
Backtesting the Asset/Liability Management Model – Part 2

Part 1 of this series began with an introductory discussion of the conveyance of interest rate risk to governing bodies such as ALCOs and others (regulators, internal auditors, third party model/process reviewers, and shareholders or analysts who review 10-Ks or 10-Qs). These people rely on the ALCO professional's ability to present the information either to execute risk management strategies or to evaluate the ALCO's effectiveness at managing risk. Backtesting of the ALCO process can evaluate our effectiveness. Part 1 continued with discussing the chief purposes for interest rate risk modeling, and

presented an in depth example of model results.

This next discussion will build on this example by discussing the differences in these results.

***NOTE:** The exhibit numbers will continue from Part 1 to avoid confusion when reading the series as a whole. Exhibit number 6 will be the first chart in this discussion.*

Differences between Modeled and Actual Results.

There are some obvious reasons for differences between modeled and actual results which we can identify at the beginning:

- It is very unlikely that any rate scenario used for risk measurement, usually made in formalized increments over neatly divisible periods of time followed by a

period where rates do not change at all, will match up perfectly or even all that closely with the real path of interest rates.

- Either static or *best forecast* balance sheets are likely to differ materially from actual results, as customer and management behavior will change along with interest rates.
- Major assumptions underlying the modeling process, such as prepayment speeds, deposit rate and balance behavior may turn out very differently from projections.
- Management decisions to restructure the balance sheet in reaction to the changing rate environment can change the interest rate risk profile.

Notwithstanding these limitations, backtesting is still a very valuable exercise that helps us assess what is right and wrong with the rate risk modeling process. It should at least give us the ability to determine if modeling gives us directionally accurate results reliable enough to manage interest rate risk, and can isolate those factors we may have missed or overestimated. Obviously there are many factors that could affect the modeling process, including assumptions about basis risk and prepayment sensitivity, but we will focus on isolating key aspects of deposit behavior as the most material factors for our sample institution to review when backtesting.

At many depository institutions, the sharp increase in short-term interest rates beginning in mid-2004 initiated a shift in deposit mix from the influx of low-cost core deposits gathered when interest rates were at historic lows. As market interest rates have increased, not only have rates paid on deposits risen, but large balances temporarily parked in low-cost but highly liquid core savings have flowed in increasing quantities to higher-cost alternatives, such as time deposits or promotionally priced (either for deposit gathering or defensive purposes) money market or savings accounts. Static balance sheet testing might omit this shift assumption, but it is a factor that can be anticipated and modeled based on historical precedent. Omitting or underestimating this shift could have adverse consequences.

At the example institution, rate risk modeling assumptions as of June 2004 incorporated an assumption of expected shift from low-cost

Exhibit 6

	Projected 06/30/2004	Actual 06/30/2006
Low-cost core savings runoff	\$75,775	\$67,444
Deposit mix percentage		
DDA and NOW	33%	24%
Low-cost core savings	17%	14%
High-cost savings / time deposits	50%	62%

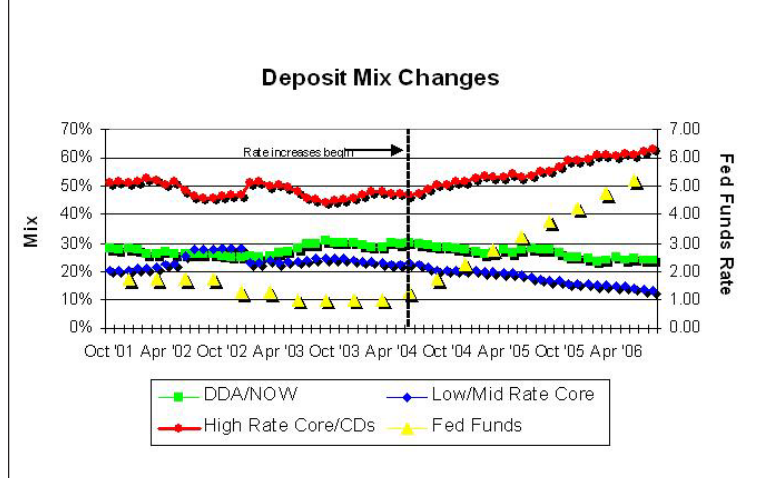
core savings balances to higher rate alternatives in rising rate scenarios. The table in Exhibit 6 shows what the ALCO in our example assumed would happen to changes in core deposit balances (basically a quantified shift from low-cost deposits to higher-cost deposits over a 12 month horizon).

