consider the share of domestic deposits held by individuals, partnerships and corporations and then look at the share of the remaining deposits that are held by domestic governments. We use a similar procedure in modeling the breakdown of domestic deposits into transaction and non-transaction and into interest- and noninterest-bearing varieties. The nontransaction deposits can then be further broken down into money market accounts, savings and time or term deposits. A flowchart showing the structure of the data is provided in Chart 2.

Our approach to variable selection involves using a style that advocates of Vector Autoregression (VAR) based forecasting will find familiar (though, as mentioned, we assume that the broad macro drivers are exogenously determined). We first identify a group of nine macroeconomic drivers that we view as likely to have an impact on the dynamic evolution of deposits and then introduce these, with a variety of lag lengths, into the models described above. The models are therefore fairly heavily parameterized,

though our key objective is to “let the data speak” in determining the importance of the different macroeconomic linkages. One can make a sound argument that stress-testing models should be more heavily parameterized than standard baseline specifications because we want to be able to differentiate between the effects of scenarios of a different nature (such as the adverse and severely adverse scenarios in the SSS) and because we do not need to produce separate forecasts for the input macro drivers. We will judge the appropriateness of the macro linkages by examining baseline forecasts for the output series and the response of the various metrics to shocks as represented by the alternative scenarios.

Data and Scenarios

In this analysis, we employ the baseline, adverse and severely adverse scenarios from the recent CCAR process. Our aim is to demonstrate that it is possible and desirable to produce cyclically sensitive forecasts and scenarios for deposits that can then be employed in a CCAR-style stress test. The nature of these scenarios bears heavily on the results reached in this article.

The baseline scenario is based on a consensus set of forecasts for the U.S. drawn

from Blue Chip surveys. As most such forecasts are, the projections are somewhat boring—a slow but steady recovery in the economy with the Fed eventually being able to raise rates in late 2013. Of the downside events, the severely adverse scenario is generally worse than the adverse scenario in terms of the performance of the real economy, though the differing nature of the events means that there may well be series that are more acutely affected by the adverse scenario than by the severely adverse installment. Generally, the adverse scenario is a stagflationary event whereas the severely adverse scenario is deflationary. This distinction is especially important when considering deposits. Under the adverse scenario, inflation immediately rises despite a poorly performing economy and the Fed instantly reacts by raising interest rates, moving the key benchmark rate to 3% by early 2014. The yield curve under this scenario is generally steeper than baseline through 2012, though in general the scenario represents a broad upward shift in the location of the curve. This will have a large impact on the behavior of depositors who will suddenly be able to earn interest on checking accounts and derive a decent yield from term deposits. These realities coincide with a poorly performing real economy and falling house prices, meaning that a good old savings account becomes a relatively good investment option. Put simply, because of yield curve dynamics, the adverse scenario may not be especially adverse from the perspective of various deposit categories.

The data employed in the analysis run from 1994 until 2012Q3. This period covers the Great Moderation and the Great Recession, together with the relatively mild 2001 recession and the tech boom of the late 1990s. Inflation through this period was generally mild, hovering mainly between 2% and 3%, and interest rates were generally much lower than they had been back in the 1980s. While the severely adverse scenario looks like a repeat of the Great Recession—though admittedly coming on the heels of the recession we've already had—there does not seem to be, in the domain of the observed data, a historical analog for the

stagflationary adverse scenario. This may make it difficult to tease out the full effects of this scenario. While we observe periods of weak growth in the real economy and, separately, periods where inflation is slightly more elevated than normal, we do not observe a period where both events occur simultaneously.

If there are interactions between the two phenomena in the determination of deposits, we will likely miss them.

Nonetheless, the proof of the pudding is in the eating.

