Pick Your Path

DYNAMIC GAP MODEL
SERVICE BUREAU
IN-HOUSE

a guide to interest rate risk tools

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Community bankers have generally managed interest rate risk very well, especially when compared to the many mortgage lenders who “fell off the cliff” in the early 1980’s. A combination of strong capital positions, well planned products and conservative management worked to keep interest income strong despite widely varied and quickly moving interest rates. However, increasingly complex products, aggressive competition, and regulatory requirements have combined to make the interest rate risk (IRR) management process more important than ever. Today’s IRR measurement systems must be able to keep up with increasingly complex balance sheets and ever widening regulatory requirements. Sometimes, banks tend to rely on limited information and antiquated analysis to satisfy IRR needs simply because it has worked in the past and resources are slim. Likewise, bankers often throw money at elaborate software and systems, with little thought of the type of staffing needed to run them or the time needed to make use of the information generated. Since it is not possible to “press a button” and generate infinite knowledge, where is the happy medium? By focusing on the types of analysis possible with varying systems, a synthesis of capability and need can be reached.
Know the Basics

Although the dynamic gap model is the most basic and, accordingly, the least costly of the systems reviewed in this article, it contains several useful features and may be the best choice for many banks. Results from ICBA Securities’ Performance Profile will be used to illustrate the major concepts of this type of system. Generally, dynamic gap models include:

- Stress tested earnings
- Stress tested cash flows
- Stress tested investment portfolio market values
- Peer comparisons

The model results are used to indicate levels and areas of risk to the bank. Chart A shows the basic methodology used to stress test net interest income by all IRR models including many dynamic gap models. This type of evaluation should incorporate repricing risk, yield curve risk, basis risk, and option (cash flow) risk to earnings. Although more sophisticated models use the same basics, they allow more flexibility than do the simpler models and, correspondingly, allow for more detailed analysis of risks and more focused solutions for risks indicated.

In this example, repricing risk, the risk associated with differences in maturities or repricing intervals between assets and liabilities, is measured in columns A and C. These columns contain traditional one-year gap amounts for these scenarios. The model recognizes the effects of yield curve and basis impact by using “earnings change ratios” (ECRs) in columns B and D. Some ECRs are common to all banks while others, such as deposit rates, should be customized for each individual bank.

The recognition of option risk can be seen in comparing the gap (repricing) totals in columns A and C. Notice agency callables have a cash flow of $4,450,000 when rates fall and a cash flow of $2,950,000 when rates rise. In a similar manner, the amount of the loan portfolio estimated to be prepaid is significantly higher in a falling rate scenario than a rising rate scenario. To be effective, a gap model must recognize the dynamic cash flow characteristics of the investment portfolio, loan portfolio, and FHLB borrowings. While other assets and liability types can be adjusted through the gap amount, normal procedure is to recognize the non-parallel nature of these account types by utilizing various ECRs for the various scenarios.

Column AxB and Column CxD estimate the combined risk to net interest income by combining the effects of changes in repricing, yield curve, basis, and cash flow (options). Adding the adjusted totals in Columns AxB results in an “income statement gap” of $19,933,000. This means that the bank’s net interest margin is

Regulators ask for measurements that address the following IRR components:

- Repricing risk
- Option risk
- Yield-curve risk
- Pricing risk
- Basis risk

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Repricing risk is associated with differences in maturities or repricing intervals between assets and liabilities.

Yield curve risk is associated with the fact that the shape of the yield curve will usually change when rates change. For example, 5-year Treasury rates move about 46 basis points for every 100 basis point change in Prime.

Basis risk is the risk associated with the fact that line items with the same repricing intervals are not necessarily going to experience the same rate changes. For example, recent history shows that money market account rates move about 38 basis points for every 100 basis point change in Prime, even though they are both “overnight” rates.

Option risk is the result of changes in cash flows due to changes in rates. For example, callable bonds are called and prepayments increase when rates fall. These same cash flows dry up when rates rise.
expected to go down by $199,000 ($19.9mil rounded x -1.0%) if prime goes down by 1.0%. Conversely, should prime move up by 1.0%, column C x D indicates the bank’s net interest income going down by only $2,000. Although the model does not have an actual projection of earnings, it does present a reliable indication of the risks to earnings from changes in rates.