While the exact amount of the estimated shift was close to the actual shift in deposit mix, the growth in higher cost deposit classes as a percentage of total retail deposits clearly exceeded the balance sheet expectation two years into the rate cycle. The ALCO got part of the disintermediation story right, but underestimated the magnitude of the shift in hindsight. This error tends to underestimate exposure to interest rate risk in a rising rate environment.

Exhibit 7 shows the change in deposit mix over time as rates increased at our example institution.

Core Deposit Rates. Core deposit rate behavior poses another notoriously difficult problem. Rate behavior and disintermediation are closely linked. However, we must make some guess about the movement of rates paid on

Exhibit 7



Bank Asset/Liability Management

these administered rate accounts as market indices move up or down. Since core deposits can constitute a big portion of funding, this is a key variable that has to be monitored closely, and may not always move symmetrically. For example, when short-term rates were at historic lows, these rates had little room to move downward, but a lot of room to increase.

The example ALCO estimated core savings rates to be most closely correlated to short-term market rates, and expressed sensitivity as a percentage of short-term rate movements. The estimate was based partly on historical precedent and partly on management's estimate of how it could manage rates based on the behavior of competitors in the marketplace. On a base of hundreds of millions or billions of dollars, any failure in estimating rate sensitivity could result in a serious misstatement of interest rate risk. How did the ALCO do at guessing?

Fortunately, the recent increase in short-term interest rates divides neatly into quarterly 100 basis point increases in the federal funds target rate, so that we can show the change in rates paid on certain core deposit categories identified by the ALCO compared to market rates. Then we can compare the ALCO's general rate sensitivity assumptions as a percentage of market rate change to what actually happened in reality, as shown in Exhibits 8 and 9.

The data suggests that the ALCO seriously *overestimated* the amount of rate sensitivity of core deposits to

rising interest rates — or, we could also conclude, managed short-term interest rates in such a way that rates paid were kept low, but encouraged disintermediation to higher cost deposit types, as reflected in the migration analysis we saw earlier. As a word of caution, the conclusion that deposit sensitivity should be reduced dramatically going forward might not hold true. Core deposit rates do not necessarily work in a linear fashion, but can jump by large steps based on market competition, and core rate behavior tends to lag market rates in either direction. Finally, we should keep in mind that deposit sensitivity in a falling rate environment may be very different from that in a rising rate environment. Few institutions increased rates paid on low-cost legacy core deposits when short-term rates rose by over 400 basis points. Can we honestly expect they can be lowered if rates decline by 100 basis points if we didn't increase them at all on the way up?

Conclusions. Although there are more factors we could review, let us draw some broad conclusions about this limited example of historical backtesting over a two-year, real world rate cycle. Viewed in retrospect, the general direction of modeled rate risk compared reasonably well to actual results over a one-year horizon. Actual net interest margin improved modestly over the first four quarters, and on average the modeling results for the two scenarios closest to actual results projected a

Exhibit 8

<i>Quarter</i>	<i>Regular Savings</i>	<i>Regular MMA</i>	<i>Regular NOW</i>	<i>Premium MMA</i>	<i>Premium Savings</i>	<i>Fed Funds Effective</i>	
Q2-04 to Q4-04	-1	12	-2	24	-2	100	bp increase
% of Fed Funds	-1.0%	12.0%	-2.0%	24.0%	-2.0%		
Q4-04 to Q2-05	-1	-11	-1	61	10	100	bp increase
% of Fed Funds	-1.0%	-11.0%	-1.0%	61.0%	10.0%		
Q2-05 to Q4-05	0	-1	-1	61	19	100	bp increase
% of Fed Funds	0.0%	-1.0%	-1.0%	61.0%	19.0%		
Q4-05 to Q2-06	2	26	3	70	133	100	bp increase
% of Fed Funds	2.0%	26.0%	3.0%	70.0%	133.0%		
Average change	0	7	0	54	40	100	bp increase