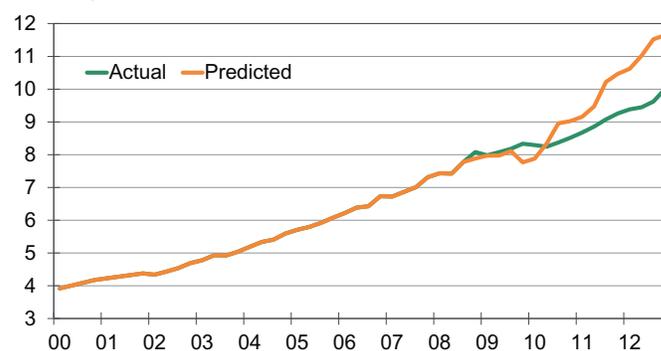
Validation

Because we use the Zero Lower Bound dummy as a key performance driver, it is technically not possible to assess the final model in terms of its performance in projecting deposits during the Great Recession. The ZLB was, after all, not in place until the recession was already a reality. With that said, we want to provide some indication that the model developed is doing a reasonable job of projecting deposit performance under stress. We proceed by excluding the ZLB-related variables, re-estimating the model through 2008Q3, and producing projections using the actual economic data that were observed up until the end of 2012. The period in question coincides with the collapse of Lehman Bros., which triggered the most acute stress that occurred through the entire period. We focus on total deposits, since this drives the levels seen in other key sub-categories. The out-of-sample projection is depicted in Chart 3.

For the first year, the projections developed by the model are somewhat lower than those subsequently observed; the model produced forecasts that were slightly too pessimistic. While we think that the primary goal of stress testing should be to provide accurate projections, conservative forecasts represent a valid second order concern. If we are going to make an error, we want it

Conditional Forecasts Perform Well

Total deposits, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

to be suggestive of low deposit levels since these create the greatest challenge from a bank management perspective. We feel that the projections over this period are fairly accurate and that they err, slightly, on the low side. Given that the data run from 1994 to 2008 in this version of the model, there is not a single incidence of consistently depressed deposit growth. The framework does a very good job of producing a “deposits recession” when undeniably poor economic data are introduced to the model.

Interestingly, from mid-2010 on, the forecasts from the model estimated over the reduced sample are more aggressive than subsequent realizations. It is our contention that this elevated, steady state deposit growth rate is due to the exclusion of the ZLB-related variables from this reduced sample model. As will be demonstrated below, very low interest rates have the effect of depressing growth in several key deposit categories. Excluding the impact of the liquidity trap creates a situation where longer-term deposit projections are elevated relative to similar forecasts made assuming a continuation of the ZLB.

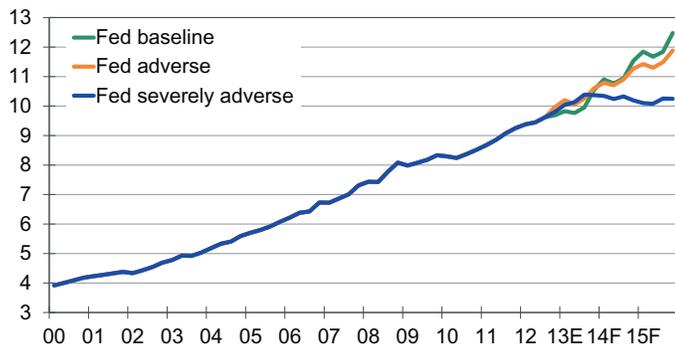
Since the full model includes ZLB-related factors, we are confident that the predictions described in the next section will not be too aggressive.

Results

The baseline and stressed projections are presented in Charts 4 to 14. Turning first to total deposit forecasts, we can quickly note that by the end of the forecast period, which runs from 2012Q4 through 2015Q4, total

Deposits Jump Under Stress, Then Flatten

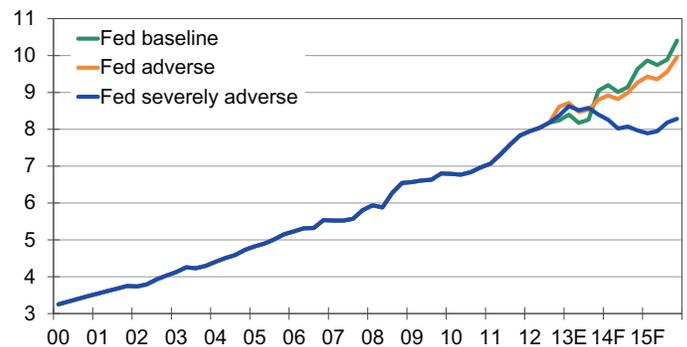
Total deposits, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Domestic Drives Total Deposit Behavior