Obviously, the example bank reflects exposure to rates falling far greater than the reflected benefit to rates rising. The question is “How do I use this information?” The example bank is effectively gap neutral in rising rate environments. For an improvement in performance in the up 100 scenario, the bank must either increase the total net dollar amount repricing, move assets into sectors with higher ECRs, or conversely reduce the amounts or ECRs for liabilities in the first year.

As a practical matter, the bank would benefit by making a concerted effort to add high cash flow assets to the balance sheet as current assets mature or prepay. In the down 100 forecast, the example bank is hurt by an ECR of zero for NOW, Savings and MMDA. The lack of any practical ability to lower rates on non-maturity deposits is common in community banks today and reflected well here. While the example has approximately $65mm in non-maturity deposits, the costs of liabilities can only move up. Should the estimated decline in NIM from 4.05% to 3.95% be unacceptable to the bank, contingent plans should be made to possibly lower rates beyond the current rate (however low it already may be). An alternative for the example may be the addition of floating rate funding, offset by more stable assets.

Although the lack of actual detailed forecasts and lack of flexibility in assumptions make these types of models somewhat limited in available analysis, the straight forward methods and understandability of the results make the model very usable. For bankers who have stable, traditional business lines combined with strong capital and consistent earnings, these types of models and the analysis associated with them are sufficient. The broker-dealer community offers dynamic gap models for community banks ranging in cost from complimentary to $750 per quarter.
Building on the Basics
As the balance sheet complexity generates a need for more extensive analysis, a logical progression is a move to a service bureau simulation model. Although these types of models use the same basic principles for estimating earnings at risk, they often add a number of valuable features such as:

- Flexible time horizon & rate projections
- Flexible line item amounts, cash flows & rates
- Projections of net interest income and net income
- “What if?” growth & rate scenarios
- Economic value calculations, including EVE
- Budgeting & historical tracking

Since a service bureau model projects actual income and economic values for each rate scenario processed, it can be used to generate a wealth of additional numerical and graphic management information. This gives the bank the ability to evaluate the effects of rate changes over a variety of time horizons and across a detailed chart of accounts. The manager can measure the effects on liquidity, earnings, capital, cash flows, economic value, and numerous performance ratios.

The ICBA Securities’ Risk Manager service bureau model will be used to illustrate some of the features that are being used by community bankers.

Chart B shows the modeled bank’s net interest income under rising and falling rates for the next two years, as well as the NIM for the previous four quarters. Notice that the trend in NIM has generally followed the average prime rate movement over the same period. The fore-
cast reflects a trending movement in NIM, indicating that the erosion of the bank’s margin should be ending (assuming no further change in prime). The down 100 basis point forecast shows margins steady through the next 8 quarters with a low of approximately 3.45 by the end of 2005. This asset sensitive indication is expanded in Chart C on page A5 to show the effects of rate changes not only to Net Interest Margin, but also Net Interest Income, Net Income, ROA and ROE. The stable margin forecast for the base projection translates into an ROE of 7.43% for the first 12 months following the report date, falling to 4.63% in the down 100 forecast. The addition of actual projections in these two easy-to-understand summaries provides bank directors with most of the information they are likely to want for performance overview.

By generating actual rate and volume forecasts, these projections give the bank a powerful tool for the planning and budget process. The budget can be forecast for current rates and to isolate exposure and risks to the budget by changing the rate forecasts and to isolate the effects of the rate changes on specific segments of the balance sheet. The bank can also run simulations that forecast earnings without budgeted growth to measure the importance of that growth to the bottom line. Once identified, the bank can protect that growth by appropriate measures such as increasing the use of floors in loan contracts or aggressively pricing adjustable loan products to increase the percentage of adjustable products in the balance sheet. The nature and slope of the forecasts may dictate the term and structure of any FHLB borrowings and investment decisions as well. The actual strategy will be dependent upon the indicated risk as well as competitive market conditions.

As the bank grows, policy and management limitations often increase. As limits are added to policy, it is important for managers to predict future compliance under expected rate environments, as well as to identify rate environments that will return policy ratios outside board approved limits. For compliance, Chart D can be customized to include current and historical performance ratios compared to the bank’s policy limits and/or target ratios (the example dis-
plays only 19 ratios to conserve space). Note that bank management can specify up to 35 ratios, and can identify associated limits. One of the requirements of the Federal Financial Institutions Examinations Council (FFIEC) for interest rate risk systems is for management to “demonstrate compliance” with all approved limits. This report will discharge that responsibility, while the ratios combine to provide a summary of the bank’s position.

