Bank Asset/Liability Management

Vol. 24, No. 1
January 2008

SCI™

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Accurate Core Deposit ALM Model Inputs: There is a Proven Answer

Recent experience with ALM model verifications clearly shows that the most significant sources of model risk are behavioral assumptions, not data inputs or technical setup issues. (Across 250+ ALM model verifications performed by McGuire Performance Solutions, Inc. (MPS) in 2006-2007, more than 20% of the models were ranked below average. The major failing was missing or inaccurate behavior assumptions. Even models ranked as average (63%) generally had weak core deposit inputs (unsupported or generic). Model risk is real in this regard.)

Core deposit inputs are either missing or poorly specified. Weak loan prepayment and missing CD optionality inputs are another concern. This situation is creating significant degrees of industry-wide model risk because poor behavior assumptions in models can distort projections of both the magnitude and direction of interest rate risk (IRR).

Recent debate in previous issues of this publication and others have questioned whether core deposit behaviors can be analyzed and accurately forecast. The answer is in fact *yes*, if (a) the proper degree of sophistication is brought to bear in the original behavior analyses, (b) forecasts based on the analyses are appropriately translated into ALM model inputs, and (c) the inputs are maintained over time. Projected behaviors embodied in the ALM model inputs can accurately capture actual outcomes, thus minimizing model risk. Hundreds of core deposit behavior analysis forecasts for a wide range of asset sizes and all charters have been successfully back tested over the last dozen years. The historic record supports advanced core deposit behavior analyses, and it is now time for the industry to act on that affirmation.

This article defines the answer to reducing core deposit-related model risk. The elements that produce success are examined in detail:

- First, comprehensive quantification of all relevant behaviors and creation of flexible forecast capabilities.
- Second, translating forecast data into precise ALM model inputs.
- Third, defining a program that monitors outcomes, proves the accuracy of model inputs, and maintains precision levels over time.

In This Issue:

The goal is to define the criteria by which to judge potential solutions for obtaining ALM model core deposit inputs. There is much at stake, as the model risk from core deposits – a large balance sheet component – can be very large.

Criteria One: Quantification of All Core Deposit Behaviors and Flexible Forecast Capabilities. Core deposit behaviors and their drivers are multidimensional and quantification requirements are substantial. The good news, however, is that advanced methodologies can create the flexible forecast capabilities that define high precision behavior assumptions required in an ALM model. Guidelines for success are as follows.

Institution Specific Analysis: Core deposit behaviors are driven by direct finance influences (from the received value created by the interaction of own rate paid, market rates paid, interest rates, and fees) and indirect finance influences (from the perceived value created by service, convenience, and product). Since core deposit behaviors are the net outcome of two influences, they are dependent on the specific elements of each institution's overall value proposition, hence the need for institution specific experience, as expressed in recent historic data.

Granularity: Analyses must be at the category level and the categories analyzed need to be granular enough to recognize unique behavior influences. For example, personal versus business balances and individual tiers need to be separately analyzed wherever material.

Robust Estimation Approach: Rates influence balances behaviors and category behaviors are interdependent, both in terms of balances and rates paid. Behavior analyses must take these relationships into account by examining historic data *simultaneously* across all categories. Commonly encountered single equation models are inadequate, for example, because they cannot capture cannibalization and other cross-category effects.

Let the Data Decide: A broad range of potential influences on core deposit behaviors can be *a priori* specified. This includes lags, trends, own rates, market rates, interest rates, and spreads, other category balances and rates, seasonal and day of the week factors, special conditions (e.g. the 9/11 flight to safety), and any unique event in the historic record (e.g. M&A activity). Because of the potential complexity, the historic data must drive selection of the predictor variables in the estimated equation system. This creates an appropriately comprehensive *n-factor, data driven* specification. Common four factor models do not adequately capture all significant influences, which explains their often limited predictive success.

Use the Estimated Equation System to Forecast: Advanced core deposit behavior analyses create an equation system capable of forecasting all ALM model relevant behaviors – supply, repricing, and runoff. Forecasts are at the category level and projections evolve over time by specified future time period (e.g. weekly, monthly, annually). Forecasts reset to current interest rate conditions in each new analysis period (e.g. for each monthly IRR analysis) and define unique behavior paths interactively with specified IRR test scenarios. The equations system can be employed to create advanced back tests, such as comparing actual retention values to retrocasted model forecasts for prior periods using actual rates paid and interest rates from those periods. The equations can also define special model inputs that are consistent with specified conditions (e.g. repricing inputs that are consistent with constant future balances supplied in a static balance sheet earnings at risk analysis).

