Financial Managers Society

Choosing the Right Asset/Liability Management Model and Keeping It Verified!

Fourth Edition

William J. McGuire, Ph.D. • McGuire Performance Solutions, Inc.
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Choosing the Right Asset/Liability Management Model and Keeping It Verified!
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Choosing the Right Asset/Liability Management Model and Keeping It Verified!

Welcome to the 2009 Edition

Dear Financial Manager,

As the leading provider of A/L management education for financial institutions, FMS is often asked to provide guidance to institutions that need to purchase or upgrade an in-house A/L model. In response to those requests, we’ve worked with one of the industry’s top A/L management consultants, Bill McGuire, Ph.D., President and CEO of McGuire Performance Solutions, Inc., to create a tool you can use as a guide for choosing the right model for your institution. Whether you are just beginning your search for an A/L model or upgrading a current one, this free publication will be helpful.

Industry A/L software vendors have supported our goal to put this information into the hands of financial managers throughout the country. Our special thanks goes to Bill McGuire, who wrote an objective guide to choosing a model and the FMS sponsor questionnaire, and to The Baker Group, FARIN & Associates, Inc., FIMAC Solutions, LLC, and ProfitStars—a Jack Henry Company, for making the fourth edition of this publication possible.

So please visit www.fmsinc.org/ChoosingALM to download this free publication today!

Sincerely,

Richard A. Yingst
President and CEO
Financial Managers Society, Inc.
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About the Author

William J. McGuire, Ph.D., is President and CEO of McGuire Performance Solutions, Inc. (MPS), a national consulting firm that provides innovative technical solutions for balance sheet performance and risk management in financial institutions. MPS services include verifications of ALM models and other advanced financial analysis tools, statistical analyses of core deposit supply, repricing and term/value behaviors plus analyses of loan prepayments and pay downs. MPS provides high-precision compliance solutions for core deposit intangible (CDI), CD and loan valuations relating to FAS 107, FAS 141R and FAS 157/159 plus FAS 142 goodwill and CDI impairment testing. MPS also provides specialized resources such as regulatory agency education programs and expert witness testimony.

Dr. McGuire is a nationally recognized expert on ALM model risk assessment, core deposit and loan prepayment behaviors and the use of ALM models to analyze interest rate risk (IRR) and explore performance potential. He is the author of multiple publications in the field of ALM, including the recent Financial Managers Society (FMS) white paper Understanding Sources of Liquidity: A New Old Fashioned View. Dr. McGuire is a frequent speaker at industry forums and serves on the faculty for the ABA Stonier National Graduate School of Banking.

Prior to founding MPS in 1995, Dr. McGuire was a Senior Vice President for Client Services with Sendero Corporation, President and a founder of Performance Analysis, Inc., (a service bureau outsource provider of IRR assessment and CRA reports, based in Cincinnati, Ohio) and a Vice President at the Federal Home Loan Bank of Cincinnati. While at the Bank, he was a lead member of the team that wrote Thrift Bulletin 13, the pathbreaking regulatory IRR assessment requirement. Dr. McGuire also taught finance and economics at several universities.

Dr. McGuire has an undergraduate degree in business administration and a master’s degree in economics from Ohio University at Athens. He holds his Ph.D. in economics from The University of North Carolina at Chapel Hill. Learn more about Dr. McGuire and MPS at www.mpsaz.com.
About Financial Managers Society

The Financial Managers Society, Inc. (FMS) is the only individual membership society exclusively devoted to serving the needs of finance and accounting professionals from financial institutions. Our more than 1,500 members are CFOs, controllers, CEOs, COOs, treasurers, investment officers and internal auditors from banks, thrifts and credit unions.

FMS offers career-enhancing education, targeted news and research, national leadership opportunities, a voice in shaping regulations and accounting principles and connections with other industry professionals.

The mission of the Financial Managers Society is to enhance the professional development of financial personnel within financial institutions.

The Society accomplishes this mission in the following ways:

• Offering premier education and information to members and others within the financial services industry regarding accounting, financial management, regulatory, operational, auditing and other industry issues

• Providing forums for the exchange of information and practical applications

• Articulating industry and member concerns to regulatory and accounting policy-setting bodies

• Providing members with opportunities for technical, personal and leadership growth and development

Learn more about FMS at www.fmsinc.org.
Preface to the Fourth Edition

Model applications and ALM models have developed rapidly since the 2006 edition of this publication. Balance sheets have become more complex and dynamic, making performance measurement and risk analysis needs greater than ever. Model capabilities have developed apace; ALM models are more powerful than ever, and specialized advanced models are increasingly common. Greater complexity escalates the need for independent model risk assessment. Verification of models and validation of their forecasts is now an integrated part of ALM model implementations.

For the most part, the years since the last edition have been a period of solid ALM model progress. Models are more powerful and comprehensive, now capable of modeling new asset and liability behaviors in institution balance sheets. An important model upgrade is the availability of “portfolio analyzer” type add-ons that permit CUSIP or record-level analysis—even in lower-cost models. Record-level general processing is also seen.

Stochastic modeling appears more frequently, typically in larger institutions. The use of specialized advanced valuation and forecasting models is increasing, again primarily at the top end of institution asset size. Common throughout are more detailed interfaces between ALM and liquidity models.

ALM models continued to move down asset sizes; even $100 million institutions are now commonly modeling. In addition, ALM model outsourcing services have made a recent comeback, driven by budgetary constraints and uncertain financial and economic conditions. More institutions than ever are engaging in institution-specific statistical loan prepayment and core deposit behavior analyses. ALM model inputs produced by these studies are a way to increase model accuracy and management’s ability to optimize their balance sheet for maximum prudent performance.

What does the future look like for ALM models? Expect less emphasis on purely technical model capabilities and much more focus on forecast accuracy, tighter integration of model outputs into decision making, stronger model control environments and closer links between ALM models and liquidity modeling. Greater regulatory emphasis on controlling model risk is also anticipated, implying a need for more frequent and comprehensive model verifications by independent third parties.

This revised edition incorporates the most recent ALM model developments and squarely addresses emerging issues, providing practical guidance for decision making.
Introduction

Asset/liability management (ALM) is now an expected component of financial institution performance analysis and risk control. This acceptance has come about because ALM provides a powerful context for conceptually understanding balance sheet behaviors and their risk implications and supports more intelligent financial management. Regulators and financial markets recognize the value of the activity and incorporate ALM-related performance and risk measures into their evaluation criteria. Thus, the benefits of a successful ALM solution are clear.

For many institutions, however, a handicap in effectively applying ALM techniques is that they do not have timely measures of current or future balance sheet outcomes. This results in lost performance opportunities and creates risk exposures. Fortunately, there is a solution. Cost-effective simulation models that meet the ALM analysis needs of almost every financial institution are available. Any institution can now have the foundation for a successful ALM solution.

This publication provides guidelines for choosing the right ALM model and keeping it accurate. It first develops a general framework for determining the right model to use. It employs both conceptual and practical perspectives to examine salient issues. Next, key concepts to understand, questions to ask and features to review when choosing an ALM modeling solution are presented. Following this, decision aids are provided to assist in your evaluations. A section on verifying ALM models introduces how to keep model forecasts accurate. Finally, descriptions of specific ALM models and services provided by leading ALM vendors and consultants are presented for review and reference.
A Framework for Choosing the Right Level of an ALM Model

Deciding whether to acquire a model\(^1\) or to upgrade an existing ALM model—and how powerful a model to buy or how much of an upgrade to choose—are fundamentally capital budgeting decisions. The same benefit/cost comparison methodology governing the choice of a new computer system, for example, or any other major infrastructure expenditure, applies. The fundamental question is whether the level of expected future benefits, compared to current and expected future costs, is favorable. If yes, the action signal is on. If no, then no action is the right answer.

Let’s begin looking at how to choose the right level of ALM model (i.e., how powerful it is) by developing a comprehensive conceptual decision framework. This establishes the benefits and costs associated with an ALM model as a component of an overall ALM process solution. This same framework will apply later, when you buy or upgrade a specific ALM model.

**ALM Model Benefits**

The benefits of an ALM model arise from its ability to quantify existing balance sheet value and forecast future performance in a timely fashion. This translates into enhanced earnings performance—directly from better financial decision making and indirectly from reduced regulatory intervention because compliance is quantified. ALM models provide the equivalent of a speedometer in an automobile—a quantitative gauge of performance. With an ALM model, the balance sheet can be accurately pushed to its “speed limit” (i.e., maximum performance) while controlling risk. Having an ALM model also reduces the chances of going too slow, thus losing performance opportunities or encountering unexpected risk sources.

What kind of performance gains can you expect from having the right ALM model? For an institution that has not had the right model, a 2–3 basis point gain in Return on Assets (ROA) and a proportionately larger gain in Return on Equity (ROE) are cited as typical results from an appropriately installed and fully implemented ALM model. Results will vary by institution but performance gains can always be expected.

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\(^1\) Note that “buying” an ALM model can be accomplished in two ways. The first is the most obvious, the purchase of an in-house or internet-based system run by the institution. The second is to acquire ALM modeling services through an out-sourcing arrangement with a third party, who may be the model vendor. The concept of the right model is the same in either case.
On a day-to-day basis, this earnings advantage in an effective ALM model arises from a more precise understanding of fundamental balance sheet potential and capital, liquidity and interest rate-related risk positions. This knowledge empowers management to avoid unduly conservative balance sheet holdings that reduce performance. Lower regulatory costs, in the form of stronger and more easily demonstrated compliance, are also an advantage. Looking longer term, effectively using an ALM model strengthens management’s understanding of balance sheet behaviors and their associated performance opportunities and risks. This leads over time to better financial decision making, which creates further earnings gains.

Six factors essentially define expected ALM model benefits. Consider each in turn.

**Degree of capital leverage** is a crucial determinant of benefits from an ALM model. A lower capital-to-assets ratio enhances earnings performance, but it simultaneously puts a premium on accurately managing the balance sheet and controlling risk because of the thinner capital cushion. An ALM model provides the insights needed to manage with a lower capital position because it accurately projects potential future earnings and capital levels. Without an ALM model, the future is a guess. With an ALM model, management quantitatively knows where the institution is going and what future risk looks like. Those abilities increase ALM model benefits when leverage of existing capital is high.

**Overall margin** (income less expense) is another crucial determinant of benefits from an ALM model. The balance sheet has to be managed to produce high earnings along a stable trend. Where overall margin is smaller, there is less of an innate earnings cushion to changes in balance sheet performance. Precise management and control of balance sheet outcomes thus become key priorities that increase ALM model benefits.

**Degree of interest rate risk** (IRR) is a strong influence on the level of ALM model benefits. The need to precisely quantify and monitor balance sheet value and earnings sensitivities to interest rate changes increases with greater IRR and multiple IRR influences in the balance sheet. Without an ALM model, unforeseen interest rate related sensitivities could easily turn into an unpleasant surprise. With an ALM model, the institution quantitatively knows its IRR position and can manage it effectively. That greater ability to control elevated levels of balance sheet IRR creates a higher level of ALM model benefits.
Liquidity management style is another key influence on the level of ALM model benefits. Precise projections of future cash flow behaviors are needed when stored liquidity positions are smaller. There is also recent strong regulatory emphasis in this area. Because an ALM model tracks existing and future sources and uses of funds in detail, it is a natural solution for monitoring and controlling liquidity risk. Benefits are increased when liquidity is at a minimum and tighter control is mandated.

The institution’s decision-making style has implications for the level of AM model benefits. Where “steady as she goes” is the best description of the financial management culture, there is limited need for a tool to forecast possible balance sheet outcomes. A more active financial management style, however, requires timely strategy evaluations. ALM model benefits increase in this environment because the model can support the fast-paced quantitative decision inputs needed by management and Board.

Regulatory requirements produce tangible ALM model benefits. As a rule, strictly regulatory ALM model-related requirements are a subset of normal business requirements (that is, business and regulatory ALM model benefits strongly coincide). Examiners look for an ALM model that is appropriate in light of the institution’s balance sheet, capitalization, liquidity and IRR positions and its general management style. An exception to this mandate may occur when an institution is deemed to be at high risk or in regulatory duress.

Exhibit 1 summarizes the conceptual issues discussed above. The guiding principle is that benefits from an ALM model will be greater where precise and timely understanding of existing and future balance sheet value, earnings performance and risk are more valuable to the user. Having a balance sheet “speedometer” is important!

Benefits from an ALM model increase quickly as basic financial management and regulatory needs are linked to modeling activities and better decision inputs are produced. Benefits increase more slowly as the model addresses less vital business and regulatory needs. Eventually, new uses of the model are exhausted and the benefits curve flattens.

Unfortunately, ALM model benefits are rarely quantifiable at even a reasonable level of precision. However, the above factors can be combined with balance sheet information to obtain a sense of the general degree of ALM model benefits. Exhibit 2 provides a checklist to qualitatively ascertain your institution’s ALM model benefits. Examine each point and “grade” your institution’s situation. A preponderance of marks in the “Higher ALM model benefits” segments of the scales (i.e., farther to the right of center) indicates that the level of ALM model required for your institution is greater.
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Exhibit 1  ALM Model Benefits

Benefits of an ALM model

Initial uses have high added benefits

Later uses have less-crucial impacts and lower added benefits

More Powerful ALM Model

- Higher capital leverage
- Smaller overall margin
- Greater IRR/more IRR sources
- Greater liquidity management needs
- More active decision-making style
- Greater/more specific regulatory mandates
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**Exhibit 2**

**ALM Model Benefits Self-Grading Checklist**

Mark the scales for each ALM model benefits driver in the area that best describes your institution’s situation.

