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

By William J. McGuire, Ph.D.

Fifth Edition
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A special thanks to our eleven sponsors without whom this publication would not have been possible:

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Thank You to Our Author

Many thanks to Bill McGuire, a contributing author, frequent speaker, superb educator, and good friend of FMS for over twenty five years.
Welcome to our Fifth Edition

Dear ALM Specialist:

As the leading provider of asset/liability management education and information for financial institutions, FMS is often asked to provide guidance and insight to institutions that need to purchase or upgrade an asset liability modeling solution.

In response to those requests, in four previous editions, we have partnered with one of the industry’s leading ALM authorities, Bill McGuire, PhD. and President/CEO of McGuire Performance Solutions, Inc., to create a tool to be used for choosing the right in-house model for your institution.

In this, our 5th edition, we have expanded the publication’s scope and address not only in-house models, but also outsourced solutions and the increasingly important area of model risk assessments — validation and verification services.

So, whether you are just beginning your search for an ALM solution, considering changing either your in-house or outsourced provider, or considering a shift from in-house to outsourced, or vice versa, this book will provide you with valuable guidance. In addition, given the regulatory demands regarding model risk assessment, it provides excellent insight on what to look for in validation services.

We are extremely grateful to the eleven ALM vendors who have supported our goal to provide valuable information to the industry, and appreciate their willingness to co-sponsor this publication. They are: ALM First, Inc.; The Baker Group, LP; Farin & Associates, Inc.; McGladrey LLP; McGuire Performance Solutions; Profitstars®; R2 Metrics; Stern Agee & Leach; Velligan/Blaxall, LLP; Vining Sparks; and ZM Financial Systems, Inc.

Finally, I’d be remiss if I did not thank Tracy Dagnon of my staff for the excellent work she performed on the design, layout and production of this work.

Sincerely,

Richard A. Yingst
President/CEO
Financial Managers Society, Inc.
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- Ready availability of IRR rate test scenarios and interest rate forecasts
- Equity-at-risk analyses
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- ALM First Financial Advisors, LLC
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About the Author

William J. McGuire, Ph.D.
President and CEO of McGuire Performance Solutions, Inc.

Dr. McGuire brings over 30 years of industry experience to the issue of choosing the right ALM model. He 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 earnings potential. Dr. McGuire is widely published in the area of ALM, is a frequent speaker at industry forums and serves on the faculty for the ABA Stonier National Graduate School of Banking.

Dr. McGuire is President and CEO of McGuire Performance Solutions, Inc. (MPS), a national consulting firm. Dr. McGuire founded MPS in 1995. MPS provides innovative technical solutions for balance sheet performance and risk management in financial institutions. In addition to ongoing technical and consulting services, MPS provides strategic direction, services development, and management expertise to institutions worldwide.

MPS services include validations of ALM models and other advanced financial analysis tools; statistical analyses of core deposit supply, re-pricing and value behaviors; analyses of loan prepayments and pay downs; and quantitative credit risk assessments. MPS also provides high-precision compliance solutions for core deposit intangible (CDI), CD and loan valuations relating to acquisition accounting and goodwill/CDI impairment testing. In addition, it provides specialized resources such as regulatory agency education programs and expert witness testimony.

Prior to starting MPS, Dr. McGuire was a Senior Vice President at the Sendero Corporation. There he had management responsibility for the Sendero service bureau, client support, and the Sendero Institute, and served on the firm’s senior management team. Before joining Sendero, he was a founder and president of Performance Analysis, Inc., a Cincinnati-based provider of IRR and CRA service bureau reports. That company was sold to Fiserv Inc., parent of Sendero, in mid-1992.

Dr. McGuire was a Vice President at the Federal Home Loan Bank of Cincinnati from 1987 to 1992. While at the Bank, he served as a member of senior staff, ran the Bank’s IRR service bureau operations, and planned and participated in numerous educational and training sessions. Dr. McGuire also contributed to several regulatory initiatives, including a leadership role in the task force that designed the thrift industry’s groundbreaking IRR requirement, Thrift Bulletin-13.

Prior to joining the FHLB, Dr. McGuire taught finance and economics at the university level.

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. is the only individual membership society exclusively serving financial executives, auditors, and risk managers from commercial banks, savings banks, thrifts and credit unions nationally.

FMS members are over 1,400 CFOs, controllers, CEOs, COOs, treasurers, investment officers, internal auditors, and risk managers from depository institutions of all sizes. In addition, nearly 175 vendors who provide products and services to the industry are enrolled as affiliate members of the Society.

FMS' mission is to enhance the professional development of financial personnel within the industry. We accomplish that through a wide array of printed and online publications, such as this one, by offering over 60 educational programs each year, and by maintaining extensive networking opportunities on a local, regional and national level.