Exhibit 9

Rate Change as % of Fed Funds	ALCO	History	Difference
Regular Savings	30%	0%	30%
Regular MMA	30%	7%	24%
Regular NOW	10%	0%	10%
Premium MMA	95%	54%	41%
Premium Savings	50%	2%	49%
Promo Savings	50%	40%	10%

similar if slightly less favorable outcome. Looking back at this survey, a bank ALCO might conclude that the modeling process passed the broad test of reasonably predicting modest asset sensitivity in the near term of the flattening of the yield curve. The second four quarters (Year 2 of the forecast horizon) projected a sharp decline in net interest margin in both cases, whereas in reality margin continued to improve. Underlying reasons for this difference include:

- Underestimating the shift in deposit mix that might result from a rising rate environment.
- Overestimating the sensitivity of core deposit rates to market rate increases.
- Balance sheet management strategies were implemented to change the structure of the balance sheet after the rate cycle began, based on the assessment of risk.
- Inherent differences between assumed rate scenarios and balance sheet projections compared to reality.

Lessons Learned. Lessons learned from this example of backtesting include the following:

- Be sure to run a wide range of standard scenarios beyond parallel rate shifts, including curve steepenings or flattenings, and be sure to include rate changes greater than the conventional 200 basis points over a 12 month horizon. While the rapid flattening of the

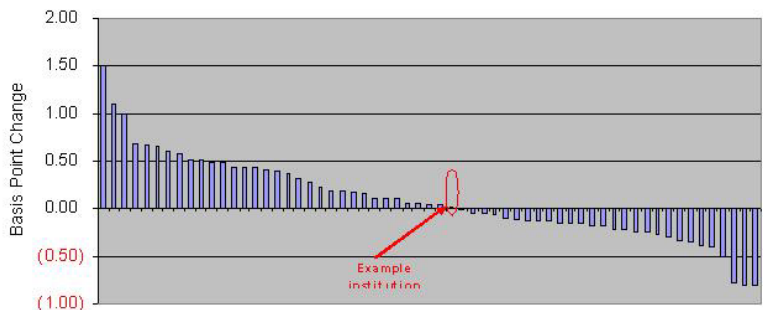
yield curve over the past 24 months may seem an abnormal case in historical context, is there ever really a *normal* amount and period of time change for interest rate shifts? Failing to estimate the effects of curve shape or of large shifts in interest rates may be a setup for a nasty margin surprise in the future.

Backtesting is still a very valuable exercise that helps us assess what is right and wrong with the rate risk modeling process.

- Identify the balance sheet dynamics crucial to your institution, which may be unique depending on business mix. Borrower and depositor preferences will change in response to interest rates, usually in the opposite direction. In our example, we discussed the importance of the shift from low-cost core deposits to higher-cost time or promotional money market deposits in the current rising rate cycle. Regardless of whether a static or forecast balance sheet assumption is used, the rate risk modeling process should at least try to capture the effect of those key changes which could most affect your assessment of rate risk.
- Periodically test the key assumptions in your process by changing the order of magnitude of your estimate. What happens if you double or halve your prepayment speed assumption? What happens if core deposit rate sensitivity is much more than you expected, or what happens if

Exhibit 10

Change in Net Interest Margin from Q2-2004 to Q2-2006



Bank Asset/Liability Management

core deposit rates do not move at all? This iterative approach will help isolate the most important assumptions that could materially alter your estimate of rate risk, especially if results turned out differently from what your modeling process suggested.

Lastly, and most importantly, remember what you are trying to communicate: the expected trend of interest rate risk over more than a short period of time. Compare what has happened over longer periods when interest rates have moved in more than small increments. Exhibit 10 compares the change in net interest margin of a sample of 60 publicly held banks from Q2-2004 to Q2-2006.

When compared to their two-year estimates of rate risk exposure published in their June 30, 2004 Form 10-Qs, the actual margin change of many institutions conformed at least broadly to expectations. Some, however, differed materially in the magnitude of estimated margin improvement or decline, and at the beginning of the rate cycle some institutions predicted the exact opposite effect of what actually happened. Backtesting over longer periods can help you determine where your rate risk management process fits in this continuum, and help validate that it is reliable enough to support decision making, or to withstand the scrutiny of a regulatory audit.

— *Mark Gim*
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