<table>
<thead>
<tr>
<th>Lower ALM model benefits</th>
<th>Mid-level ALM model benefits</th>
<th>Higher ALM model benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Capital Leverage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10% K/A</td>
<td></td>
<td>Less than 6% K/A</td>
</tr>
<tr>
<td><strong>2. Level of Overall Margin (Income - Expense)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significantly less than peer group</td>
<td></td>
<td>Significantly higher than peer group</td>
</tr>
<tr>
<td><strong>3. Interest Rate Risk Indicators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Repricing Mismatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close repricing mismatch in next 12 months (e.g., gap&lt;10%)</td>
<td></td>
<td>Significant mismatch in next 12 months (e.g., gap&gt;15%)</td>
</tr>
<tr>
<td>• Maturity Mismatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close maturity match between long-term assets and liabilities</td>
<td></td>
<td>Significant mismatch between long-term assets and liabilities</td>
</tr>
<tr>
<td>• Driver (Repricing) Rate Mismatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Few driver rates (e.g., &lt;5)</td>
<td></td>
<td>Many different driver rates (e.g., &gt;10)</td>
</tr>
</tbody>
</table>

Continued on next page
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

Exhibit 2

ALM Model Benefits Self-Grading Checklist

(continued)

<table>
<thead>
<tr>
<th>Lower ALM model benefits</th>
<th>Mid-level ALM model benefits</th>
<th>Higher ALM model benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optionality Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited mortgage product, callable agency investments and/or convertible FHLB advances (e.g., &lt;10% assets)</td>
<td>Significant mortgage product, callable agency investments and/or convertible FHLB advances (e.g., &gt;20% assets)</td>
<td></td>
</tr>
<tr>
<td><strong>CD Option-Related Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100% penalty on all CDs/no bump-up type products</td>
<td>Weak penalties on many CDs/multiple bump-up type products</td>
<td></td>
</tr>
<tr>
<td><strong>Core Deposit Funding</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10% core deposit funding</td>
<td>More than 40% core deposit funding</td>
<td></td>
</tr>
<tr>
<td><strong>Complexity Influences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CMOs or other structured instruments</td>
<td>Holdings of CMOs, REMICs or other structured instruments (e.g., &gt;5% assets)</td>
<td></td>
</tr>
<tr>
<td><strong>Off-Balance-Sheet Items</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No off-balance-sheet items</td>
<td>Extensive and/or complex off-balance-sheet items</td>
<td></td>
</tr>
</tbody>
</table>

Continued on next page
### Exhibit 2  ALM Model Benefits Self-Grading Checklist

(continued)

<table>
<thead>
<tr>
<th>Lower ALM model benefits</th>
<th>Mid-level ALM model benefits</th>
<th>Higher ALM model benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Liquidity Position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquidity ratio significantly less than peer group</td>
<td>Liquidity ratio significantly higher than peer group</td>
<td></td>
</tr>
<tr>
<td><strong>5. Management and Board Decision Style</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noninterventionist decision-making style; few strategies considered; limited business plan forecasting</td>
<td>Actively manage the balance sheet; frequent strategies considered; comprehensive business plan forecasting</td>
<td></td>
</tr>
<tr>
<td><strong>6. Regulatory Mandates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very limited regulatory based ALM modeling requirements</td>
<td>Regulator essentially mandates ALM modeling to assess IRR and monitor performance</td>
<td></td>
</tr>
</tbody>
</table>

---

**Summary**

Based on the general direction of marks above, the level of benefits associated with an ALM model at my institution is:

- **Low** (Mostly lower benefit marks)
- **Moderate** (Mostly low mid-point benefit marks)
- **High** (Mostly high mid-point benefit marks)
- **Advanced** (Mostly higher benefit marks)
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**The influence of your institution’s ALM culture** is a last important point on ALM model benefits. Your institution’s ALM culture can also affect realized ALM model benefits. Where upper management and the Board understand and trust model outputs as a basis for financial decision making, ALM models make greater performance and risk control contributions. Where the model is viewed as just an expense or as a regulatory mandate without business value, benefits are constrained to below their potential by such preconceived notions and associated lack of buy-in.

Whether expected ALM model benefits justify acquiring an ALM model or upgrading an existing ALM model to a more powerful level depends on the related costs. Let’s consider these below and then put benefits and costs together and make a decision.

### Costs Associated with an ALM Model

Quantifying the costs of an ALM model is often considered easier than quantifying the benefits because many costs can be directly valued. A full review of the issue, however, will show that many ALM model-related costs are indirect. A comprehensive evaluation must recognize all cost elements.

Exhibit 3 depicts the drivers of the all-in costs (direct and indirect) of an ALM model. The major cost elements are the level of the ALM model (how fundamentally powerful it is), options specified, installation activities (setting up the model so it technically functions), implementation activities (incorporating the model in an ALM process solution), behavior assumption service fees (e.g., for prepayment inputs), ongoing user-related costs (time running the model, training, etc.) and annual maintenance fees.

As a rule, all-in ALM model costs increase very quickly as more powerful (and more complex) models are specified. This increase especially relates to initial outlay and model installation/implementation costs. Once a model is implemented, ongoing costs rise more linearly with the ALM model level.

The all-in cost of an ALM model derives from six components. Consider each in turn.

**Initial outlay** is a significant part of the total. The initial outlay includes the cost of searching for the right ALM model, initial purchase (or upgrade) price, expenses for any specialized supporting software or hardware and user training time.

Purchase price varies with the model level chosen or the degree of upgrade obtained. Options and add-on services add to this total.
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Exhibit 3   ALM Model Costs

- Initial outlay
- Installation costs
- Implementation costs
- Behavior assumption service fees
- Ongoing operating costs
- Maintenance fees

Costs of an ALM model

Up-front costs can be significant

Increasing model capabilities are exponentially more costly to implement, maintain and use
Supporting software or hardware costs are often an important consideration, particularly for high-powered/complex ALM models. Be sure to inquire about these needs when purchasing or upgrading a model. Networked versions of an ALM model often require their own servers and installation-related items. If your institution is running on a virtual server (or planning to), be sure that the model is compatible with that environment.

Most of the initial costs for an ALM model are direct and can readily be monetized. Be sure to include the indirect costs of your search time and user orientation. Much time is often required to make a smart ALM model choice and properly engage users, and that time has an opportunity cost.

**Installation of an ALM model** makes the model function in a technical sense. This includes (1) setting up, implementing and auditing data extract capabilities; (2) designing a chart of accounts (the list of asset and liability categories to be modeled) that properly reflects your institution’s balance sheet; (3) populating the chart of accounts with specialized definitions and contractual inputs that reflect specific balance sheet behaviors; (4) specifying behavior inputs for prepayments, other options and core deposits; (5) doing an initial run of the model; (6) defining rudimentary reports. The installation also includes user training that focuses on how to populate and operate the model. Some ALM model vendors still come on-site for installations, but they are typically done remotely.

Installation is usually included in an ALM model’s price, and it is technically counted with that outlay. Be sure to recognize the time spent in user training and by institution staff assisting the model installation. These again represent costs—even if they are not direct outlays.

**Implementation of an ALM model** is the process that makes a model function as an effective ALM decision-making and risk-analysis tool. Implementation integrates the model with your institution’s asset/liability management committee (ALCO) activities, policies and procedures and defines the model’s specific applications (e.g., IRR analysis, business plan evaluation, liquidity model interface). It also includes establishing the model control environment, defining efficient routines for running the model, setting procedures for periodic model risk assessment and designing reports that effectively communicate model forecasts and other analysis results to multiple audiences (ALCO, senior management, Board, regulators).

The all-in cost of successfully implementing an ALM model as the nucleus of an ALM process solution is often several times the model’s initial outlay. So be aware of this primarily indirect, but still very real, element of model cost.
Behavior assumption service fees are associated with third-party vendors that provide loan prepayment and core deposit ALM model inputs, specialized cash flow information for derivative instruments and interest rate data. These fees are direct costs for ongoing data access or one-time studies with trailing maintenance. They are not part of all model implementations. Where no direct fee costs are involved, however, institutions still have the indirect costs of developing their own in-house estimates of ALM model loan and deposit behavior assumptions. Because of the specialized expertise required, these indirect costs can be significant.

Ongoing operating costs are mainly staff time associated with running the model and quality assuring outputs. ALCO time spent interpreting model forecasts is also a factor. Periodic independent verification of ALM model accuracy is another cost element (see the discussion of Periodic ALM Model Risk Assessment below).

Model complexity is a primary driver of ongoing operating costs. It is determined by your institution’s balance sheet composition (e.g., a larger chart of accounts with many option behaviors or a large core deposit base may require a greater number of highly specialized and franchise-specific assumptions), management style (how the model is used and how often it is used) and, in some instances, regulatory mandates (e.g., equity-at-risk assessments). The ease of physically running the model, maintaining its underlying databases, category-level set up, contractual inputs, behavior assumptions and producing reports are other factors in defining ongoing operating costs. The ease of performing these activities varies significantly among models. Consider this often-overlooked cost issue during the search process.

Ongoing operating costs are a mix of direct expenses (e.g., staff expense) and time-related opportunity cost. If model complexity is enough to require incremental hiring of highly specialized ALM staff, that is another source of model cost.

Model maintenance fees are charges by ALM model vendors to offset the costs of ongoing model development and user support. They are an easily quantified direct outlay (usually some percentage of the model’s initial purchase price annually). Payment of a model maintenance fee ensures access to vendor-provided model support staff, free or low-cost availability of model upgrades and other benefits (newsletters, etc.).

While model maintenance is a cost, it is also one of the best model-related investments you can make. It keeps your model up-to-date and functioning at its maximum capability. Thus a strong recommendation: Plan to stay current on model maintenance as long as your institution uses its ALM model.
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

While there is no way to define a final fully quantitative cost value, good insights can be derived from the points noted above. Exhibit 4 provides a checklist for qualitatively ascertaining your institution’s ALM model costs. Examine each point and “grade” your situation. A preponderance of marks in the “Higher ALM model costs” portion of the scales (i.e., farther to the right of center) indicates that the expected cost of an ALM model is higher for your institution. How high is too much to justify acquiring a model or an upgrade? That depends on the net of benefits compared to costs. Before turning to that comparison, a final important note on ALM model costs should be made.

The influence of your institution’s ALM culture can affect all-in ALM model costs just as it affects model benefits. Where upper management and the Board understand and trust model outputs used in financial decision making, ALM model functions tend to run more smoothly and thus at lower cost. This is because adequate staff and resources are more likely to be dedicated to the ALM modeling area. Further, accurate model data are more readily obtained on a timely basis from the line of business areas because everyone appreciates their importance to success. If the model is viewed just as an expense or as a regulatory mandate without value, modeling is a chore. Lack of model buy-in results in higher costs across the board as everyone just goes through the motions in a hostile climate.

Comparison of Benefits and Costs of ALM Models

Exhibit 5 combines the benefit and cost relationships depicted in Exhibits 1 and 3. Below point A, an ALM model is not justifiable because total all-in costs are greater than total benefits. Beyond point C, higher-level (more powerful/complex) ALM models or further model upgrades/options are not justifiable because the costs exceed obtainable benefits.

Extreme “yes or no” situations (such as A or C) are rare. The question likely confronting decision makers is this: Given all the choices available, what is the right level of ALM model for my institution? The answer is that the right model is the one that provides maximum benefits relative to costs. But how to determine this?

The best way to assess model benefits versus costs is first to establish the fundamental advantages of having and using any ALM model (that is, rule out being below point A). Then sequentially compare the extra benefits derived from higher-level (more powerful and complex) models or more advanced model options to their extra all-in costs. The best ALM model (new or upgraded) for your institution lies where increases in the all-in costs related to adding more model power just begin to overtake increases in benefits associated
### ALM Model Costs Self-Grading Checklist

Mark the scales for each ALM model cost driver in the area that best describes your institution’s situation.

<table>
<thead>
<tr>
<th>1. Initial Outlay Required</th>
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<tbody>
<tr>
<td>Entry-level ALM models</td>
<td>Mid-level ALM model costs</td>
<td>Higher ALM model costs</td>
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<tr>
<td>Advanced-level ALM models</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Installation Requirements</th>
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<tbody>
<tr>
<td>Simple model and simple balance sheet</td>
<td>Advanced model and/or very complex balance sheet</td>
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</table>

<table>
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<tr>
<th>3. Implementation Requirements</th>
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</thead>
<tbody>
<tr>
<td>Simple model, compact ALCO process and simple balance sheet</td>
<td>Advanced model, comprehensive ALCO process and/or very complex balance sheet</td>
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<tr>
<th>4. Behavior Assumption Service Fees</th>
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<tbody>
<tr>
<td>Few options and less than 10% core deposits</td>
<td>Many options, derivative instruments and more than 40% core deposits</td>
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</tbody>
</table>

Continued on next page
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

Exhibit 4

ALM Model Costs Self-Grading Checklist

(continued)

<table>
<thead>
<tr>
<th>Lower ALM model costs</th>
<th>Mid-level ALM model costs</th>
<th>Higher ALM model costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5. Ongoing Operating Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple model, easy to use model, simple balance sheet, limited types of model applications</td>
<td>Advanced model, specialized users required, very complex balance sheet, broad range of model applications</td>
<td></td>
</tr>
</tbody>
</table>

| **6. Model Maintenance Fees** |                           |                       |
| Low initial model costs and/or low fee percent | High initial model costs and/or high fee percent |

**Summary**

Based on the general direction of marks above, the level of costs associated with an ALM model at my institution is:

- **Low** (Mostly lower cost marks)
- **Moderate** (Mostly low mid-point cost marks)
- **High** (Mostly high mid-point cost marks)
- **Advanced** (Mostly higher cost marks)
Exhibit 5
ALM Model Benefit and Cost Relationships

Resources vs. Level of ALM Model

- Benefits
- Costs

Points A, B, C illustrate the relationship between ALM model level, benefits, and costs.
with the benefits of that enhanced model power. Given the imprecision of most cost and benefit data, a range of optimal outcomes (e.g., outcomes around point B) is likely. A range of points is not a problem, though, because a general answer is an adequate solution in this case.

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Levels of ALM Models

Different models generally fall into distinct power-level ranges. This tendency sorts out the model-level choice for most institutions into easy-to-review groups of models. A rough determination of an optimal model level (as obtained above) is thus sufficient. The general model-level ranges are entry, intermediate and advanced.

**Entry-level ALM models** are the simplest of ALM solutions. They provide reasonable levels of balance sheet simulation precision for a limited outlay. The problem is that entry-level ALM models normally cannot handle complex balance sheets or properly deal with option-related complexities (e.g., callable investments or convertible FHLB advances). They generally have other limitations (the chart of accounts is often limited in size, and core deposit behavior modeling is usually a key weak area). Only so much can be delivered for the low price! An entry-level ALM model would be a good choice for an institution whose marks in Exhibit 2 are consistently in the “Lower ALM model benefits” portion of all scales.

**Intermediate-level ALM models** are the right choice for a large number of institutions that have needs beyond entry-level ALM models but do not require the most powerful ALM software. In recent years, this class of models has advanced significantly in terms of model capabilities while remaining roughly constant in price. This has significantly raised their innate benefit-to-cost ratios.

Intermediate-level ALM models can now handle complex balance sheets and properly forecast all sources of optionality. They are usually capable of modeling categories with unusual behaviors, for example, core deposits, hybrid ARMs or teaser rate products. An added benefit is that some models can also simultaneously drive budget applications. A weakness in a few cases, though, is very limited off-balance-sheet instrument modeling capability (which is an issue only if an institution has such items).

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2 Some ALM model vendors offer their products as “families” of models with differing standard features and available options. Different modeling solutions are referred to as “levels” of the model.
An intermediate-level model is a good choice for an institution whose marks in Exhibit 2 were consistently in the center areas of the “Mid-level ALM model benefits” portion of the scales. Be aware, though, that a single unique need (such as advanced rate ramp IRR analysis capabilities) can change the answer to a more powerful model.