An interesting feature of the example model is its ability to calculate the changes in deposit rates necessary to maintain a bank’s net interest income when market rates change. Although loan, MMDA and CD rates are often dictated by changes in market rates, NOW and Savings rates are usually more discretionary. As the Federal Reserve makes changes in the Fed Funds rate, many rates earned or paid are outside of the bank’s control. The question then becomes “can manipulation of NOW and Savings rates paid make the institution “gap neutral”?” In Chart E, the forecast changes in expenses on NOW and Savings rates are removed from the income stream, and adjustments are made to MMDA and CD forecasts when necessary to identify the forecast changes in earnings that are beyond the ability of the bank to manipulate. The corresponding change in earnings is divided by the account totals for NOW and Savings, to estimate the change needed in NOW and Savings account rates to “tactically offset” a 50 bps move in the Fed Funds rate. In the example, the amount needed to become gap neutral is 22 basis points. Although the decision of how far to move deposit rates is dependent on many factors, the bank now has a benchmark against which to evaluate changes to account rates. Although the competitor bank down the street may not change their NOW rates enough to maintain their profitability, at least the example bank knows how far it needs to go to break even.

As the A/L management environment evolves, the need for evaluation of exposure to economic value changes increases. Chart F on page A8 shows the estimated change in the bank’s EVE (economic value of equity) under the forecast scenarios. EVE calculations not only indicate exposure to the value of the bank’s balance sheet components, including capital, but can be used as indications of long term exposure to earnings from a change in rates. A reduced economic value for any balance sheet item indicates the earnings potential for that item is less than the “market” earnings potential. In the example, base case economic value is estimated to be $25.7mm, compared to a book value of $19.0mm. In an up 200 basis point environment, the bank’s assets devalue by $5.9mm, or approximately 2.6% of value. The net liability gain to offset this change is $7.6mm, or 3.8%. Analysis of the change indicates the largest loss is in the loan portfolio, where there would be no
tangible effect on GAAP capital. However, should the indicated exposure to changes in market value be outside any limits set by the directors or outside the comfort zone of management, changes in future products and/or possible sales may be considered to reduce the exposure. EVE is calculated to be 11.43% of the economic value of the bank’s assets. However, the economic value as a percentage of total assets remains over 10% in all scenarios, reflecting very little risk in the example. The end result becomes stable, predictable earnings under all rate scenarios. In recent exams, the regulators have begun to routinely ask for this information even though many bankers are not using it for day-to-day management of the bank.

For banks that are actively involved in leverage programs, have an aggressive growth profile, or maintain high degrees of optionality in the balance sheet, a service bureau may well supply the tools needed to effectively manage the associated risks. Limitations come from staff available to interpret the results and the timing and frequency of the simulation desired. Although some service bureau models are processed monthly, most are processed quarterly, and cost is in the neighborhood of $500 to $3,000 per quarter.
Beyond the Basics

When it comes to managing large and/or complex and/or dynamic community banks, there is no substitute for having access to an in-house simulation model. When used effectively, the model becomes management’s most powerful tool. Model results not only provide the bank with a clear understanding of the various contributors of risk embedded in the existing balance sheet, but also provide an understanding of how potential strategies impact the bank’s future earnings, capital, liquidity and exposure to changing interest rates. This information results in more informed decisions and consequently breeds a more proactive management process rather than a more reactive one.

Although simulation models vary in capability and complexity, they offer similar advantages to the bank. The Darling Consulting Group’s model BASIS (Balance Sheet Information System) will be used to illustrate key features a simulation model should provide. Installing and maintaining an “in house” simulation model adds valuable extras such as:

- Unlimited & immediate “What-Ifs”
- Customization to the bank’s exact needs
- Rapid analyses of growth alternatives
- Rapid analyses of pricing & promotional alternatives
- Integration with budgeting and planning processes

Think of a simulation model as providing the ability, given unlimited time, to think through and project every line item’s rate, size, growth/shrinkage pattern, prepayments and impact on other line items every month (or quarter) for the foreseeable future. Add to this the ability to see the effects that the various rate changes have on each line item’s characteristics. Now consider that simulation models can do all this and more in a matter of minutes. It is important to note that simulation model complexity does not simply translate into a more precise measurement tool. The key to choosing the right model is to match the abilities of the model to the complexity of the balance sheet, and to the capabilities and time limitations of the staff. This staffing cost varies greatly depending upon the complexity of the model, and the process required to maintain it. Over the life of the model, these staffing costs should often be the primary consideration for systems that require maximum care and feeding. Any simulation model is only as good as the data, the assumptions, and staff who run it.