Since FMS is not an advocacy group, and thus does not engage in any type of political or legislative lobbying, we are free to concentrate on our core mission: providing targeted education and unbiased information to the professionals in our membership and others throughout the industry.
Preface to the 5th Edition

Asset/liability management (ALM) is an expected component of financial institution performance analysis and risk control. This has come about because ALM provides a powerful context for conceptually understanding the balance sheet behaviors that drive performance and risk and supports more intelligent financial management. Regulators and financial markets recognize the value of robust ALM activity and incorporate ALM-related performance and risk measures into their evaluation criteria. Thus, the benefits of a successful ALM solution have never been clearer.

A handicap for many smaller or otherwise budget constrained institutions to effectively apply modern ALM techniques is that they often do not have timely measures of current or future balance sheet outcomes. This results in not only lost earnings opportunities, but also possible risk exposures.

Fortunately, there are solutions. Cost-effective ALM simulation models are available that meet the performance and risk analysis needs of almost every financial institution. Every institution can now have a model-based quantitative foundation required for a successful solution. On the other hand, cost-effective solutions that meet the earnings at risk and equity at risk analysis needs of an institution are also available through third party outsource providers. Thus, every institution now has a choice, depending on needs, ALM culture, staffing, and budget.

This publication provides guidelines for both choosing the right ALM in-house model and the right IRR analysis outsource provider and ensuring their ongoing accuracy. It employs both conceptual and practical perspectives to examine salient issues. It is divided into two parts:

**Part 1** develops a general framework for determining an appropriate in-house model. Key concepts to understand, questions to ask, and features to review are presented, and decision aids are provided to assist in your evaluations. Guidance on validating and verifying the model is provided, and leading ALM vendors and consultants provide descriptions of specific ALM models and services, and risk assessment services for review and reference. Finally, in Appendix A, a sample ALM Model Request for Proposal is presented.

**Part 2** offers a general framework for determining whether outsourcing your model solution is a correct choice. Key concepts to understand, questions to ask, and features to review when considering an outsourced IRR analysis solution provider are presented, and again, guidance on validating and verifying models is provided. Leading ALM outsourcing providers and risk assessment providers and consultants provide descriptions of their services for review and reference. Finally, in Appendix B a sample outsourced IRR analysis service request for proposal is presented.
A Framework for Choosing the Right Level of ALM Model

Deciding whether to acquire an ALM model and how powerful of a model to choose is fundamentally a capital budgeting decision. The same benefit versus cost methodology governing the choice of a new core processing system, for example, applies. The 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 us begin looking at how to choose the right level of ALM model (i.e., how powerful it is) by developing a conceptual decision framework. This establishes the global 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 a specific ALM model.

**ALM Model Benefits**

The benefits of an ALM model emanate from its ability to quantify existing balance sheet holdings and forecast future earnings and value in a timely fashion. This translates into enhanced earnings performance — directly from better financial decision-making, and indirectly from enhanced regulatory compliance.

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 missing earnings opportunities or encountering unexpected risks.

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

On a day-to-day basis, the earnings advantage of an effective ALM model stems from a more precise understanding of fundamental balance sheet earnings potential and interest rate risk positions, as well as better-quantified capital and liquidity risk positions. This knowledge empowers management to avoid unduly conservative balance sheet holdings that limit earnings and more readily demonstrates regulatory compliance — lowering costs.

Over the longer term, effectively using an ALM model strengthens management’s understanding of balance sheet behaviors and their associated performance opportunities and risks, leading, over time, to better financial decision-making and greater earnings.

Multiple factors 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 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 capital exposures look like.

---

1 Note that “buying” an ALM model can be accomplished in two ways. The first is the purchase of an in-house or internet-based system run by the institution. The second is to acquire ALM modeling services through an outsourcing arrangement with a third party, who may be the model vendor. The concept of the right model is the same in either case, but there are key differences in many other ways.
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 earnings. Precise management and control of balance sheet outcomes thus become key priorities and key 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 earnings and value related interest rate related sensitivities increases with greater levels of IRR, and when multiple IRR influences are present 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.

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. 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, a metric under increased regulatory scrutiny.

Institution financial decision-making style is also an influence on the level of ALM 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 current possible alternate 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 the Board.

Institution ALM-related culture is also an influence on ALM model benefits. When upper management and the Board understand and trust model outputs as a basis for financial decision-making, ALM models make significant earnings enhancement and risk control contributions. On the other hand, when the model is inappropriately viewed as just an expense or as a regulatory mandate without business value, benefits are constrained to well below their potential.

Regulatory compliance is a significant ALM model benefit. As a general rule, regulatory-related ALM model requirements are a subset of normal business needs (that is, business and regulatory ALM model benefits often strongly coincide). Examiners look for an ALM model that is appropriate in light of the institution’s balance sheet size and complexity, capitalization, IRR and liquidity positions, and its general management style. An exception to this practice may occur when an institution is deemed to be at high risk or already 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 current and future balance sheet earnings and value, and all associated risks, are more valuable to the user. Having a balance sheet “speedometer” is more important when you want to precisely match performance to an appropriate speed level!