**Advanced-level ALM models** are the only solution for institutions that need maximum ALM model capabilities. This may be due to balance sheet complexity, special business models or regulatory mandates. Full in-house capabilities to handle all types of balance sheet complexity and optionality, unique core deposit behaviors, complex off-balance-sheet items and other advanced features justify their sharply higher costs. A capability usually found only at this level is stochastic (Monte Carlo) modeling, an element of advanced regulatory compliance mandates. An advanced-level ALM model is appropriate for an institution whose marks in Exhibit 2 were into the “Higher ALM model benefits” portion of the scales.

The definition of an “advanced” ALM model has broadened over the last several years. Special application financial models for assessing performance and value for mortgage pipelines, mortgage servicing rights, derivative instruments and value at risk (VaR) are now common where required by business models or institution size. Very specialized models combining prepayment and credit risk are also now seen for testing other than temporary impairment (OTTI) for non-agency guaranteed instruments. Such models are still rare in less than regional size institutions, however, and they are noted here for potential future reference.

By following the benefit versus cost principles above, you have significantly narrowed your model choice process (and its cost) because models that are either underpowered or overpowered are ruled out for further review. There is one more issue to consider before moving on to vendor model selection.

**In-House versus Outsourced ALM Models**

The benefits and costs of an ALM model vary between in-house models directly purchased/used and those indirectly used through an outsourcing service. Differences largely arise on the outsource side, owing to the indirect connection between the model and the ultimate user, the institution.

Outsourced ALM models normally have a cost advantage over in-house models because the cost of the model itself and supporting systems and staff can be allocated across a wide user base. A key motivator of the recent increase in the popularity of outsourced model solutions is the desire to reduce costs in an adverse economic climate. A degree of indirect alternate costs are incurred,
namely more time spent coordinating production and ensuring forecast accuracy, but these rarely offset the reduction in direct costs enjoyed.

In outsource decisions, financial institutions usually fail to account for the difference in the benefits received relative to an in-house model. Outsourcing is most effective when analyses are routine and require minimal manual customization. That is why most outsource services run standard regulatory reports rather than business plans.

Using an outsourced ALM model to make timely financial decisions can be difficult given the coordination and turnaround times required by most outsource providers. Services exist in which the outsourced model is interactively available to the institution, but employing them requires much of the user overhead associated with an in-house model.

Bottom line: Do your homework well before jumping into an outsourced ALM model solution. Outsourcing makes the most sense when model applications are simple and do not require significant interaction between the outsource provider and the institution. If you choose to outsource, look beyond the provider to the ALM model being used. The same choice criteria apply to that model as to a purchased one.
Review Elements for Choosing the Right ALM Model

Once the general level of your ALM model is determined, you can assemble the set of specific ALM models to evaluate. The best place to start your list is in the “Responses to Vendor Questions” section later in this publication. There you will find information from our sponsor vendors.

ALM Model Selection Criteria: General Requirements

Before you begin examining ALM models, use Exhibit 6 to identify your institution’s balance sheet value and performance behavior sources. Check any that warrant special review because of their magnitude or special features. Review your marks from Exhibit 2, if necessary, to reinforce key areas of need. Undertaking this exercise alerts you to your true ALM model related requirements.

Look first at each ALM model under review to reaffirm its ability to analyze all of the ALM-related behaviors found in your institution’s balance sheet. In particular, examine whether the ALM model is functionally capable of modeling the contractual repricing and maturity behaviors of every category represented and the special indeterminate behaviors of core deposits, credit cards, etc. Then confirm that it has the functionality to model baseline and interest-rate-related cash flow dependencies that arise from all categories and the types of optionality embedded in your balance sheet.

Bottom line: To be successful, an ALM model must be able to define and forecast your balance sheet’s complete set of potential behaviors. For every category, in every time period and in every interest rate scenario, an ALM model must be able to accurately capture contractual behaviors from underlying data, apply inputs and assumptions and forecast them correctly. Major elements to consider in your review follow.

Repricing mismatch is caused by all elements of the balance sheet due to the varying physical repricing opportunities present across categories. Repricing balances are input into an ALM model through its detailed downloads of maturity and repricing information from your institution’s underlying systems. Verify that these downloads can be easily done. Manual data input and adjustments should be minimal. Also review how pricing is assigned for existing and new balances (growth or replacement) entering future balance sheets. These definitions should be easy to assign, and they should include the ability to assign specific rates, caps and floors, etc., to all repricing balances.
**Maturity mismatch** is caused by all elements of the balance sheet due to the varying physical maturity points present across categories. These attributes are input into an ALM model through its detailed downloads of maturity information from your institution’s underlying systems. Verify that these downloads can be easily done. Again, manual data input should be minimal. Also review how maturity information is defined for balances entering future balance sheets. Specifications should be easy to assign and include the ability to assign amortization, option-related behaviors, decay, etc., to all balances.

**Amount of repricing** for a given general interest rate change depends on each specific asset or liability category’s driver rate (the financial market rate that repricing is tied to), beta relationship (specified repricing that occurs for any given change in the driver rate) and the repricing lag specification (how fast repricing occurs). Review how each ALM model handles these behavior elements for categories tied to common financial sector driver rates and for categories whose repricing is administered and often lagged, such as core deposits. Also review how the model handles temporary teaser rates.

Repricing limits (e.g., caps and floors) on existing balances normally come directly from system downloads, but verify this. A key issue to consider is how categories are aggregated from underlying record-level data. Models vary significantly in this regard, in some cases averaging together important differences in repricing limits information. Also determine how replacement and new volume repricing limits can be input.

**Embedded options** on both sides of the balance sheet are now vital performance and IRR sources for many institutions. They create cash flows or other outcomes that are unique to specific interest rate scenarios and require special modeling treatments. Continuous option behaviors derive from ongoing prepayments, most notably 1–4 family mortgages, mortgage-backed securities (MBSs) and other mortgage-related categories. Consumer and commercial loans can also have prepayments. Caps and floors are an additional important source of balance sheet optionality.

Switch options (behaviors that change dramatically at a specific time and interest rate level) are encountered in the investment portfolio in the form of calls on certain holdings. On the funding side, they are mainly found in convertible FHLB advances. Time deposits (CDs) may be subject to an early withdrawal option in rising interest rate environments in addition to product options such as “bump up” features.
### Check if a High Degree of Any Influence

<table>
<thead>
<tr>
<th>Asset/Liability Category</th>
<th>Repricing Mismatch</th>
<th>Maturity Mismatch</th>
<th>Amount of Repricing</th>
<th>Embedded Options</th>
<th>Indeterminate Behaviors</th>
<th>Complexity Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commercial Loans</strong></td>
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<tr>
<td>Teaser rates/other special features</td>
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<td>Unique prepayment behaviors</td>
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<td><strong>Consumer Loans</strong></td>
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<td>Unique prepayment behaviors</td>
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<td><strong>Mortgage Loans</strong></td>
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<td>Fixed or adjustable (caps/floors/etc.)</td>
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<tr>
<td>Teaser rates/hybrid ARMs</td>
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<td>Special features</td>
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<td>(prepayment lockouts/interest only/etc.)</td>
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<td>Unique prepayment behaviors</td>
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<td><strong>Investments</strong></td>
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<td>Callable/other options</td>
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<tr>
<td>Complex (derivative) products</td>
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<td><strong>Time Deposits</strong></td>
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<tr>
<td>Callable/step up/other options</td>
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<td>Early withdrawal behaviors</td>
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<td><strong>Core Deposits</strong></td>
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<td>Repricing and average life behaviors</td>
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<td>Special behaviors of high rate products</td>
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<td>Teaser rates/other special features</td>
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<td><strong>Wholesale Funds</strong></td>
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<td>Fixed or floating (caps/floors/etc.)</td>
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<td>Callable/convertible/other options</td>
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<td><strong>Off Balance Sheet</strong></td>
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<tr>
<td>Simple swaps/caps or floors/etc.</td>
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<tr>
<td>Complex (derivative) products</td>
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<tr>
<td><strong>Other Items of Note</strong></td>
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<tr>
<td>Mortgage servicing portfolio</td>
<td></td>
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<tr>
<td>Mortgage origination pipeline</td>
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</table>

*Note: Expand this matrix to the level of category detail required by your institution's balance sheet.*
Complexity risk (option-related risk magnified by derivative structures) is typically found in collateralized mortgage obligations (CMOs) or similar investment types. Complexity risk is normally difficult to model correctly in an ALM model without importing specific cash flows because behaviors are specific to individual instruments and uniquely vary in each interest rate path examined.

Ascertain that each ALM model can adequately handle all of the option-related behaviors in your institution’s balance sheet. Many option treatments are addressed via user input tables (e.g., prepayment definitions that link to interest rate scenarios or other definitions of rate dependent behavior). Many types of prepayments are institution specific, so be sure a model has the flexibility to intake custom input data.

Check in particular how switch options are handled because many models are weak in this area and require special solutions. Avoid models that require manual input of switch option behaviors if possible, as it is time-consuming and error prone. Many intermediate-level models now offer add-on “portfolio analyzer” tools that allow line item modeling. This is a key enhancement because it allows relatively inexpensive models to conduct CUSIP or record-level modeling (including options).

Review in detail how complexity risk is handled (for example, how can CMO cash flows be obtained and entered into the model). If the import of external cash flows is the only method allowed, determine input sources, available interest rate scenarios and the cost of the services involved.

Stochastic modeling applications have an added requirement for option-related inputs. The range of potential interest rate paths is very large and, by definition, so is the range of required option inputs. Simple prepayment tables or other mechanical approaches are not sufficient here because the model must define and apply thousands of uniquely defined (for each interest rate path) option behaviors. Look for the ability to obtain continuous option inputs from external sources or to embed your own custom option behavior equations into the model. This advanced feature can also be valuable in non-stochastic models. For example, scenarios testing for basis-risk-related IRR and yield curve shape changes require unique option inputs in future interest rate forecasts.
**Indeterminate behaviors** are most notably found in core deposits. Contractually, these categories can reprice immediately (but on an administered basis) and have overnight maturities. However, they normally have limited repricing or interest expense sensitivity and long average lives. Review the way each model allows you to define core deposit repricing (its magnitude, lags, caps and floors), the way it treats repricing balances versus maturing balances and the way it defines existing balances decay (runoff). Do the same for other indeterminate categories such as credit cards and lines of credit (LOC).

In stochastic modeling applications, the required range of core deposit behavior inputs expands. Simple decay tables or other mechanical approaches are not sufficient. Look again for the ability to embed into the model custom behavior equations that will produce inputs specific to each scenario. This advanced feature can be valuable in non-stochastic model uses also, as noted above.

**IRR analysis capabilities** are essential. Determine how IRR scenarios are produced in the model (typically rate shocks and linear rate ramps). Establish also how external interest rate scenario data (such as advanced rate ramps that test for basis risk and yield curve shape changes) can be entered. External data should be uploadable directly through a spreadsheet interface, but that is not always the case. Again, as a rule, avoid manual data entry.

In models used for equity-at-risk analyses, review how the model calculates present values and durations and the handling of non-interest expense inputs for core deposits.

**Off-balance-sheet positions** are often quite simple and within the capability of ALM models. However, these positions can be complex enough to require the intake of specific cash flows or specialized tools. Review your institution’s off-balance-sheet holdings (if applicable) and investigate each model’s capabilities relative to your needs.

**Model interface with liquidity analyses** is an emerging area of high concern given recent turmoil in liquidity markets. Liquidity and contingency funding models ideally should be based on the same data as the institution’s ALM model. This is for consistency and because model information incorporates all cash flow (sources and uses of funds) influences. Ascertain whether liquidity-related analyses can be appropriately produced within the model itself or how readily model data can be brought into your institution’s liquidity and contingency funding models.
Ease of model use should be evaluated. Look back at your search so far. Has verifying model capabilities been a reasonably direct and easy-to-follow process? If so, then the model interface is likely to be satisfactory. Did you have trouble following the general flow of each ALM model? If no major problems surfaced, that is an indication that the ALM model will be easy (or at least straightforward) to use. Include your institution’s model user team in the evaluation.

Vendor condition, user support and current user references are now areas to review. At a general level, determine the financial condition of the vendor, the history of recent model updates and the types of user support offered plus the number (and location) of support staff available. Also ascertain whether clients similar to your institution in asset size, charter type and operating characteristics use the vendor ALM model under review. Specific client references can come later; this general review is just to ensure that a given ALM model is worth more detailed assessment.

For those models/vendors that you believe meet all of the above criteria, the focus can now turn to specifics. What to seek and specifically evaluate in ALM models is outlined next. Two classes of functionality are defined to organize the discussion: keystone ALM model requirements and advanced ALM model requirements. Keystone requirements are necessary for a successful model implementation at any financial institution. Advanced requirements are options only particular institutions require, based on unique needs.

**ALM Model Selection Criteria: Keystone Requirements**

A good ALM model is easy to use and maintain, capable of modeling all relevant balance sheet behaviors/options and producing meaningful forecast outputs. Running the model should take a reasonable amount of time, using nonspecialist staff as much as possible.

Questions to ask relating to keystone requirements for an ALM model are listed below. Use the answers to these questions along with the previously completed Self-Evaluation Checklists (Exhibits 2 and 4). Complete the ALM Model Decision Matrix (Exhibit 7) for each model under consideration.

Fundamental ALM model capabilities define characteristics that correlate with model success. Questions to ask:

1. What is the cost of the model, including options and annual maintenance fees?
2. How long does a typical ALM installation take and what does the vendor do?
Exhibit 7  ALM Model Decision Matrix

<table>
<thead>
<tr>
<th>Evaluator</th>
<th>Model Capabilities</th>
<th>Notes on Capabilities</th>
<th>Importance Rank (A)</th>
<th>Capability Rank (B)</th>
<th>Weighted Rank (C)</th>
<th>Initial Cost of Model</th>
<th>Annual Maintenance/Other</th>
<th>Overall Benefit/Cost Comparison Grade</th>
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3. When can my ALM model’s installation be scheduled (if applicable)?

4. Does the vendor come on-site for any portion of the ALM model implementation?

**Data extract, download and input data capabilities** are key to the efficient running of an ALM model. As a rule, minimize manual data entry. Questions to ask:

1. What are the model’s system extract requirements and how are they fulfilled?

2. What other data download requirements are there and how are they fulfilled?

3. How are record-level contractual inputs, such as amortization, balloon point, caps and floors, teaser rates, etc., brought into the model?

4. How are investment premiums and discounts input and assigned over time?

5. Are automated capabilities for importing model-related data (e.g., rate scenarios, loan prepayments and core deposit decay) offered?