Deposits held in domestic accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

deposit levels end the forecast period in the "correct" order. By this, we mean that total deposits end up highest under the baseline scenario, followed closely by the adverse scenario with the severely adverse scenario lagging behind starkly. The most interesting feature of the interim period, however, is that deposits initially rise above the baseline projection under both scenarios. This result is most marked for the adverse scenario, which begins 2013 with a deposit rate 2% higher than the severely adverse scenario and about 5% above the baseline projection. In part, the strong early performance of the adverse scenario is because interest rates are instantly set higher by the Fed. Aside from this, we note that every alternative investment option under both downside scenarios takes a sudden and dramatic hit. Both housing prices and corporate profitability nosedive, forcing investors to retreat to the safety of bank deposits. Over time, the

lack of income generation by businesses and consumers takes its toll to the point where deposit growth slows noticeably. Note that total deposits is a nominal concept, so although the end result for the adverse and baseline scenarios is not much different, the effect is far greater when viewed through an inflation-adjusted lens. The performance under the severely adverse scenario looks particularly pronounced with only slight deposit growth through the 13-quarter period and outright declines through much of 2014 and 2015. A couple of quarters during the Great Recession witnessed such deposit decline, and overall growth was quite muted in 2009 and 2010. In general, though, our analysis suggests that a repeat performance of the recent recession would be quite detrimental to the national deposit account balance.

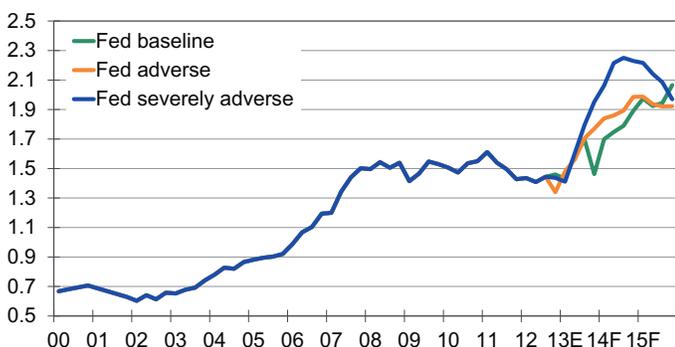
Similar trends are observed in domestic deposits, which make up the vast majority of the total. Focusing on foreign deposits,

which have been stagnant since the onset of the recession, the models suggest that growth will occur under all three scenarios. Here, the three separate projections wind up in approximately the same place though interim growth is actually strongest under the severely adverse scenario. We do not utilize any of the Fed's assumptions regarding the behavior of international economies under the three scenarios with exchange rates providing the only bridge between the U.S. economy and the rest of the world. With that said, our results indicate that American banks will see increased activity in their foreign offices should a disastrous economy unfold in the U.S. In general, the scale of foreign deposits is likely to correct after several years of sub-par growth no matter what happens in the broader economy.

Digging deeper into the domestic activity is where the results become especially interesting (if you pardon the pun). Looking

Foreign Accounts Recover After Stagnation

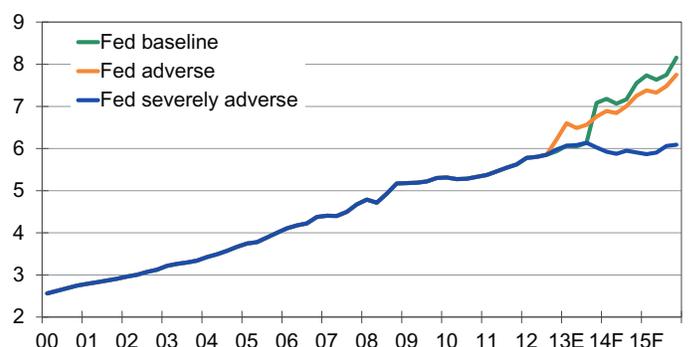
Deposits held in foreign accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Higher Interest Rates Attract Depositors