If the underlying analyses meet all of the conditions above, then forecasted ALM model inputs will consistently predict well. This minimizes core deposit related model risk. But the results of accurate core deposit behavior analyses and forecasts need to be entered correctly into the ALM model if the right end results – accurate balance sheet performance and IRR analyses – are to be attained.

Criteria Two: Translation of Forecasted Core Deposit Behaviors into Accurate ALM Model Inputs. Precise behavior forecasts are a means to an end – accurate core deposit ALM model inputs. A list of what is needed and how to ensure that the right inputs are specified is developed below.

Repricing Specifications: Repricing of core deposits has a magnitude dimension (the repricing coefficient, a.k.a. beta) and a time dimension (lags and point of assessment). ALM model inputs need to (a) specify the correct beta and lags (both are quantified in properly created forecast data) and (b) apply the right point of assessment (at 12 months for earnings at risk analyses and at equilibrium in equity at risk analyses). Forecasted betas and lags can be modified in earnings at risk analyses to reflect management's current expectations, but any respecified repricing inputs need to be generally consistent with historic experience. Be careful of asymmetric

repricing inputs, as repricing analyses across long time series do not support such outcomes. Repricing lags are slightly longer when interest rates rise than when they decline, but the effects are normally seen only in the first year. Equity at risk betas are more appropriately left untouched as they accurately define the long term behavior of pricing. Lags have limited importance here because the assessment horizon is so long.

Consistent Balances Supplied – Repricing Specifications: The repricing inputs specified in earnings at risk assessments must be consistent with assumed future balance behaviors. If a static (constant balances) balance sheet earnings at risk analysis is specified, then model beta inputs must support this. Since historic repricing may not have ensured constant balances supplied, forecasted betas may need adjustments. For example, if the forecasted beta specifies +25 basis point (bp) of repricing (first year) for a +100 bp change in interest rates, and the simultaneous forecast is for a decline in balances supplied of 10%, then the 25 bp beta is clearly not consistent with a constant balance sheet NII IRR analysis. Increase the beta by a reasonable amount (based on experience or consensus), enough to roughly counter the adverse supply effect. The same mandate applies for dynamic balance sheet IRR analyses; repricing must support targets in each scenario.

Retention, Runoff, and Average Life Specifications: Runoff is derived from forecasts of existing balances retention. Retention is defined based on fixed pools of all accounts open at the start of the historic time series analyzed. (The use of original accounts only, fixed pool approach is chosen because it is most consistent with regulatory action in the event of a resolution. At that point, there is no future for the institution, and hence no new accounts.) Average life is calculated by weighting runoff balances, the difference in retention between periods, by the mid-point of each period. In some cases, retention continues at high levels for very long periods of time. This is particularly true for checking type categories, where the effects of limited account closings are offset by rising average balances in remaining accounts. Retention may be truncated (runoff ballooned) at a point where the forecast's potential for error becomes unjustifiably high. Truncation points can be management specified but are rarely longer than 17.5 years. Fortunately, changing truncation points at very long maturities has limited effects on effective duration because cash flows at long maturities are discounted so heavily. Effective duration is the true measure of the equity at risk hedging contribution of core deposits. Beware of *conservative* short truncation points that mask the adverse effects of correctly estimated long core deposit average lives on performance and IRR positions when interest rates decline.

Core versus Non-Core Balances: Before applying forecasted runoff inputs to category level core deposit balances, assess whether current balance levels contain a non-core component. This could be from seasonal or otherwise transient influences or from money parking until financial market conditions improve, as happened in 2002-2003. Best practice is to identify non-core balances from graphical reviews of time series balances supplied data and create parallel core deposit sub-categories for non-core balances by category. Assign non-core balances minimal (e.g. 3 month) average lives by specifying almost immediate runoff.

Net Non-Interest Expense Inputs: Net non-interest expense (NIE) is usually added to the rate paid on core deposits to create an *all-in* cost of the balances valued. NIE inputs should represent the cost of gathering, servicing, and retaining balances, net of fees. Best practice is to present value NIE in the period it is incurred (based on remaining balances) while interest expense is compounded and present valued when balances run off.

Discount Rates: A market defined time cost of alternative funding curve must be specified. The most common curve applied is bullet term advances rates from the institution's local Federal Home Loan Bank. This is a well known and trading rich depiction of alternative funding costs, and one that closely mirrors LIBOR curve rates, an international time cost of money measure.