**Comprehensive cash flow and repricing control** in the model is necessary, given increasing optionality in balance sheets. The model must be capable of producing a unique specification for every repricing and maturity event, in every month, for every category, in every interest rate scenario. Questions to ask:

1. Can separate contractual repricing and maturity balances be easily identified?

2. How are categories with prepayments, puts/calls and other options defined?

3. How are prepayments, puts/calls and other option-related behaviors defined and applied by interest rate scenario?

4. How are option-related behavior definitions (e.g., prepayments, calls/puts) input into the model and updated across interest rate scenarios?

5. How are option-related behaviors applied to future balances in all rate scenarios?
6. What vendor-supplied or external sources are available for model prepayment rates and other option inputs? What controls do users have to tune external prepayment inputs to institution-specific conditions? What is the cost of external services?

7. Can custom equations for option behaviors be embedded? How is this done?

Accurate assignment of category rates and repricing inputs is an important part of using an ALM model. A key issue is being able to automatically define asset and liability rates (e.g., from key driver rates using equations) so changes in interest rates across scenarios internally reset category rates to new levels. Questions to ask:

1. How is the pricing of existing balance sheet categories input and updated?

2. Can driver rate equations (e.g., category pricing = spread + beta × driver) in the model be defined and modified? How is this done?

3. How can lags be built into asset and liability repricing relationships?

4. How are the rates on future balance sheet categories input and updated?

5. How are cap and floor rates, teaser rates, time limits on teasers, etc., applied to specific categories in the model?

Easy creation of new volume growth and maturity inputs ensures that future balances can be made to grow or diminish along specified paths and placed at their appropriate maturity points or across proper maturity ranges. Questions to ask:

1. How are the potentially multiple maturities of new volume (future) balances defined and input? How are specific growth volumes defined by category?

2. Can new volume balances be uniquely amortized? How are specific pricing and optionality behaviors assigned to new volumes?

3. How are category-level new volumes replicated or assigned to other categories?
4. Can defined groups of assets and liabilities be assigned a common growth rate?

5. Can the growth of all assets and liabilities be controlled together (e.g., holding the balance sheet constant or showing a universal percentage of growth)?

Accurate definition and modeling of indeterminate behavior categories, primarily core deposits, is underdeveloped in many ALM models. However, because of the unique nature of core deposit behaviors and their frequently significant size, accuracy here is vital to precise results. Questions to ask:

1. How is core deposit repricing (both the beta and lags) specifically defined?

2. Can floors or caps be imposed on category-level core deposit rates paid?

3. Can different repricing behaviors (e.g., asymmetric repricing and lags) be applied in different rate scenarios?

4. How are maturing (decay/runoff) balances defined in each interest rate scenario?

5. What vendor or externally sourced national average-type core deposit repricing and average life/value inputs are available? What are the source(s) and what is the cost?

6. How can external core deposit behavior assumptions (from third-party or in-house sources) be input into the model? Is there a standard (i.e., automated) interface?

7. Can custom equations for core deposit behaviors be embedded in the model? How is this done?

Availability of IRR test scenarios and interest rate forecasts expedites running an ALM model in many applications. Questions to ask:

1. How are standard rate shock and linear rate ramp IRR test scenarios created in the model or input into it?

2. Can rate scenario data be adjusted in special cases (e.g., rate floors)?

3. What vendor-supplied or external sources are available for advanced IRR tests (e.g., rate ramps where each rate moves at its own speed to examine basis risk and rate ramps that test for yield curve shape change risk)? How is such data imported into the model? What are the source(s) and at what cost?
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4. What vendor-supplied or external sources are available for realistic interest rate forecast scenarios (e.g., econometric model produced)? How is such data imported into the model? What are the source(s) and at what cost?

5. What is the historic accuracy of vendor sources for realistic rate forecast inputs?

**Equity-at-risk analyses** are now commonly produced because of their comprehensive (all balance sheet time periods) view of balance sheet behaviors and potential rate-related exposures. Most ALM models—even those in lower price ranges—can effectively perform this task. But not all. Questions to ask:

1. What methodologies are available to calculate present values and durations?
2. Are user override options available if alternate valuations (e.g., external investment pricing data or outsourced core deposit valuations) are available?
3. In calculating present values, how can non-interest-related adjustments be input?
4. How are present values and durations for core deposits specifically calculated?

**Model interface with liquidity analyses** is an emerging area of concern. Using the ALM model as a liquidity analysis source or as a feed to liquidity and contingency funding models is the best solution for leveraging the cash flow definitions in the model. Questions to ask:

1. What liquidity analyses are produced in the model or in directly related software? Can those analyses be subjected to “what-if” contingency testing?
2. How can ALM model data be exported to in-house liquidity and contingency funding models?
3. What capabilities does the model have for producing repricing and maturity gap analyses as liquidity analysis tools? How are core deposit repricing versus decay (runoff) balances treated in gap analyses?

**User operation procedures** for an ALM model should be intuitive and efficient. While this is often a personal issue, certain concerns are important. Questions to ask:
1. Is the general layout and flow for using the model logical and intuitive?

2. Can multiple IRR rate shock/rate ramp assessments be run in a single operation?

3. Can multiple rate forecast business plan analyses be run as a single operation?

4. How are “what if” strategies input and evaluated? How fast can multiple-strategy results be produced and compared?

5. Can budgeting information be run concurrently with the balance sheet forecasts? Can ALM model inputs/outputs be moved directly to such models?

6. Can profitability/funds transfer pricing (FTP) applications be run concurrently with balance sheet forecasts? Can ALM model inputs/outputs be moved directly to such models?

**Report production** in an ALM model should be intuitive and efficient. In addition, model outputs should communicate model results or be exportable into spreadsheets or other systems that produce effective presentation materials. Questions to ask:

1. How are standard IRR analysis reports and typical business plan evaluation reports produced? What presentations are included in standard model reports?

2. How are comparative results for different scenarios or strategies presented?

3. Can ALM model outputs be directly exported to spreadsheet software?

4. How are documentation reports of ALM model inputs and assumptions produced?

5. Is a specialized report writer or similar tool included as a part of the ALM model?

**Vendor condition, user support and references** are key elements of the long-term relationship you are entering when you purchase an ALM model. Questions to ask:

1. What is the corporate history of the vendor and its current financial situation?
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2. What was the first release date of the ALM model under review? How many times has it been significantly enhanced or upgraded in the last three years?

3. How is model user support provided? At what times is phone support available, from what location(s) and what statistics describe recent support experiences?

4. Does the vendor have an ombudsman or some other method to resolve conflicts?

5. What current references can the vendor provide for institutions in my general asset size, charter and operating type that use the model?

ALM Model Selection Criteria: Advanced Requirements

ALM models are increasingly asked to perform advanced tasks as part of expanded balance sheet management solutions. Such applications are most often driven by more complex balance sheets with their associated need for broader views of performance and risk, although regulatory mandates sometimes apply.

Advanced features to seek in ALM models are listed below. Keep in mind few institutions need these features. As above, use these discussions along with the Self-Evaluation Checklists (Exhibits 2 and 4) and the ALM Model Decision Matrix (Exhibit 7).

Stochastic modeling (Monte Carlo) capabilities are required when an institution needs high-precision estimates of the current and interest-rate-related value behaviors of categories with significant embedded options. Most ALM models, which use industry standard rate-dependent, single-path, present-value methodologies, cannot accurately present value an existing embedded option or accurately measure value changes as rates change if material optionality is involved. While this is not always a constraint (equity-at-risk assessments do not require trading-floor levels of precision, for example), as more optionality enters balance sheets and is applied off balance sheet, this limitation may become a more meaningful limitation. Further, advanced regulatory risk mandates (e.g., Basel II) require stochastic modeling capabilities. Questions to ask:

1. What methodologies are available to define the implied forward yield curve? What approaches can be applied to smooth the estimated curve?

2. What models are available for producing the stochastic rate paths by scenario? Are advanced methods available? If advanced methods are proprietary, what test results are available?
3. Can rate paths be developed from random seeds and what advanced controls (e.g., the degree of lognormality or variance dampening techniques) can be applied?

4. How are option behaviors applied to cash flows in every stochastic rate path? What methodologies are available to calculate present values and durations?

5. Can custom equations (e.g., based on vendor or institution-specific analyses) for loan and core deposit behaviors be embedded in the model?

6. Can interest income and interest expense be estimated in a stochastic context? How is this accomplished?

Specific rate-dependent investment cash flow data are required when complexity risk or extreme optionality is present in category balances (e.g., CMOs). Cash flows may be produced internally by the model, but more typically they are input from external sources. Questions to ask:

1. What capabilities does the model have to internally generate interest rate dependent cash flows for complex instruments? Does the vendor charge a separate fee for the “reverse engineering” that produces cash flows?

2. How are externally produced cash flows obtained and input into the model for complex instruments? What are the source(s) and what is the cost of such data?

3. How are underlying assumptions and outcomes (e.g., prepayment speeds and payment waterfalls) documented?

Off-balance-sheet items are increasingly found. Many ALM models can effectively handle simple off-balance-sheet items. However, not all models are equally capable or comprehensive. Questions to ask:

1. How are typical off-balance-sheet positions specifically defined and input?

2. How are option-related behaviors in off-balance-sheet positions defined, input and applied (if applicable)?

3. How are special reporting requirements and/or FAS 133 accounting treatments handled (if applicable)?

Budgeting, profitability and funds transfer pricing (FTP) are increasingly combined with traditional ALM-related activities. Some models offer unique advantages in interfacing with these applications. Questions to ask:
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1. Are there effective ways to interface the ALM model and budgeting, profitability and FTP models? How is this done?
2. Can detailed, multicenter budgeting be efficiently done within the ALM model?
3. Can ALM, profitability and FTP models all share the same data sources, category specifications, inputs and assumptions?
4. What integrated reporting capabilities exist among the models?

Executive information systems (EIS) are increasingly a part of institution information technology solutions. Some ALM models offer synergies with EIS. Questions to ask:

1. Can ALM model results be passed to the institution’s EIS? How is this done?
2. Do EIS and ALM models share common data inputs and category specifications?
3. Are integrated ALM and EIS reports available?

Final Notes on Choosing an ALM Model

Choosing and installing the right ALM model is the first step toward modeling success. The full balance sheet management and risk control value of an ALM model will only be apparent when it is fully implemented in an institution-wide total ALM process solution.

Exhibit 8 illustrates the summary elements of a Data-to-Decisions ALM process solution. Success starts in element 1 with the right ALM model and its full implementation. The ALM model is the engine that powers the institution’s understanding of its balance sheet value, performance potential and risk. In element 2, the ALM model is put to work. This is done with IRR testing, business plan evaluations and supporting ALCO policies and procedures (a.k.a. model governance). Finally, in element 3, model forecasts are transformed into decisions by communication materials specifically designed to meet the unique needs of each model output audience.

Within the Data-to-Decisions process, organized and coordinated links connect all of the institution’s ALM model implementation elements. This maximizes benefits because it effectively applies and supports the model in a truly results-oriented role.

The sum is much more than the parts. ALCO, senior management and the Board are now fully empowered with timely, quantitative insights into the
Exhibit 8  Data-to-Decisions ALM Process Solution

1. Data Extracts | The Right ALM Model | Implementation of ALM Model

   Analytical Capability

2. Risk Assessment | Business Plan Evaluation | Performance Management | Regulatory Compliance

   Performance and Risk Management (ALCO)

3. Risk Reporting | Management Reports | Board Presentations

   Communication and Decisions
future performance and risk potential of the institution. These advantages lead to a suggestion. Keep the Data-to-Decisions ALM process solution in mind as your ultimate goal when choosing an ALM model. With a broader perspective, ALM model features and their benefits are better highlighted as to their importance and can be specified to support your success.

Finally, best of luck choosing the right ALM model solution for your institution!
Periodic ALM Model Risk Assessment

ALM models are complex software systems that require a significant level of data and institution-specific (and ever-changing) contractual inputs and behavior assumptions. Because of their intricacy and ongoing upkeep requirements, ALM models tend to collect errors and omissions over time. It is also possible that the original model installation was not completed correctly or that users have made inappropriate changes to model or category setup definitions or other technical specifications after the installation. From many sources, ALM models can drift into a state of low analytical precision that creates model risk, which is defined as making a wrong decision based on inaccurate model outputs.

Model risk is an obvious business concern because of the possibility of lost performance opportunities and unforeseen risks. Regulatory agencies across all charters were quick to recognize this issue and act. Early discussions are found in the FFIEC’s pathbreaking 1996 Joint Policy Statement on Interest Rate Risk. The OCC (Office of the Comptroller of the Currency) has the strongest statement of model risk assessment need in its Bulletin 2000–16, which requires that an annual ALM model verification (audit) be conducted by an independent third party. Further guidance, with a new emphasis on the model control environment, is provided in the FDIC’s December 7, 2005, Supervisory Insights article on model governance. Other agencies have similar, if less specific, directives. The Sarbanes-Oxley legislation, in the control environment mandates presented in Section 404, also bears directly on the model risk issue.

The business and regulatory mandates are clear: Control model risk. To achieve this goal, ALM model value and forecast accuracy must be formally reviewed on a periodic basis. This has three components.

1. **Verification.** To prove that the model has the technical capacity to produce accurate values and forecasts, the model must be verified. This includes a detailed review and assessment of all model data, setup attributes, contractual inputs, behavior assumptions and reports.

2. **Validation.** Comprehensive validation of model forecasts compared to contractually expected category behaviors is required to prove that the model actually produces accurate values and forecasts.

3. **Confirmation.** Finally, the model must be confirmed as an appropriate simulation tool, given the institution’s applications. The model control environment must be satisfactory, and the model’s supporting ALM model governance should be comprehensively defined and implemented.
Many providers offer ALM model risk assessments (a.k.a. model verification or model validation). Below are discussions of underlying issues and key criteria, oriented around the key sources of model risk, for evaluating providers and their deliverables.

### The ALM Model Itself as a Risk Source

ALM models are complex software programs that can have thousands of lines of code for even a simple application. In vendor-provided models, prerelease analyses, ongoing internal reviews and the day-to-day experiences of large numbers of users attest to the efficacy of the underlying code and the accuracy of its results. Assuming a current version of the model is installed, shortfalls in the fundamental forecast accuracy of a vendor-provided ALM model are rare. Thus this area of model risk is normally minimal.

Note that this statement does not apply to ALM models developed in-house or to outsourced ALM model solutions provided by an independent consultant using a non-vendor model. For those models, comprehensive testing and precision certification by a third party must be completed and documented. The affirmation process must be repeated periodically.

### ALM Model Components as Risk Sources

Model risk arises from multiple sources. Consider each model risk source in turn.