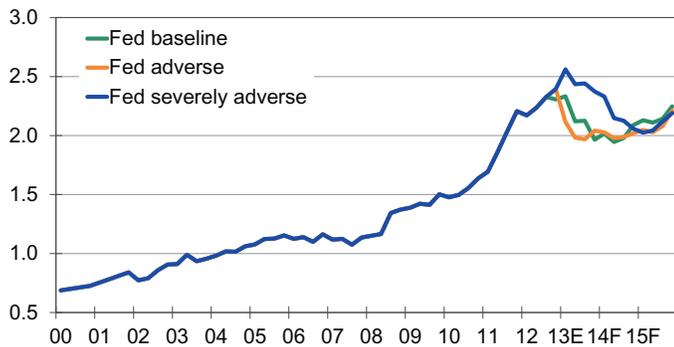
Deposits in interest-bearing accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Liquidity Trap Helps Noninterest Accounts

Deposits in noninterest-bearing accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

initially at interest-bearing deposits, we see that the timing of the end of the Fed's zero interest rate policy becomes very important. Under the adverse scenario, the Fed raises rates straightaway and this makes interest-bearing deposits an instant attraction for businesses and households. Such deposits jump by about 7% under the adverse scenario; this result is matched by the baseline scenario though the timing of the jump is held until late 2013 when the Fed raises rates. In our model, the timing of the first rate rise is determined by dummy variables. In reality, investors would likely anticipate the Fed's actions and deposit shifts would not be quite so abrupt. We are accentuating the effect of future Fed actions but this is the easiest and most parsimonious way to account for their effect on nominal deposits.

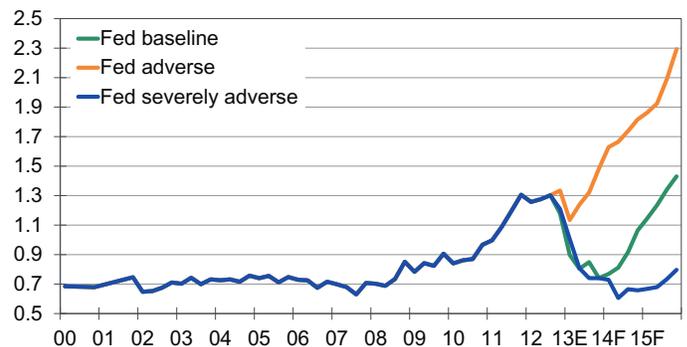
Other interest rate-sensitive deposit products exhibit similar, if not more pronounced, behavior. Buried within the non-

transaction sub-sector, term deposits exhibit very strong growth once the Fed moves interest rates into positive territory. The attractiveness of time-based accounts took a nosedive in the wake of the Great Recession and the associated shallowing of the yield curve. Curiously, the prospect of a 0.5% annual return for locking your money away for five years does not appeal to many people. Under the severely adverse scenario, where rates remain depressed for the entire period, the desirability of time deposits remains very low—the volume of accounts in the category actually falls below recent levels. Under both the adverse and baseline scenarios, however, we see strong nominal growth in these deposits as interest rates normalize and a decent term premium can thus be reaped.

The remaining category to be affected by the Fed's actions appears to be transaction-based or checking accounts. This category

Inflation and Rates Drive Transactions

Deposits held in transaction accounts, commercial banks, \$ tril

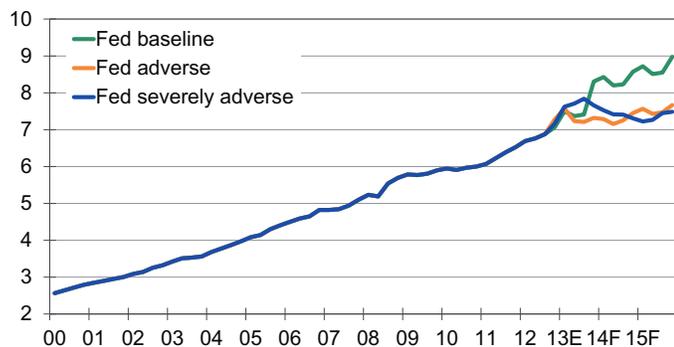


Sources: FDIC, Moody's Analytics

represents about 15% of all domestic deposits. Through much of the estimation period, growth in the scale of transaction-based accounts was fairly moribund. The Great Recession saw growth in transaction accounts, presumably because people value convenience and this rises to the fore when returns on investment deposits are about the same as those on checking accounts or cash. Interestingly, the model once again finds support for the view that a steeper yield curve, ceteris paribus, is associated with higher growth in transaction-based deposits. When economic growth is poor, as it is under the adverse scenario, alternative investment options are unavailable and we find that checking account growth is strongest under this scenario. In both the baseline and severely adverse scenarios, however, we find that the recent surge in checking deposits undergoes a correction and balances revert to something resembling the long-run steady state. Again,