For illustration purposes, the example bank discussed beginning on page A5 is used. The results on Chart C indicate ROE falling to 4.63% with rates down 100bps. Using the capabilities at hand, the modeler has the ability to further review, identify and “test” the assumptions that are contributing to the estimated exposure by running alternative assumption scenarios. For example, the base model has conservatively assumed that the rates paid on Savings and NOW accounts will not change as rates drop, and that prepayments on mortgage-related assets are doubling. To evaluate the severity of the bank’s exposure, the bank can run an alternative scenario: pricing the Savings and NOW accounts more aggressively. Using the capability of the model, the rates on NOW and Savings accounts are reduced 20 basis points across all deposit levels in conjunction with the drop in prime rate. To simulate possible customer reaction, the decay rate on these deposit types is raised from .9% to 1.5%, with the corresponding shortfall absorbed by available fed funds lines. This simulation results in a lower cost of funds, and reduces the lost net interest income by over $300k. Management can then illustrate the relative effects of the alternative assumption to ALCO who can then decide whether the estimated exposure reduction to
6.3% ROE would truly warrant the corrective action. Similar “what ifs” redirecting securities cash flow to offset an expected loss of deposits may also be quickly evaluated.

In a strategic mode, potential strategies can be run through the simulation and evaluated prior to execution. For example, the bank may wish to test the impact of instituting a leverage strategy with longer-term MBS funded by short-term borrowings to hedge the exposure to dropping rates. While this leverage effectively shields earnings from a decline in rates, the impact on liquidity, capital, shorter-term IRR (NII simulations) and longer-term IRR (EVE) can be reviewed. With the expected results modeled, a discussion of the potential risks can occur and informed decisions can be made. The “what if” capability is usually available at some level by a service bureau, but the constraints of the transfer of data and inability to quickly include or exclude scenarios as feasible limit the effectiveness of routine use of the service bureau for tactical planning. This proactive decision-making process can only take place when ALCO has an effective modeling tool that a in-house model provides and the appropriate resources to manage it.

At its core, the primary advantage of an in-house A/L model is the ability to measure and monitor these changes in a virtually unlimited combination, at whatever frequency chosen. For banks with complex lines of business or dynamic growth this pro-active ability can be extremely valuable. The trade-offs are the costs – both initial and on-going in both financial and staffing terms. In financial terms, in-house simulation models have an upfront cost that ranges between $10,000 and $500,000, normally based upon asset size. Annual maintenance costs range from 18% to 20% of the original price.

What Path Should You Pick?

What is best for one bank may be inadequate for another bank of similar asset size. The right size model for any bank is the best combination of all factors involved, including model capability, bank resources required, and costs. Banks may vary in complexity and requirements for analytics, but the need is clear. The right system of measurement, properly understood will not only keep the regulators at bay, but increase the level and stability of the bottom line.
# Interest Rate Risk Tool Comparison Chart

<table>
<thead>
<tr>
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<th>Dynamic Gap Model</th>
<th>Service Bureau</th>
<th>In-House Simulation Model</th>
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<tr>
<td><strong>NET INTEREST INCOME RISK MEASUREMENTS</strong></td>
<td></td>
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<tr>
<td>Repricing risk</td>
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<tr>
<td>Basis risk</td>
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<tr>
<td>Yield-curve risk</td>
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<td>Option risk</td>
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<td><strong>PROJECTIONS</strong></td>
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<tr>
<td>Parallel rate shift</td>
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<tr>
<td>Non-parallel shift</td>
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<td>One-time shock</td>
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<tr>
<td>Over-time shift</td>
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<td>Net Income</td>
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<td>Optional Cash-Flow</td>
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<td>Beta (ECRs)</td>
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<tr>
<td>&gt; 1.0B</td>
<td>n/a</td>
<td>OK</td>
<td>best</td>
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</tbody>
</table>

* The complexity & dynamics of the bank are actually more important in determining the "Best" model than is the bank size.
Finally!
An Asset/Liability Service Bureau that is:

**Simple**
- to use
- to understand
- to expand

**Flexible**
- in rate scenarios
- in reporting
- in growth patterns

**Powerful**
- in income simulations
- in economic valuations
- in scenario forecasting

**Expandable**
- in detail
- in complexity

For additional information on the Risk Manager or any other of the services of ICBA Securities contact Wade Oliver at (800) 422-6442 or your account rep.