**Data-related risks** are obvious. They involve using the wrong data or data that does not foot across the model. In most cases, model data is comprehensively assessed in reviews of underlying automated systems or managed as part of the model control environment (e.g., user procedures that require balancing tests each time the model is run). Data-related risks are not typically a key model risk area, but ALM model risk assessments must evaluate data-related model risk issues at a basic level.

**Category setup** tells the ALM model how to interpret incoming category-level data. Because these inputs define the categories analyzed in the model, the behaviors specified are crucial to the success of all subsequent model applications. As such, they are a source of fundamental model risk that arises from their initial installation specifications and any ongoing changes over time.
**Contractual inputs** are behavior definitions that can be read directly from underlying asset and liability contracts. Pricing spreads, teaser rates and repricing limits (caps and floors) are common examples. Call and put features (in many investments and wholesale funding sources) are further common illustrations. These inputs are a source of model risk that arises from initial specifications and ongoing model evolution over time.

**Behavior assumptions** are the weakest link in almost all ALM models. This source of model risk includes prepayment inputs for contractual maturity loans of all types (not just first mortgages) and paydown inputs for indeterminate maturity loans. Loan behavior inputs also need to specify the interrelationships among loan types (e.g., second mortgage prepayments or HELOC paydowns driven by 1–4 family mortgage prepayments). Inputs defining core deposit supply, repricing, decay (defines average life) and present value-related behaviors and CD early withdrawal and other option inputs are also important. Behavior assumptions, in particular the treatment of core deposits, can swing IRR analyses and performance evaluations by large amounts. Accuracy is thus of the utmost importance.

**Reporting** that originates directly from a vendor-provided ALM model is normally error free and rarely a source of model risk. Custom-produced model reports, however—and especially reports created from model outputs imported into external spreadsheets—are material risk concerns. Ample evidence of widespread spreadsheet errors is available in the business literature, yet most ALM model applications normally have few controls over them. Address this issue in an uncompromising manner, preferably by treating each spreadsheet as a “model” and focusing on its embedded risk potential as such.

**The model control environment and ALM process solution** provide the surrounding support for an ALM model. They round out the technical elements of the model with the processes needed to implement and maintain it as a true decision-making tool.

The model control environment is defined by user process controls and documentation of modeling activities. A best practice solution includes a comprehensive user manual (with an inventory of files that interface with the model), a simple user checklist to document completion of all modeling steps in each period and change control documents. Model risk arises when the model control environment is weak, raising the probability that user errors will occur or changes to the model will go undocumented.
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The institution’s ALM process solution (a.k.a. its model governance) revolves around the asset/liability management committee (ALCO) and its functions. A best practice solution embodies the center and lower elements of the Data-to-Decisions framework described earlier. Model risk can stem from an incomplete ALCO function (often due to unengaged management), poor IRR exposure limits or a lack of Board involvement/oversight.

Controlling ALM Model Risk

The goal of every ALM model is to produce accurate valuations and forecasts. This requires a multifaceted solution, given the multiple sources of model risk. An outline of the steps required to comprehensively control model risk follows.

Correct installation of the model is the key first step in controlling model risk. For many implementations, installation is distant history and its quality is not now directly relevant. However, for new models, the best defense is to address and document the treatments used for every element of model risk at installation. The vendor should have comprehensive installation policies, data tests, category setup, contractual input and behavior assumption controls and reporting tests. Documentation of these activities mitigates all dimensions of model risk at this beginning step.

Periodic assessment of model risk is the second step in controlling that risk. Use of a competent and independent source is essential. Model risk assessment first includes a detailed technical review of each model element. This establishes the model’s potential to accurately value and forecast. The assessment then needs to validate that model forecasts are actually accurate. Model risk assessment must go far beyond just affirming that the model could forecast correctly. The model risk assessment must also prove that the model does forecast correctly. That is, the model must be validated as well as verified.

Validation of your model’s value and forecast accuracy needs to include reviews of a constant interest rate (Base Case) scenario and a range of rising and declining rate ramp or shock scenarios. Testing across a range of interest rates ensures that baseline forecasts and interest rate sensitivity forecasts correctly capture all balance sheet behaviors. Special behavior diagnostic systems are typically employed. A model’s validity can also be demonstrated through comparisons of near-term margin forecasts vis-à-vis actual prior month values and by comparing model forecasts of NII IRR exposure against recent actual margin sensitivity data.

Two important notes apply to the validation of model-produced values and forecasts.
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1. Model accuracy cannot be adequately judged by producing parallel forecasts in another model run. This has two reasons. First, running your exact current model through a separate other model (which is necessary for comparability) tests little beyond the ability of the two models to complete simple computations properly. None of the underlying elements in your model (e.g., data, category setup, inputs, assumptions or outputs) is assessed. The result is that a poor quality model is not recognized. Second, the “model math” capabilities of your model need to be certified by the vendor—not by you—preferably using an independent third-party expert. Having every user affirm the model’s basic calculation accuracy has little purpose when it can be proven in a model certification.

2. Model accuracy cannot be adequately judged by running backtests of prior model forecasts against subsequent actual outcomes. Several reasons for this are apparent. First, backtests are by nature backward looking while model risk is future oriented. Second, information on the model’s ability to forecast option influences in higher magnitude scenarios (e.g., beyond +/-100 bp) is usually minimal. Interest rates rarely vary enough over a typical backtest period to reach those extreme levels. Third, detailed backtesting is costly to complete for earnings at risk forecasts and virtually impossible to complete for equity at risk forecasts. Finally, in the limit, a backtest only assesses the model’s computational capabilities. Again, that is best accomplished via an independent model certification.

Implementation of a comprehensive model control environment is the third step in controlling model risk. This includes user cross training and backup users to provide production depth, a detailed model user manual and a model user checklist (completed each time the model is run, dated, initialed and placed in the record). The model control environment also includes data and model change control procedures that stipulate how often and by whom each model specification and input/assumption must be examined and updated, acceptable sources of any new information and documentation of modeling and reporting changes to ALCO.

Implementation of a comprehensive ALM process solution surrounding the model is the final step in controlling model risk. While the ALM process solution encompasses all ALCO activities, certain elements more directly bear on model risk.
1. An annual formal review of the model must be mandated by ALCO. This internal function is a complement to an ALCO-mandated periodic independent model verification.

2. IRR limits must be defined correctly for all rate test scenarios reviewed by ALCO and the Board. Best practice IRR limits expand nonlinearly across rate scenarios to accommodate the adverse value and performance implications of option influences.

3. The model and its applications must be described in the institution’s ALCO Policy. This is most commonly done in an appendix that documents the “implicit contract” between the Board and ALCO with regard to model applications.
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Judging ALM Model
Verification Providers

As demonstrated above, there are multiple dimensions of model risk. As a result, model risk assessments must be detailed and multifaceted. Simple checklist reviews of data and basic model inputs are usually not sufficient in this light. But how to ensure that a more encompassing model risk assessment is adequate?

In particular, how do you evaluate potential providers? A wide spectrum of ALM model risk assessment reports is offered. Each provider has a unique deliverable and brings varying qualifications to the effort. What should you specifically seek out—and seek to avoid—in model risk assessment reports and their providers?

The most important starting point is that many entities, foremost the regulators, believe that an ALM model risk assessment must be provided by an independent third party that can demonstrate specific expertise and practical experience with your model. Use your own criteria for independence and expertise, but apply high standards.

The ALM model risk assessment deliverable must provide a model verification (which examines in detail model data, setup attributes, inputs, assumptions and reports) and a related model validation (which ensures that the model’s forecast data depict underlying balance sheet behaviors). To direct your response activities, specific, prioritized recommendations for model upgrades and enhancements must be provided.

The provider should be able to consultatively partner with you to enhance the model and its associated processes. A broad client base, which exposes the provider to industry best practices, is valuable in this regard.

The following are specific issues to consider and questions to ask when evaluating ALM model verification providers.

Assess the Provider’s Independence

As mentioned, the regulators consider the independence of ALM model verification providers to be essential—and you should, too. Questions to ask the provider here are:

1. Is the provider connected in any way with, or does it receive payments from, your ALM model vendor? If yes, is this compromise of independence important to your institution? Is it important to your internal audit group or regulators?
2. Is the provider connected in any way with, or does it receive payments of any kind from, a securities broker your institution uses? If yes, is this compromise of independence important to your institution? Is it important to your internal audit group or regulators?

3. Does the provider offer an outsource ALM model solution that competes with your in-house model? If yes, is this potential compromise of independence important to your institution? Is it important to your internal audit group or regulators?

Evaluate the Provider’s Model Experience and Expertise

Value added content in an ALM model verification comes from deep qualifications and broad industry experience and expertise. Questions to ask the provider here are:

1. What is the level of the provider’s specific technical knowledge of the details, nuances and limitations of your specific ALM model?

2. How many staff members will contribute to your report? What level(s) are they in the organization? Who will perform the final quality assurance review?

3. In the last 12 months, how many comprehensive risk assessments of ALM models like yours has the provider provided?

Review the Provider’s Model Risk Assessment Process

ALM models are multifaceted and, as such, ALM model verifications must address all dimensions of model risk. Questions to ask the provider here are:

1. Why is the provider’s model risk assessment process defined as it is?

2. Does the provider take physical possession of the model for the verification?

3. What specific model technical verification techniques are used and why?

4. What specific model value/forecast validation techniques are used and why?
5. What are the report’s specific model verification and validation deliverables?

6. What quality assurance processes does the provider’s production process use?

7. Are industry standard and best practices defined in the deliverable?

Consider the Provider’s Model Risk Assessment Report Deliverable

An ALM model verification is a consultative process. The deliverable thus must not only assess model risk but also recommend responses to model areas in need of upgrade. Questions to ask the provider here are:

1. What does the provider’s ALM model verification report specifically include? What is the conceptual or theoretical reason each report element is included?

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?

3. Can the provider assist your institution in implementing the model enhancements and refinements from the verification report?

4. Can the provider help your institution enhance its model control environment and ALCO process solution, including definition/fine-tuning of IRR exposure limits?

Determine the Regulators’ Acceptance of the Provider’s Model Risk Assessments

The business-related aspects of an ALM model verification should be its primary value. However, regulatory compliance unquestionably needs to be a vital element in the final deliverable. Questions to ask the provider here are:

1. Have examiners in the field reviewed the provider’s model risk assessment report? If yes, from which regulatory agencies?

2. What feedback have examiners provided on the provider’s reports?
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3. Does the provider offer assistance if regulators challenge the report? Specifically, what types of support are provided?

**Obtain References from Recent Provider Model Risk Assessment Clients**

The ALM model verification provider should be your partner through the project. References are your best way to gauge the degree to which this will happen. Questions to ask the provider here are:

1. Can the provider give specific references from recent clients with your institution’s approximate asset size, charter type and general operating characteristics?

2. Ask the references about report quality and content, production timing and quality of staff. Also ask them to share any internal audit or regulatory responses to the report.
Sample Request for Proposal

Below is a basic form to request an ALM model proposal from a vendor. Replace the information enclosed in <angle brackets> with your institution’s specific information to customize the form to your needs. A list of vendor questions that you can enclose with the request for proposal follows the request form.

<Asset/Liability Management Model Vendor>

<Institution Name>

<Institution City, State, Zip>

<Date>

Executive Summary

<Institution name> requests that selected ALM model vendors provide information and a demonstration of an asset/liability management (ALM) model that specifically meets the following balance sheet management and risk assessment:

1. Fully or nearly fully automated data extract and download into the ALM model.

2. Efficient processes for defining asset and liability category setup attributes, inputs, behavior assumptions, interest rate scenarios and other routine model elements.

3. Capability to model and value/forecast uniquely by interest rate scenario the category-level balance sheet repricing and maturity characteristics, pricing, repricing, rate limit relationships, option-related interest rate dependencies, core deposit behaviors and all other unique performance and risk attributes of the institution’s balance sheet.

4. Capability to measure net interest income (NII), net income (NI) and <economic value of equity (EVE)/net portfolio value (NPV)/Net Economic Value (NEV)> IRR at high precision levels in rate shock, rate ramp and custom rate ramp scenarios.

5. Capability to produce multiscenario business plan strategy analyses using realistic rate forecasts for most likely, rising and declining interest rate projections.
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6. Capability to readily produce standard and custom reports from model outputs, with the ability to export model reports directly to popular spreadsheet software.

7. Capability to produce detailed liquidity and contingency funding forecasts internally or to interface with in-house systems to measure liquidity and contingency funding.

8. <add to list as desired>

9. <if applicable> Capability to simultaneously produce budgeting forecasts with business plan analyses.

10. <if applicable> Capability to interact with or produce forecasts relevant to profitability analysis and funds transfer pricing (FTP) applications.

11. Cost of no more than $<xx,xxx>. Price includes a full model installation, with initial user training and first year maintenance fees. <list options if applicable>

Data processing for <institution> is provided by <specify firm or in-house department>. Management anticipates working closely with the data servicer and the ALM model vendor in coordinating the model’s data and category setup related installation activities.

Submit information materials relating to the model or models deemed to be solutions to our needs and a proposal to the address below. Deadline for submission of proposals and completion of demonstrations is <allow 30 days if possible>. Submit materials to

<Contact Name, Title>

>Institution Name>

>Street Address>

>City, State, Zip>

>Phone and Fax Numbers>

>E-mail Address>
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Balance Sheet and Performance-Related Background Information

As of <latest quarter end>, the institution had total assets of $<data>. Total capital was <data>% of assets. The institution has posted <adjective> recent financial performance and has <no or describe> unusual risk problems or other unique financial characteristics.

Qualitative reviews <or current ALM model analyses> of balance sheet data <do or do not> suggest a wide mismatch between asset and liability repricing in the short term. Qualitative reviews <or current ALM model analyses> of balance sheet data <do or do not> indicate significant maturity mismatch. Different driver rates, pricing behaviors and rate limits for individual asset and liability categories <are or are not> material factors. A <significant or not> degree of optionality is embedded in the balance sheet. Core deposits <are or are not> a significant percentage of overall funding. The institution also needs to be able to quantify the performance implications of <specify any unique items> for IRR and business plan performance.

Management Issues Regarding an In-house ALM Model

<Institution> wishes to assess earnings <and equity> and at-risk IRR <quarterly or monthly>. Rate shocks and rate ramps (linear and alternative) are considered appropriate IRR tests. IRR tests must be capable of producing high-precision analyses with minimal commitment of time and staff resources.

<if applicable> The institution uses a comprehensive business plan as its primary planning and decision-making tool. Management wishes to update the business plan on a periodic basis and requires the capability to readily construct future business plans.

<if applicable> The capability to cost-effectively review outcomes of “what if” balance sheet strategies is a high priority as the model will be actively used by the institution.