Downside Events Depress Investments

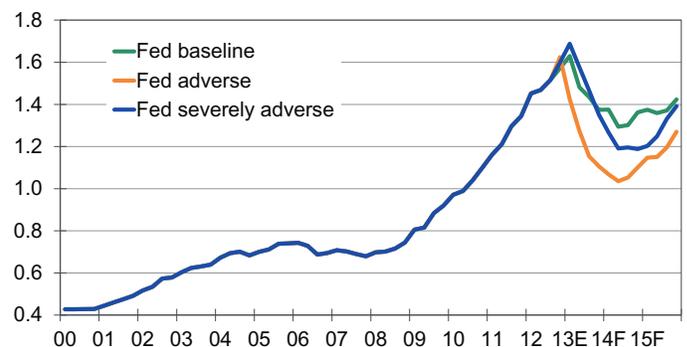
Deposits in nontransaction accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Savings Normalize After Strong Growth

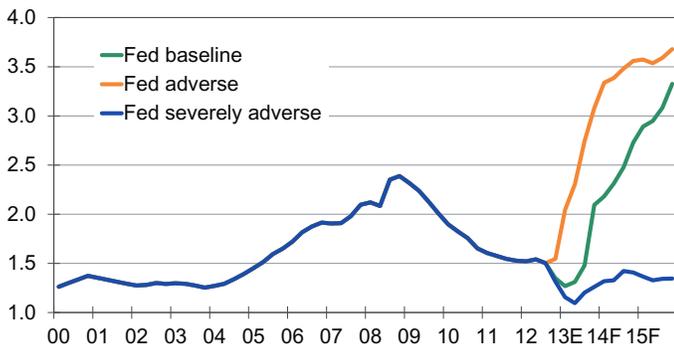
Deposits in savings accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Time Deposits Recover on Steeper Yield Curve

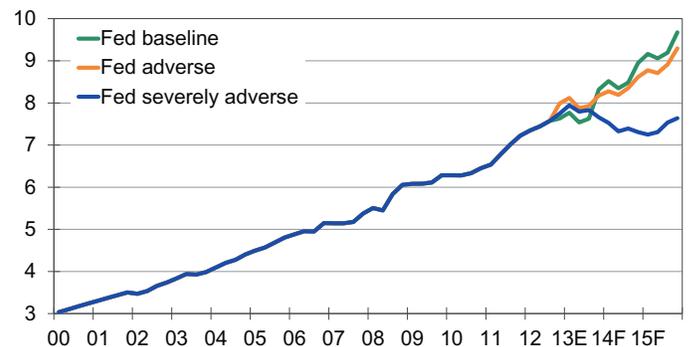
Deposits held in term/time accounts, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

Private Sector Deposits Drive Trend

Deposits of individuals, partnerships & corps., comm. banks, \$ tril



Sources: FDIC, Moody's Analytics

a rise in short-term rates in late 2013 sees baseline balance growth start to rise though this path remains well below the baseline projection through the end of the period. Recent 2013 growth in transaction account balances has been even stronger than those suggested under the adverse scenario. In general, the projection for transaction-based accounts is the most unusual result found in this research; it demands greater scrutiny.

Results for money market and savings accounts are generally in accordance with the results described earlier. The shift of deposits into checking and time accounts as rates rise is matched by a consequent decline in the desirability of savings and money market accounts. On the savings side, for example, the severely adverse scenario sees deposits end the forecast horizon almost on par with the level under baseline conditions. It thus represents a far larger share of the deposit pie should such circumstances bear out. Under the adverse

scenario, where the shift to higher yielding accounts is more pronounced, savings accounts fall quite sharply in their utilization by consumers and businesses. Savings account balances have been growing very strongly through the Great Recession so, in part, the declines witnessed under all scenarios represent a correction back to the steady state after a period of higher than normal growth.