Correct Valuation Methodology: ALM models are generally configured to calculate core deposit present values based on the difference between rate paid and the cost of alternative funds with similar maturities. This is adequate for zero beta (DDA) or low beta categories. For high beta categories such as those repricing in excess of 75 bp per 100 bp change in interest rates, another approach is required. The economic advantage of semi-floating (or floating) rate funds can only be the difference between their all-in cost and the cost of alternative funds with a similar repricing frequency. For example, suppose a high tier MMDA category reprices by 95 bp per 100 bp change in interest rates. The Treasury rate with that closest sensitivity is the one year maturity, based on statistical analyses (source of the Treasury beta is the MPS Smart Ramps service) of historic Treasury rate relationships.

The economic advantage of the MMDA balance is the present value of the ongoing favorable spread (on remaining balances) between the all-in cost of the MMDA versus the one year FHLB term advance rate (repricing equal to the one year Treasury). Few ALM models are set up to do this calculation, even though differences in outcomes can be large.

The end results of accurate core deposit behavior analyses and forecasts, and the right ALM model inputs, are precise interest expense inputs for balance sheet performance assessments and earnings at risk analyses, plus precise present value and effective duration inputs for equity at risk analyses. Model risk is minimized and balance sheet management information is maximized. But typical core deposit contracts permit potentially rapid and significant behavior changes, so ALM model inputs need to be continually monitored, tested, and updated.

Criteria Three: A Maintenance Program to Ensure Continued ALM Model Input Accuracy. A multi-faceted program to monitor, prove out, and update core deposit ALM model inputs is vital to maintaining ongoing confidence that their underlying behaviors continue to hold. Several pieces are necessary. Focus is on retention behaviors, because they are not observable in standard financial institution reporting.

Ongoing Monitoring: Every month, actual category level retention outcomes need to be compared to forecast inputs in the model. A large adverse variance in any month (i.e. the forecasted input overstates actual retention) may indicate a change in depositor behavior. More likely such an outcome is due to seasonal or other one-time factors, but these outcomes need to be investigated. Each quarter, back test over the prior three months and report the results in a simple memo. This documentation becomes part of the model workpapers for that period. If significant variances occur, discuss as a special topic in that period's ALCO meeting.

Periodic Formal Back Testing: Produce a formal back test of actual category level retention outcomes versus the forecast inputs in the model at least annually. This puts the longer term accuracy of the model's retention assumptions into proper perspective. Include a narrative on the outcomes seen in the back test. Be sure to note how changes in interest rates and actual versus forecasted repricing may have contributed to observed outcomes. This report should be reviewed by ALCO and the Board as part of annual ALM model presentations.

Periodic Updates and New Analyses: Over time, the accuracy of any forecast will degrade. To keep ALM model inputs up to date, reforecast all behaviors at least annually, based on a refresh of the estimated equations system using data through the most current period. More frequent updates will need to be conducted in unsettled times or if core deposits are a very large part of overall balance sheet strategy design. Every three years, conduct a new study, based on more current fixed pools of accounts. This ensures that forecasted runoff inputs are contemporaneous with current depositor behaviors.

Monitor Continuing Franchise Quality: As part of understanding your institution's deposit franchise and anticipating possible changes in future behaviors, review franchise fundamentals periodically. Identify continuing strengths, such as service and convenience levels, and also review potential threats to prior behaviors, such as a major change in economic conditions. Include this assessment in the annual ALCO and Board ALM model input review materials.

The road to minimizing model risk and maximizing management information with respect to core deposit behavior inputs can be long and challenging. But many financial institutions follow the path successfully, finding more clarity and purpose in their IRR analyses and other ALM model applications.

Accurate core deposit behavior information supports enhanced profitability and FTP inputs. Also, quantified core deposit behaviors offer key insights into recent depositor supply and retention patterns. This knowledge provides context for marketing strategies, budget targets and other uses across the institution. Finally, market makers recognize that high value institutions are increasingly based on a high value core deposit franchise. By understanding and quantifying your institution's core deposit history, and calculating its proven premiums, you are in a better position to demonstrate the value of your core deposit franchise to Wall Street.

There is a proven answer to obtaining accurate core deposit ALM model inputs. Now is the time to implement the process. Rarely has virtue, in the form of lower model risk, joined hands so closely with value – the ability to translate enhanced deposit behavior understanding into higher performance and value!

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