<if applicable> The capability to produce relevant budgeting, profitability and FTP data simultaneously with ALM outputs is important to the institution.
Model Choice Criteria

Vendors should propose ALM models that specifically address current institution needs and goals. Vendor demonstrations should speak directly to how their ALM models will address each specific aspect of balance sheet value, performance and risk present in <the institution’s> balance sheet. The vendor is expected to provide convincing evidence on how the model provides solutions to specific ALM-related needs of the institution. Model functionality and features are of interest only as they contribute to this goal.

Model cost, including indirect costs, will be a key factor in the decision. Vendor financial condition, levels of ongoing user support and cost of annual maintenance are also choice inputs. Information relating to these issues should be included with the ALM model proposal.
FMS Sponsor Questionnaire

Please answer the following questionnaire regarding the modeling solution you propose to meet our needs. If the topics listed are addressed in standard sales support materials, those materials (with annotations if needed) can suffice.

1. GENERAL INFORMATION
   » Vendor Contact information:
   » Describe current client base:
     • Number of clients:
     • Client characteristics as deemed relevant:
   » Model User Support Program
     • Toll-free, phone-based user support (enter “yes” or “no”):
     • Hours during which phone support function operates:
     • Location(s) of the phone support function:
     • Web-based user support (enter “yes” or “no”):
     • Other support characteristics as deemed relevant:

2. MODEL INFORMATION
   » Model name:
     • Level and Version:
     • Last update:
     • Operating system(s) and other required software:
   » Is a vendor-supplied outsource service using the model available?
   » What other vendor-provided financial management products interface with the ALM model?
   » What is included in the vendor-provided model installation?
   » Does the vendor offer support beyond initial model installation in consulting or extended implementation assistance?

3. DATA EXTRACT AND INTAKE
   » Briefly describe the model’s intake processes for balance sheet data (e.g., general ledger, maturity, repricing information) from my existing data processor(s).
   » Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.).

4. CHART OF ACCOUNTS
   » Identify any special features and/or limitations of the model in its ability to model the balance sheet behaviors listed below:
     • Repricing and maturing balances for categories without embedded options
• Interest rate adjusted repricing and maturing balances for categories that have continuous and call/put embedded options
• Repricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
• Repricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)

» Are there any limitations on automated control of pricing, repricing, caps/floors and teaser rates?
» Can the model effectively amortize discounts/premiums?
» Can the model effectively address unique balance sheet items (e.g., mortgage servicing, off-balance-sheet positions)?

5. PRICING/REPRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

» How are contractual inputs (e.g., pricing spreads, repricing limits) entered?
» How are interest rates and driver rates input and periodically updated?
» How are pricing and repricing relationships defined and updated?
» How does the model define investment or FHLB advances with puts or calls in the interest rate comparisons?
» How does the model define repricing and apply decay rates (or similar inputs) to core deposits by scenario, and how does it calculate present values?
» How does the model intake and apply advanced rate ramps that test for basis risk and yield curve shape change?
» Describe the model’s analysis and reporting capabilities (IRR and other forecasts).
» Can the model export outputs and reports to spreadsheets or other products?
» What internal liquidity analysis capabilities does the model have and can the model interface with typical internal liquidity and contingency funding spreadsheets?
» Does the model have stochastic forecasting capability? If so, describe it.
» Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

6. FREE-FORM COMMENTS ON MODEL CAPABILITIES

» Specify any unique advantages and benefits of your model as it would be implemented at this institution.
Responses to FMS Sponsor Questionnaire

This section contains sponsor answers to the vendor questions. Links to each sponsor’s product information are provided.
1. GENERAL INFORMATION

Vendor Contact information:
Jeff Caughron, Associate Partner
ccaughron@gobaker.com
Chris Wilson, Financial Strategist
cwilson@gobaker.com
The Baker Group
1601 Northwest Expressway, 20th Floor
Oklahoma City, OK 73118
Phone: 1-800-937-2257
Web: www.gobaker.com

Describe current client base:
• Number of clients:
  600
• Client characteristics as deemed relevant:
  A/L Vendor since 1979

Model User Support Program
• Toll-free, phone-based user support (enter “yes” or “no”):
  Yes: 1-800-937-2257
• Hours during which phone support function operates:
  M–F 8:00 a.m.–4:00 p.m. CST
• Location(s) of the phone support function
  Home Office—Oklahoma City, OK
• Web-based user support (enter “yes” or “no”):
  Yes: Tutorials / Basic Information / Definitions
• Other support characteristics as deemed relevant:
  Education, training and consultation on your risk profile provided at no additional
  cost. In-house or on-site Training/Support facilities are available for users.
2. MODEL INFORMATION

Model name:
Interest Rate Risk Monitor (IRRM®)
• Level and Version:
  V4.0
• Last update:
  January 2009
• Operating system(s) and other required software:
  All Windows Applications

Is a vendor-supplied outsource service using the model available?
Yes

What other vendor-provided financial management products interface with the ALM model?
Advanced Portfolio Monitor (APM)—the Baker Group’s proprietary bond portfolio analytics package

What is included in the vendor-provided model installation?
Install from our Web site to the desired drive from each station that will be using IRRM®.

Does the vendor offer support beyond initial model installation in consulting or extended implementation assistance?
Yes. Training, Consultation and Education are also provided.

3. DATA EXTRACT AND INTAKE

Briefly describe the model’s intake processes for balance sheet data (e.g., general ledger, maturity, repricing information) from my existing data processor(s).
We currently interface with 30 data processors to import maturities, repricing and repricing options on loans and deposits. Investment analytics are imported from our bond analysis model, APM.

Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.).
Accounts can be broken out by account type, reset frequency and rate index. Amortization can be defined for each account.
4. CHART OF ACCOUNTS

Identify any special features and/or limitations of the model in its ability to model the balance sheet behaviors listed below:

- Repricing and maturing balances for categories without embedded options
  These are maintained separate from each other in order to get accurate cash flows along with accurate repricing balances and dates.

- Interest rate adjusted repricing and maturing balances for categories that have continuous and call/put embedded options
  No limitations

- Repricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
  No limitations

- Repricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)
  No limitations

Are there any limitations on automated control of pricing, repricing, caps/floors and teaser rates?

- No limitations

Can the model effectively amortize discounts/premiums?

- Yes, through yield calculations in Advanced Portfolio Monitor (APM).

Can the model effectively address unique balance sheet items (e.g., mortgage servicing, off-balance-sheet positions)?

- Yes, with the exception of foreign exchange items.

5. PRICING/REPRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

How are contractual inputs (e.g., pricing spreads, repricing limits) entered?

The model allows the user to either download any contractual inputs through an interface with the bank’s data processor or input them manually. Additionally, any contractual inputs in the investment portfolio may be downloaded from the Advanced Portfolio Monitor.
How are interest rates and driver rates input and periodically updated?
The user may access yield curves and market rates through the Baker Group’s password-protected Web site. These rates are updated at the beginning of each month and may be directly downloaded. Rates may also be entered manually if desired.

How are pricing and repricing relationships defined and updated?
The pricing of each account may be defined individually through the input of many embedded options, including: repricing index, repricing frequency, margin, caps, collars and floors. These inputs are saved from run date to run date, but may be overwritten through downloads from the data processor and/or the Advanced Portfolio Monitor (APM).

How does the model define investment or FHLB advances with puts or calls in the interest rate comparisons?
These instruments are modeled with dynamic cash flows created in the Advanced Portfolio Monitor (APM). APM projects CUSIP-level cash flows over nine interest rate scenarios utilizing the model’s algorithms designed to determine whether the instrument is likely to be called at each call date, and in each rate scenario. These algorithms take into account each instrument’s coupon versus current issue refunding rates. These cash flows are then aggregated by type and interest rate scenario and downloaded into the Interest Rate Risk Monitor. FHLB advances, puts/calls can be defined through the data entry screens. The instruments are priced to the worst case scenario.

How does the model define repricing and apply decay rates (or similar inputs) to core deposits by scenario, and how does it calculate present values?
Core deposit repricing and decay rates are handled independently for maximum flexibility. Each core deposit account may be allowed to reprice immediately, but the user defines the timing and magnitude of movement relative to rate scenario. Embedded options, such as repricing lags and collars, implied floors/caps, are considered for each account and rate scenario. The user may distribute the balances of nonmaturity deposits over time and may define Decay Rates for each account and rate scenario. The resulting outflow may be redirected into other liability accounts. Present value calculations will take into account all embedded repricing characteristics and projected cash flows in each rate scenario.

How does the model intake and apply advanced rate ramps that test for basis risk and yield curve shape change?
The model is flexible with respect to ramping of rate scenarios and nonparallel yield curve shifts. Rates can be immediately shocked or ramped over a user-defined time horizon, and can be designated as nonparallel using any combination of long versus short rate shifts. Basis risk between and among different types of assets and liabilities can be modeled through changes in relative sensitivities (betas) and time lags.
Describe the model's analysis and reporting capabilities (IRR and other forecasts).

The model produces the following reports:
- Summary ALCO
- Cumulative Gap Measures
- Net Interest Change—12 Mo. Horizon
- Net Interest Change—24 Mo. Horizon
- SFAS 107—Book/Fair Value Summary
- Economic Volatility—Fair Value
- Economic Volatility—App. & Dep.
- FIDICA 305 Schedule 5—Summary
- Balance & Rate Entry
- Rate Shift Assumptions
- Projected Balances—Summary (9 Scenarios)
- Asset/Liability Mix—Detail
- Change in Interest Income—Assets
- Change in Interest Income—Investments
- Change in Interest Income—Funds Sold
- Change in Interest Income—Loans
- Change in Interest Income—Other Earning
- Change in Interest Income—Liabilities
- Change in Interest Income—Nonmaturing Dep.
- Change in Interest Expense—Under 100mm
- Change in Interest Expense—Over 100mm
- Change in Interest Expense—Borrowed Funds
- Change in Interest Expense—Other Paying
- NIC Detail—Totals Only
- ALCO Benchmarks
- FDICIA 305 Schedule 5—Detail
- Reinvestment Rates—Detail
- Principal Scenario Cash Flows (Detail and by Category)
- Principal Scenario Cash Flows—Cumulative (Detail and by Category)
- Traffic Reports (Change in Asset/Liability Mix)
- Filtered Reports (Largest Impact Categories)

Can the model export outputs and reports to spreadsheets or other products?

Reports can be exported to PDF file formats. IRRM® files can also be easily uploaded between the client and Baker Group support staff.
What internal liquidity analysis capabilities does the model have and can the model interface with typical internal liquidity and contingency funding spreadsheets?

Principal cash flows are modeled by rate scenario and reports are available for cash flows in individual time periods or on a cumulative basis and by category or in detail. There is no specific interface for contingency funding spreadsheets.

Does the model have stochastic forecasting capability and if so, describe it.

The optionality of cash flows is modeled through the use of rate-relationships comparisons, though IRRM® does not currently incorporate Monte Carlo-type probabilistic modeling.

Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

Yes. Time lags and account sensitivities to (market) rate shift assumptions are incorporated as mandatory inputs for each individual asset and liability line item.

6. FREE-FORM COMMENTS ON MODEL CAPABILITIES

Specify any unique advantages and benefits of your model as it would be implemented at this institution.

Bakers’ Software Solutions® is a family of proven, industry-responsive systems that show results where it counts: the bottom line. This year we are celebrating 30 years of assisting financial institutions with managing interest rate risk. Over 600 clients nationwide are utilizing our various systems and our depth of resources, which provide them with two key benefits…experience and expertise.

The Interest Rate Risk Monitor (IRRM®), the foundation of the ALCO process, allows you to simply and accurately measure, manage and quantify your interest rate risk profile. Our over thirty data processor interfaces have streamlined data input and put the focus where it belongs…managing interest rate risk. Your time is focused on pricing strategies, reinvestment assumptions and simulations. The system is in your hands, allowing you to determine the impact of your strategies and assumptions before you execute them. Whether you are redirecting your maturities and cash flows, simulating a new deposit program or reflecting a change in your pricing/marketing strategies, it can be done easily, quickly and efficiently.
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The lower price points of IRRM® are not a reflection of its capabilities or complexity. All embedded options are modeled, including prepayment/decay rates, reset dates, caps, collars, floors and call/put dates. Average lives, modified and effective duration as well as convexity are calculated on each instrument, enhancing the accuracy of both changes in income and fair market value of equity. Additionally, our Advanced Portfolio Monitor (APM) directly interfaces CUSIP-level, dynamic cash flows over nine interest rate scenarios into your IRRM®. This unique, invaluable program of advanced analytics on your investment portfolio may also be provided in a printed format, reflecting risk/reward analysis, current and future cash flow and yield projections. While IRRM® gives you a tool to manage your balance sheet, APM gives you a tool to manage your investment portfolio.

IRRM® reports and graphs clearly present your risk profile, matching your performance against your ALCO benchmarks. Sample A/L, investment and liquidity policies and guidelines are provided to facilitate the process of linking your reported risk parameters with your policy risk parameters.

Whether processing IRRM® in-house or utilizing our service bureau, you receive the same thorough education, training, service and support. Consultation and review of your risk profile are provided at no additional cost. Our seasoned staff with extensive knowledge and expertise in working with financial institutions in the areas of asset/liability and investment management is ready to assist you.

Asset/Liability Management and The Baker Group, thirty years and going strong.
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

FARIN & Associates, Inc.
www.farin.com

1. GENERAL INFORMATION

Vendor Contact information:
FARIN & Associates, Inc.
2924 Marketplace Drive
Fitchburg, WI 53719
Phone: 1-800-236-3724
Web: www.farin.com

Describe current client base:
FARIN ALM clients include community-based financial institutions, including commercial banks, thrifts and credit union charters.

- Number of clients:
  320 total software users

- Client characteristics as deemed relevant:
  Client Asset Ranges: $15 million to $10 billion
  Average Assets: $675 million
  Type of Institutions:
    Commercial Banks: 44%
    Credit Unions: 45%
    Thrifts: 9%
  Geographic Locations: 37 States plus Puerto Rico and Virgin Islands

Model User Support Program
- Toll-free, phone-based user support (enter “yes” or “no”):
  Yes

- Hours during which phone support function operates:
  M–F 8:00 a.m.–6:00 p.m. Central Time

- Location(s) of the phone support function:
  Madison, WI

- Web-based user support (enter “yes” or “no”):
  Yes
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• Other support characteristics as deemed relevant:
  FARIN offers an on-line support site with FAQs, key assumption downloads and model upgrade links. Additionally, we provide both real-time and recorded education/support sessions for use in diagnosing common problems during off-hours.
  For complex problems, we offer remote desktop control services that will allow our support staff to take control of the user’s desktop to resolve and train on the situation or issue.
  Our user help system and knowledge base are Web-based and updated in real-time, allowing users access to the most up-to-date information and answers to issues.