Conclusions and Future Work

The baseline and stressed projections presented here should help to inform deposit expectations under a variety of CCAR-style stress scenarios. The results for the adverse scenario are generally the most stark, in the sense that inflation and rate rises combined with poor real economic growth create an environment where depositor behavior changes abruptly. Such conditions are not observed in the historical record for these data and, indeed, have not pertained to the U.S. since at

of overall deposits and several important sub-categories appear sound under all scenarios.

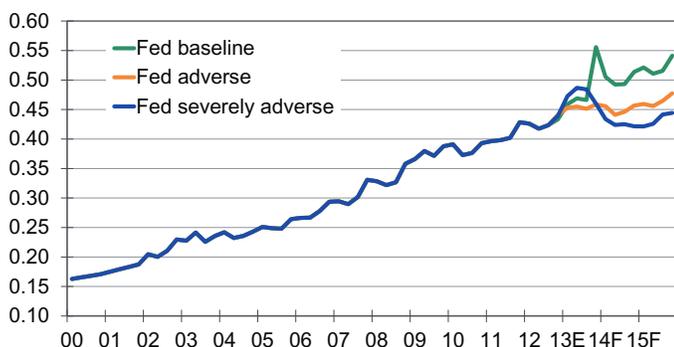
If a fully representative bank existed, the scenario forecasts provided in this paper would be an adequate submission of projected deposit behavior for CCAR. Naturally, though, no bank is truly representative. In order to extend this work to allow for the idiosyncrasies of an individual bank, several additional steps are required. First, to cope with regional variations, we can use FDIC data on state-level deposits to calibrate to the results seen here and thus construct state-by-state deposit projections. These data are based on the branch location at which deposits are held; an alternative FDIC data bank contains breakdowns based on the state of incorporation; this is far less useful for modeling—Delaware is massively over-represented. The useful state-level data cover only total deposits and the number of bank branches. Armed with state-level total deposit forecasts and the results in this paper, we should be able to generate reasonable stress projections for representative banks in Iowa, New York or New Mexico and then use weighted combinations to match regions to specific bank footprints. State-level deposit forecasts will constitute the next installment of this series of research papers.

The third step in the tailoring process requires internal bank data. The bank in question may price deposit services aggressively, to gain market share, or exorbitantly, to reap high profits, depending on prevailing market forces. The bank may have a

least the 1970s. The fact that nothing like the adverse scenario exists in the domain of the observed data makes it very difficult to model, though the framework presented does at least a plausible job of predicting deposit behavior. Results for the other scenarios are more robust. Projections

Government Accounts Lower Under Alternatives

Deposits held by domestic governments, commercial banks, \$ tril



Sources: FDIC, Moody's Analytics

small number of rundown branches that are thinly staffed, or it may have gleaming new edifices on every street corner. The bank may have an extensive TV and internet marketing presence or it may rely simply on word of mouth among consumers. The bank may be trying to grow deposits by attracting new customers or it may target

existing clientele and encourage them to save more. The bank's exact share of the deposit pie will rest on these types of internal strategic drivers.

A tailored and appropriate stress-test model will reflect the macro dynamics presented in this paper and its state-level extension. Such a framework will also ac-

count for past efforts of managers to grow the deposit book and potential management responses to the onset of stress. Looking forward, it should be possible and certainly desirable for managers to assess "what if" strategic questions of deposit behavior in the context of baseline and stressed economic projections.

About the Author

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Tony Hughes is senior director of Credit Analytics at Moody's Analytics. His main responsibility involves managing the company's credit analysis consulting projects for global lending institutions. An expert applied econometrician, Dr. Hughes also oversees the development of Moody's CreditCycle and manages the data and forecasting product CreditForecast.com. His varied research interests have lately focused on problems associated with loss forecasting and stress testing credit portfolios.

Now based in the U.S., Dr. Hughes previously headed the Moody's Analytics Sydney office, where he was editor of the Asia/Pacific edition of the Dismal Scientist web site and was the company's lead economist in the region. He retains a keen interest in emerging markets and in Asian/Pacific economies.

A former academic, Dr. Hughes held positions at the University of Adelaide, the University of New South Wales, and Vanderbilt University, and has published a number of articles in leading statistics and economics journals. He received his Ph.D. in econometrics from Monash University in Melbourne, Australia.

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