2. MODEL INFORMATION

Model name:
  FARIN Foresight

• Level and Version:
  Version 5.2.8.5

• Last update:
  July, 2009

• Operating system(s) and other required software:
  Windows Vista, Windows XP or Windows 2000

Is a vendor-supplied outsource service using the model available?
  Yes, FARIN offers customized outsource options ranging from simple back-office assistance to complete outsource. Our outsource services can be used as a backstop to existing personnel or as a way to jump-start implementation while new staff is on the learning curve.

What other vendor-provided financial management products interface with the ALM model?
  Our iPrice Loan and Deposit Pricing system share many elements. Using our export function, many clients link to other programs such as cost accounting applications.

What is included in the vendor-provided model installation?
  Model installation includes database build with client interaction, initial load of 3–6 months of data, the creation of a base plan with cash flow validations, 2½ days of new user training in Madison, WI, basic model installation with client IT staff.

Does the vendor offer support beyond initial model installation in consulting or extended implementation assistance?
  Yes, FARIN can be engaged in many different capacities, including extended IT roles, as educational specialists for the ALCO and Board, as ALCO Advisors on strategy and risk and as an outsource of model installation (SaaS).
3. DATA EXTRACT AND INTAKE

Briefly describe the model’s intake processes for balance sheet data (e.g., general ledger, maturity, repricing information) from my existing data processor(s).

FARIN Foresight can accept many different file layouts to accomplish the task of interfacing application data to the ALM model. We look for common data on financial contracts such as maturity/repricing data, caps, repricing information, call data, etc., to accurately model the underlying cash flows of the instruments in the client’s database. If data is lacking in the underlying core system, FARIN Foresight can, with the proper information, help to create missing data from elements that are available. This flexibility helps make FARIN Foresight an efficient and accurate model to configure and maintain.

Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.).

FARIN Foresight can handle all types of instruments with differing cash flows. Each instrument is defined within the model based upon a set of cash-flow characteristics. These characteristics can control the incoming data, the newly originated data or both.

If the client wants to combine a series of accounts from the incoming data that has slightly different cash flows from the currently offered programs, the model will accept the cash-flow information from the incoming data file (example, balloon period, repricing margin, amortization schedule, etc.) and use them for existing data while new balances forecast in any plan will assume (“inherit”) the settings within the account setup.

FARIN Foresight allows an unlimited number of chart-of-account categories, nested as deep as necessary. Categories can have child categories and accounts, and those child categories can also have child categories and/or individual accounts.

Categories function like summary accounts. They will inherit many of the properties of typical accounts and some properties, like balance and budget values, will be available at the category level. Accounts holding more detailed data and modeling will be done at the account level.

Each institution chart maintains a list of special accounts that are used for model balancing and built-in ratios or features. These special accounts, with the exception of the balance sheet and income statement accounts, can be set by the user to be any account in the model chart.
4. CHART OF ACCOUNTS

Identify any special features and/or limitations of the model in its ability to model the balance sheet behaviors listed below:

- **Repricing and maturing balances for categories without embedded options**
  
  No limitations in modeling the most basic of instruments. These instruments have no options, therefore they reprice as cash flows occur or as contracts allow. Data provided on repricing from core systems will drive the specific future rate.

- **Interest rate adjusted repricing and maturing balances for categories that have continuous and call/put embedded options**

  Continuously callable instruments can be modeled in FARIN Foresight as a repricing instrument based upon contract provisions, with a separate final maturity date. The call function can be set to a specific strike price related to an index, or to a curve of rates where the model will review the remaining final maturity of the instrument, using current rate and determine if, based on the curve, the option has triggered a call event. Repricing, maturity and call events are spate items in FARIN Foresight and can be combined on any instrument as needed.

- **Repricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)**

  In FARIN Foresight, existing data has its own repricing information such as next reprice date, subsequent reprice frequency, rate index, margin, caps. This information is used on existing positions to determine rates. For planned purchases, the overall account characteristics define the basic structure, then assumptions on current rates, repricing rates, calls, etc., are handled as an assumption within the plan.

- **Repricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)**

  For the purposes of modeling indeterminate accounts, the client may elect to apply decay rates to create assumed “maturity structures” for valuing cash flows. However, repricing is a function that is controlled via assumptions on offer rates and will be applied to the entire balance in the period being analyzed. We have separated the assumed core deposit run-off from the projections of balance levels and allowed the user to control expected outcomes when forecasting income at risk and future balance levels.

Are there any limitations on automated control of pricing, repricing, caps/floors and teaser rates?

No
Can the model effectively amortize discounts/premiums?

Users have the ability to define the amortization of discounts or premiums on a straight line basis, level yield basis or with the projected cash flows of the associated balances. If the institution has a specific schedule to write down, the model accepts a “cash-flow definition” for the projected write-down by rate environment.

Can the model effectively address unique balance sheet items (e.g., mortgage servicing, off-balance-sheet positions)?

Modeling off-balance-sheet items is easy in FARIN Foresight. We have predefined a series of “standard” accounts that are typically used in financial institutions to speed the setup data input process.

FARIN Foresight contains specific modeling support for common derivative products such as IOs, POs, Swaps, Caps, Floors, Collars, Puts & Calls (both equity and interest rate). In addition to these derivative products, FARIN Foresight models the Mortgage Servicing assets when provided with the appropriate loan information on cash flows, rates, servicing spreads, etc.

5. PRICING/REPRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

How are contractual inputs (e.g., pricing spreads, repricing limits) entered?

Account-level pricing information can be entered by hand, through uploads or by creating a set of client-specific drivers.

How are interest rates and driver rates input and periodically updated?

All FARIN-supplied external rate drivers (over 150 driver rates) are updated via Web interface by a click of the mouse. User-defined rates must be entered by client.

How are pricing and repricing relationships defined and updated?

Pricing and repricing relationships must be handled in two discussions. First, for the existing contracts such as adjustable-rate loans we have two options. We either receive data on the loans in the import or we use “default” data in lieu of specifics from the processor. The specifics on the loans can be imported from the core system with specific repricing information on each loan regarding the index, spread, floor, cap, ceiling rates and dates or frequency of repricing. As for nonmaturity accounts, and for all new balances that are booked in a forecast, the relationships on offer rate can be set using a traditional spread/index relationship, or we can apply a formula using multiple factors to calculate a rate, or a specific rate may be entered. Additionally, trends/regressions on offer rates can be built with enough historical information. Assumption updates are dependent upon the method in use.
How does the model define investment or FHLB advances with puts or calls in the interest rate comparisons?

We store each investment or bond as a separate event with specifics on the put, call or comparison in that contract. These conditions are kept within the database so periodic updates can be done without having to re-enter these conditions, simply update balances.

How does the model define repricing and apply decay rates (or similar inputs) to core deposits by scenario, and how does it calculate present values?

Decay rates are stored by category and can be defined by rate change. Decay categories are then applied to the account as a characteristic of that account. Thus there are no limitations on how to define the impact of rate changes on decay functions.

Account repricing is controlled by forecast so clients may assess different pricing strategies to see the impact on earnings and value. These repricing assumptions can be any number of functions.

Assessing the present value in FARIN Foresight, we combine the projected cash flows using the decay rate, apply the appropriate interest rate for each scenario under consideration, plus any servicing cost adjustments applied by the client for recognition of cost. Then, using discounted cash flow analysis, we calculate the present value of the account.

How does the model intake and apply advanced rate ramps that test for basis risk and yield curve shape change?

We support direct links to McGuire Smart Ramps and Global Insight Rate Services, or the user may enter a specific set of driver rate movements over time. Our model also stores historical interest rates and allows users to use these past curves as a starting point to build a forecast for new rate levels. The old curves can be adjusted up or down to a new level to create a forecast. These projections can be put together in a forecast to create a rolling forecast of rate movements, thus providing a more realistic look at possible rate changes over time.

Describe the model’s analysis and reporting capabilities (IRR and other forecasts).

FARIN Foresight uses standard income simulation techniques to project the amount and timing of cash flows on all instruments, replacing runoff balances with client-controlled projections for future activities. The analysis horizon can be as short as 1 month and as long as 72 months. Results can be examined under any combination of interest rate projections or forecasts over the selected horizon, and various reports showing earnings at risk levels can be run to report risk levels.
In addition to the earnings at risk, we calculate value at risk using discounted cash flow analysis. This analysis can be run on current, past or projected future balance sheet positions. When running under a projected scenario, the model allows users to run a series of baseline interest rate projections that would occur during the forecast, then stresses those new rate levels to create a lattice of projected value-at-risk possibilities based upon possible interest rate movements. This process is called dynamic value at risk; it must be considered under multiple interest rate forecasts during the projection period to accurately assess all potential risks.

**Can the model export outputs and reports to spreadsheets or other products?**

All reports in our model can be exported to CSV files for use in any other application. In addition reports can be directly exported individually, or as a group, to Adobe PDF format for ease of report packet production.

**What internal liquidity analysis capabilities does the model have and can the model interface with typical internal liquidity and contingency funding spreadsheets?**

FARIN Foresight contains a liquidity report that is based on the projected sources and uses of funds in a plan. This approach helps identify key assumptions in managing liquidity levels and plan for stress tests on these assumptions to understand the implications of a missed projection. This reporting can include dynamic projections of external funding sources, stress test key assumptions such as deposit run-off or prepayment speed changes. These are typical adjustments and tests found in many contingency funding plans. Of course all outputs can be saved to formats compatible with external spreadsheets should the client prefer to use a different format or methodology.

**Does the model have stochastic forecasting capability and if so, describe it.**

Yes, as an advanced option (additional cost) clients may run on FARIN servers Monte Carlo Analysis. One way Monte Carlo Simulation can be used is to evaluate two different “What If” Forecasts. For example, say that the institution has two different choices, issuing the bulk of its mortgage loans as either fixed rate or adjustable rate. The Monte Carlo Method will more fully evaluate the two choices than a traditional static analysis can.

Monte Carlo Simulation can be used another way to predict the probability of some goal being achieved. For instance, the budget number for Net Income is $550,000. From the graph shown, this can be seen to be unlikely.

The user selects the forecast and set of output parameters desired. The user may also define the number of rate paths to run. Output is saved to a CSV file to make the output file results easy to manipulate in Excel.

As a part of the Monte Carlo engine, users may elect to run forecast market value calculations at the end of the forecast to test the long-term interest rate risk in the resulting strategies. This option helps to more fully assess the trade-off between income and value at risk in the different what-if scenarios.
To calculate market rate paths, the user selects a base Yield Curve. FARIN Foresight displays the estimated historical volatility for the selected Yield Curve over the selected number of historical periods. This is purely for informational purposes to help explain how history may or may not impact future volatility. The user is asked to supply a volatility level for the curve in the analysis.

Output from the model can display any information requested in the output metrics. The example in the graph shows the Net Income results from a 300 rate path run comparing net income levels to the 3-Month T-Bill rate.

Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

FARIN Foresight has the ability to use formulas to drive future projected balances and offering rates. These assumptions can be written to adjust levels based upon many different factors, including market interest rate levels.
6. FREE-FORM COMMENTS ON MODEL CAPABILITIES

Specify any unique advantages and benefits of your model as it would be implemented at this institution.

FARIN Foresight

The FARIN Foresight Asset/Liability Management model is independently certified to fully and accurately perform mandated regulatory analyses and reporting of interest rate risk for both income-at-risk and value-at-risk metrics. FARIN Foresight provides industry best practice functionality for institutions that aspire to use their ALM solution for more than basic regulatory compliance—for example, as a strategic business tool to optimize net interest margin, assess risk exposure and develop appropriate contingency funding plans for various forecasted economic environments.

FARIN Foresight provides tremendous flexibility in tailoring a system to fit your unique needs. An unlimited, intuitive and highly adaptive chart of accounts can be maintained, thus supporting a variety of important financial management activities such as forecasting, budgeting or regulatory analysis. FARIN Foresight’s extensive features substantially improve productivity and decision processes.

The model allows institutions to meet specific ALCO objectives by providing:

- Income and Market Value (NEV) calculations
- Simulation of interest rate shocks, ramps and yield curve twists
- Complete, meaningful and understandable reports that are supported by thorough, in-depth analytics and communicate all risks in the ALCO process
- Cash flow projections at detailed or summary level for easy update
- Branch or entity-level reporting for accountability and performance
- Numerous options for use of historical data in projections and reporting of financial performance trends
- Full IRR analysis supporting both current and future views of your risk position
- Comprehensive budgeting features
- Graphing capabilities to help you quickly transform outputs into actionable decisions

FARIN Foresight provides a framework to test countless interest rate scenarios and strategy combinations, showing the Institution the impact of individual components as well as the entire balance sheet and income statement. In addition to the Asset/Liability components, FARIN Foresight offers full budgeting and planning support as budgets are typically a sub-set of the income forecasts used for ALM.

FARIN is committed to ensuring that an investment in FARIN Foresight earns a real return for an institution in its compliance, knowledge and decision-making processes. When you contract with FARIN, you benefit not only from a quality product, but also from the experience of our people. FARIN staff is composed of former CEOs, ALCO members, controllers and financial analysts who understand both our products and your business. In other words, FARIN understands the needs and pressures of your work life, and we are here to make certain that FARIN Foresight becomes a valuable, indispensable asset for you and your team.
FARIN Insight

A growing trend in ALM is the use of an outsource provider for ALM services. To meet this need, we offer a complete outsourced ALM service, FARIN Insight™. FARIN Insight provides the convenience and cost savings of a Web-based application with FARIN’s expertise to deliver a powerful asset/liability management process solution. FARIN Insight allows you to build a set of outsource services and reports as you would for an in-house solution. No compromises are required, and you get the custom solution you need for effective decision making and regulatory reporting.

FARIN Insight allows you to securely access your model from virtually anywhere there is an available Internet connection and Web browser. FARIN Insight requires no user-installed software and thus no license purchase or ongoing maintenance and upgrade fees.

With FARIN Insight, you get a fully outsourced solution that eliminates the cost and concerns associated with running an in-house ALM process. FARIN Insight utilizes the FARIN Foresight ALM model with our staff acting as your back-office. With FARIN Insight, you can take on the parts of the ALM process you feel equipped to handle, and you can have FARIN fill in the rest.

FARIN Insight provides industry best practice functionality for institutions that aspire to use their ALM solution for more than basic regulatory compliance—for example, as a strategic business tool to optimize net interest margin, assess risk exposure and develop appropriate contingency funding plans for various forecasted economic environments.

Services are tailored to meet your specific ALCO objectives and may include:

- Proper analysis framework to capture and assess various risks in the ALM process, including interest rate risk, option risk, basis risk and liquidity risk. Precision database construction significantly enhances the reliability and decision-making quality of the analysis and reporting.

- Regular updates of financial data, key assumptions and current estimates of future interest rates. Data must be kept current and capture the changing operating environment to provide the best assessment of risk and opportunities in your institution.

- Use of proven, time-tested modeling tools to assess future risks in uncertain interest rate scenarios. Planning for the future makes ALCO a proactive process for decision making.

- Complete, meaningful and understandable management reports that present findings and results for key current and forecasted financial indicators. Complete reporting allows for informed decision making in the ALCO and boardroom.

- Regular educational and/or consultative assistance for the growth of ALCO personnel. Staying current on ALM issues is an industry best practice and helps to ensure that the evolving market won’t catch you off guard.
1. GENERAL INFORMATION

Vendor Contact information:
Randall Corwin, Sr. V. P. and Sales Manager
FIMAC Solutions, LLC
3300 E. First Ave., Suite 280
Denver, CO 80206
Phone: 1-303-320-1900, Ext. 739
E-mail: rcorwin@fimacsolutions.com
Web: www.fimacsolutions.com

Describe current client base:
• Number of clients:
  350 ALM/IRR users plus users of our other risk management based software products.
• Client characteristics as deemed relevant:
  Clients range from small CUs to top 100 banks.

Model User Support Program
• Toll-free, phone-based user support (enter “yes” or “no”):
  Yes
• Hours during which phone support function operates:
  M–F 7:00 a.m.–5:30 p.m. mountain time
• Location(s) of the phone support function:
  Denver, CO
• Web-based user support (enter “yes” or “no”):
  Yes
• Other support characteristics as deemed relevant:
  Assigned Relationship Manager
2. MODEL INFORMATION

Model name: Risk Analytics® ALM Model® and A/L Reporter®

- Level and Version:
  always current as operated in SAAS format.

- Last update:
  Weekly

- Operating system(s) and other required software:
  PC with Windows 2003 or higher.

Is a vendor-supplied outsource service using the model available?
  Risk Analytics ALM model—No; A/L Reporter—Yes

What other vendor-provided financial management products interface with the ALM model?
  Balance Sheet Manager module for “what-if” scenarios available for the Risk Analytics ALM Model.
  Leading Light Budget© software

What is included in the vendor-provided model installation?
  Data conversion install with core processor, initial model mapping and set-up, operator training.

Does the vendor offer support beyond initial model installation in consulting or extended implementation assistance?
  Absolutely.

3. DATA EXTRACT AND INTAKE

Briefly describe the model’s intake processes for balance sheet data (e.g., general ledger, maturity, repricing information) from my existing data processor(s).
  For the Risk Analytics® ALM Model®, available data is extracted at the instrument level from the core system and loaded into our Data Capture© desktop-resident software for transmission to the processing servers. A/L Reporter© clients may use Data Capture© or send manual input.

Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.).
  Mapping fields are sufficiently available to map at the micro or macro aggregation levels as relates to category-level output.
4. CHART OF ACCOUNTS

Identify any special features and/or limitations of the model in its ability to model the balance sheet behaviors listed below:

- Repricing and maturing balances for categories without embedded options
  Full capabilities.
- Interest rate adjusted repricing and maturing balances for categories that have continuous and call/put embedded options
  Full capabilities.
- Repricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
  Full capabilities.
- Repricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit and credit card outstandings)
  User sets defined decay/repricing volumes or rates, prepayment/withdrawal speeds. Multiple decaying balances scenarios are conducted in Balance Sheet Manager.

Are there any limitations on automated control of pricing, repricing, caps/floors and teaser rates?
No

Can the model effectively amortize discounts/premiums?
Yes

Can the model effectively address unique balance sheet items (e.g., mortgage servicing, off-balance-sheet positions)?
The models do not calculate OBS positions within the models themselves, but rather accept outside calculations for netting purposes.

5. PRICING/REPRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

How are contractual inputs (e.g., pricing spreads, repricing limits) entered?
By user—one-time entry until modified, as both models hold assumptions until changed. Various account types have various input formats. Floors, caps, interim caps, up/down rate movements, etc., may all be embedded.
How are interest rates and driver rates input and periodically updated?

Internal rate charts and external curves are utilized.

How are pricing and repricing relationships defined and updated?

Defined by current internal and global rate charts. Updated at each model run with global rates charges automatically embedded within the software as updated continually.

How does the model define investment or FHLB advances with puts or calls in the interest rate comparisons?

Optionality considered.

How does the model define repricing and apply decay rates (or similar inputs) to core deposits by scenario, and how does it calculate present values?

User defined. PVE is calculated considering all cash flows, optionality and the current rate environment.

How does the model intake and apply advanced rate ramps that test for basis risk and yield curve shape change?

Conducted within our Balance Sheet Manager module from static rate environment balance sheet modeled data. Ramps, twists, curves, etc., can then be conducted instantaneously. User defines the scenarios.

Describe the model’s analysis and reporting capabilities (IRR and other forecasts).

Models conduct eight rate shock scenarios. With Balance Sheet Manager, unlimited scenarios may be conducted.

Can the model export outputs and reports to spreadsheets or other products?

Partially.

What internal liquidity analysis capabilities does the model have and can the model interface with typical internal liquidity and contingency funding spreadsheets?

A/L Reporter© has limited capabilities, while Risk Analytics® ALM Model© has a full liquidity analysis section. Neither model will interface with competitors’ software.

Does the model have stochastic forecasting capability and if so, describe it.

No.
Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

Yes.

6. FREE-FORM COMMENTS ON MODEL CAPABILITIES

Specify any unique advantages and benefits of your model as it would be implemented at this institution.

The Risk Analytics® ALM Model© is a SAAS style platform requiring no large initial investment and is offered by subscription usage. The client drives the model while processing on our servers. Our models (including A/L Reporter©) offer instrument-level modeling of all assets and liabilities, including by specific CUSIP for all bond holdings. Upon receipt of data into our servers, price and cash flow data is then pulled from our acquired nationally recognized data bases to fold in indicative data on all CUSIPs under each chosen rate shock level. This provides, at no additional cost, full and accurate modeling of a large portion of the balance sheet that is customarily not modeled correctly.

Our models are dynamic income simulation and economic value models that do not use duration estimation. Driven at the instrument level, we provide the highest degree of accuracy available. Delivered with model output are a Backtesting Report and a Variance Report. Annually an FAS 107 report is also produced and delivered to the client as an included benefit within the usage agreement.

The models utilize an immediate and parallel rate methodology at first processing. The Balance Sheet Manager© may be utilized to conduct unlimited instantaneous “what-if” scenario modeling. Anything on the balance sheet, as well underlying assumptions, may be changed. Scenarios such as ramps, twists, curves, modified optionality, changing NMD behavior, etc., may also be modeled. No other system can compete with our speed.

Our output sections include: an easy-to-read and understand Executive Summary with plenty of graphics; Balance Sheet analysis; Income Statement analysis; GAP reports; investment analysis; capital and liquidity; assumptions. Complementing the basic output report are two supplemental reports: Summary and Detail. Additionally, a Variance Report and a Backtesting Report are included in each model run. Subscriptions are available for either quarterly or monthly model runs.

At FIMAC Solutions, LLC, we pride ourselves on providing the finest customer service and support in the industry. After initial fees, we train, at no additional cost, until the client is comfortable. Pick your price and level of service. No software to purchase, but not a service bureau either—you have control.
1. GENERAL INFORMATION

Vendor Contact information:
ProfitStars—a Jack Henry Company
2110 Papillion Parkway, Suite 110
Omaha, NE 68164
Phone: 1-800-356-9099
Fax: 402-431-8822
Web: www.profitstars.com

Describe current client base:
• Number of clients:
  1881 PROFITstar ALM clients as of 04/30/09
• Client characteristics as deemed relevant:
  Community Banks and Credit Unions across the United States, as well as Canada, Guam and the Caribbean, ranging in asset size from $20M to $24B.

Model User Support Program
• Toll-free, phone-based user support (enter “yes” or “no”):
  Yes
• Hours during which phone support function operates:
  M–Th 7:30 a.m.–6:30 p.m. CST
  F 7:30 a.m.–5:00 p.m. CST
• Location(s) of the phone support function
  ProfitStars Omaha, NE, location
• Web-based user support (enter “yes” or “no”):
  Yes. Online Help and FAQs are available as well as the capability of Web-based support sessions with Client Support
• Other support characteristics as deemed relevant:
2. MODEL INFORMATION

Model name:
PROFITstar Classic

- Level and Version:
  2008a.117
- Last update:
  04/24/2009
- Operating system(s) and other required software:
  Windows 2000, 2003, XP Professional, Vista

Is a vendor-supplied outsource service using the model available?
Yes

What other vendor-provided financial management products interface with the ALM model?
Budget Manager (allows for distributed budgeting to branch/cost center managers and others supplying input to the budget process), PROFITstar Portfolio (for CUSIP-level modeling of Investments and Borrowings), PROFITability (Organizational and Product dimension modeling and analysis of FTP and allocations), RPM (Customer Profitability).

What is included in the vendor-provided model installation?
Installation includes building a custom chart of accounts and download setup specific to the institution. The install is completed by our Client Support prior to training on the model. We offer initial Basic Training on the model either in a classroom setting or one-on-one. Additional training/consulting is available through workshops, client conferences, users’ groups and webinars, as well as individual training either face-to-face or via the Web.

Does the vendor offer support beyond initial model installation in consulting or extended implementation assistance?
Yes, we offer model training as well as consulting on an ongoing basis. Client Support assistance is also available following the installation. Each client is assigned a specific point of contact. That Client Support representative works in a team environment so that team members are available for backup.
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

3. DATA EXTRACT AND INTAKE

Briefly describe the model's intake processes for balance sheet data (e.g., general ledger, maturity, repricing information) from my existing data processor(s).

PROFILEstar ALM is able to interface with any core provider that can export data in ASCII file format.

Briefly describe the model's process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.).

The PROFITstar ALM Chart of Accounts is broken out to the level of detail requested by the client. The model can utilize multiple fields from the core file (including but not limited to: Type Code, Class Code, Collateral Code, Fxd/Var Indicator) in order to provide additional breakout. The client is provided with a detailed listing of data requirements and fields needed to provide appropriate modeling of amortization, repricing characteristics and limits, participations, embedded options, etc.

Files that can be imported into the model include:
General Ledger, Loans, Investments, Investment Cash Flow, Deposits, Borrowings and Statistics

The user is also able to manually input any data not available from an import file as well as adjust downloaded data if necessary.

4. CHART OF ACCOUNTS

Identify any special features and/or limitations of the model in its ability to model the balance sheet behaviors listed below:

- Repricing and maturing balances for categories without embedded options
  Done based on information provided in the application file download.

- Interest rate adjusted repricing and maturing balances for categories that have continuous and call/put embedded options
  Done using PROFITstar Portfolio, which allows for CUSIP-level modeling/analysis of investments.

- Repricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
  Done using information provided in the application file along with key rate ties for existing volume and projected new volume.
Choosing the Right Asset/Liability Management Model and Keeping It Verified!

- Repricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)
  Modeled using core/non-core and decay rates or other distribution techniques available in PROFITstar ALM.

Are there any limitations on automated control of pricing, repricing, caps/floors and teaser rates?
  Ceilings and floors can be imported on existing volume as long as those data items are included in the file. Ceilings/floors can also be set up on new volume at the chart of account level. Teaser rates are modeled using key rate ties.

Can the model effectively amortize discounts/premiums?
  Done using PROFITstar Portfolio, which allows for CUSIP-level modeling/analysis of investments.

Can the model effectively address unique balance sheet items (e.g., mortgage servicing, off-balance-sheet positions)?
  Static servicing costs can be modeled at the chart of account level. Other off-balance-sheet items can be stored in PROFITstar ALM’s Databank and used in formulas and reporting.

5. PRICING/REPRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

How are contractual inputs (e.g., pricing spreads, repricing limits) entered?
  Through the monthly import process as long as that data is provided in the file.

How are interest rates and driver rates input and periodically updated?
  Key Driver Rates—Import as part of the monthly update process
  Portfolio Rates—Weighted average rate imports at the chart level on a monthly basis
  Offering Rates—Manual adjustment of any rates that have changed since the previous month

How are pricing and repricing relationships defined and updated?
  Key rate ties can be set up at the chart of account level. Key rates such as Prime and Treasury rates are downloaded each month from our Web site as part of the monthly update process.

How does the model define investment or FHLB advances with puts or calls in the interest rate comparisons?
  PROFITstar Portfolio allows for analysis of the effect of rate changes at the account (CUSIP) level for investments and borrowings.
How does the model define repricing and apply decay rates (or similar inputs) to core deposits by scenario, and how does it calculate present values?

Decay rates are set up at the chart of account level for Flat scenario as well as +/- 100, 200, 300 BP. For present value calculations, core and non-core deposits are discounted to determine value.

How does the model intake and apply advanced rate ramps that test for basis risk and yield curve shape change?

The user is able to model rate ramps and yield curve twists in PROFITstar ALM. A yield curve twist projection wizard is available to take the user through the setup of yield curve twists.

Describe the model’s analysis and reporting capabilities (IRR and other forecasts).

Interest Rate Risk and Valuation Risk calculations allow the user to customize rate scenarios, ramping and rate shock delay as well as compare the impact of the shocks on various what-if scenarios. Reporting can be done at a high level (matrix showing results by rate scenario) as well as at a very detailed level (documentation reports of the impact of the shock by rate scenario and time frame for each chart of account item).

Can the model export outputs and reports to spreadsheets or other products?

Export options in reporting include: PDF, HTML, text, comma delimited.

What internal liquidity analysis capabilities does the model have and can the model interface with typical internal liquidity and contingency funding spreadsheets?

The PROFITstar ALM model contains a custom Report Writer. Liquidity Analysis Reports can be built within the report writer.

Does the model have stochastic forecasting capability and if so, describe it.

N/A

Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

Users can choose to use provided prepayment/decay tables or create their own user-defined tables.
6. FREE-FORM COMMENTS ON MODEL CAPABILITIES

Specify any unique advantages and benefits of your model as it would be implemented at this institution.

In multiple industry surveys, PROFITstar has consistently been rated as the most “user friendly” model on the market. Feedback we get from previous users of other ALM systems tells us that PROFITstar is much easier to use for modeling what-if scenarios and for reporting capabilities, while offering the same or better functionality than their previous model. PROFITstar also seamlessly integrates with the ProfitStars Organizational and Product profitability system, PROFITability®. PROFITstar is the only ALM software on the market that utilizes a common database platform to share data between ALM, Budgeting, Financial Reporting and Profitability Analysis. Although the PROFITstar model has evolved over the years to accommodate the needs of our customers and regulators, it is one of the few models in the industry that has retained its core functionality that has been so popular with financial managers.