As noted in Exhibit 1, expected benefits from an ALM model increase quickly as basic financial management decision and regulatory needs are linked to modeling activities and better management inputs are produced. Not surprisingly, benefits increase more slowly as the model addresses less vital business and regulatory needs, and 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 level 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. If most marks are on the left side, under the “Lower ALM model benefits” heading, this implies relatively limited benefits. A preponderance of marks in the “Higher ALM model benefits” segment (i.e., to the right of center) indicates significant ALM model benefits.
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
### 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>ALM Model Benefits</th>
<th>Lower</th>
<th>Mid-level</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Capital Leverage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10% K/A</td>
<td></td>
<td>Less than 6% K/A</td>
<td></td>
</tr>
<tr>
<td><strong>2. Level of Overall Margin (Income - Expense)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significantly less than peer group</td>
<td></td>
<td>Significantly higher than peer group</td>
<td></td>
</tr>
<tr>
<td><strong>3. Interest Rate Risk Indicators</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Repricing Mismatch</td>
<td></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>
<td></td>
</tr>
<tr>
<td>• Maturity Mismatch</td>
<td></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>
<td></td>
</tr>
<tr>
<td>• Driver (Repricing) Rate Mismatch</td>
<td></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>
<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>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></td>
<td>Liquidity ratio significantly higher than peer group</td>
</tr>
<tr>
<td><strong>5. Management and Board Decision Style</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-interventionist 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)
Choosing the Right Asset/Liability Management Model Solution and Keeping It Accurate!

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 us 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 and not so easily valued. 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 model (how fundamentally powerful it is); model options specified; installation activities (setting up the model so it technically functions); implementation activities (customizing the model to match your institution); behavior assumption service fees (e.g., for prepayment and core deposit inputs); one-time investments to integrate the model into your ALM process solution, ongoing user-related costs (time running the model, training, etc.); and annual maintenance fees.

As a rule, all-in ALM model costs normally increase 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.

Multiple factors define expected ALM model all-in costs. 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. Model options and add-on services add to this total.

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 be readily monetized, but be sure to include the indirect costs of your search time and user orientation. A significant outlay of 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 purely technical sense. This includes (1) setting up, defining and auditing data extract capabilities; (2) designing a chart of accounts (the asset and liability categories to be modeled) that properly reflects your institution’s balance sheet; (3) populating the chart of accounts with category-level definitions and contractual inputs that reflect specific underlying balance sheet contracts; (4) specifying approximation level behavior inputs (e.g., for loan prepayments and core deposits); (5) initial test runs of the model; and (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 model installations, but most can now be 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 customizes every facet of the model to your specific situation. A key element in this is to ensure that loan prepayments (contractual maturity loans), loan payoffs (indeterminate maturity loans), core deposit supply, re-pricing, decay rates, CD options (such as bump up outcomes), and CD early withdrawal inputs reflect your institution’s specific experience. Best practice behavior inputs are forecasts based on statistically quantified recent institution history. Custom peer behavior data, available now for both loans and core deposits, may be applicable in some cases.
EXHIBIT 3: ALM Model Costs

- Up-front costs can be significant
- Costs of an ALM model
- Increasing model capabilities are exponentially more costly to implement, maintain and use
- Higher Level (More Powerful) ALM Model
- Initial outlay
- Installation costs
- Implementation costs
- Behavior assumption service fees
- Ongoing operating costs
- Maintenance fees
The model implementation also 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 standard and special analyses, sensitivity and stress testing, model outcomes/behavior assumption back tests, business planning, and liquidity model interface). It also includes defining efficient routines for running the model, establishing the model control environment, setting procedures for periodic independent third party 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 keenly 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 third-party vendor costs are involved, however, institutions still have the indirect costs of developing in-house estimates of ALM model 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 and for its annual ALM function review are also factors. Periodic independent verification of ALM model accuracy is a further cost element (see discussion of this in “Periodic ALM Model Risk Assessment” below).

Model complexity is a primary driver of ongoing use-related costs. The level of cost is determined by your institution’s balance sheet size and complexity (e.g., a larger chart of accounts with numerous option behaviors or a large core deposit base requires a more highly specialized, and in most cases, 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 analyses).

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. Some of those costs can be minimized by a strong model control environment, but ease of performing user activities varies significantly among models. Carefully assess this often overlooked but potentially important cost issue during the search process. If incremental hiring of highly specialized ALM staff is needed, that is obviously another cost to include.

**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 and provides access to model specific technical expertise. Thus, a recommendation: Stay current on model maintenance as long as your institution uses its ALM model.

**Influence of your institution’s ALM culture** can affect all-in ALM model costs just as it affects model benefits.

When upper management and the Board understand and trust model outputs as financial decision making inputs, ALM model functions run more smoothly, and thus at lower cost. This is often because adequate staff and resources are more likely to be dedicated to the ALM modeling area (an area of current concern in many institutions). 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 purely regulatory mandate without real value, modeling is a chore. Lack of model buy-in leads to higher costs across the board as everyone just goes through the motions in a hostile climate.

While there is no way to define a final quantitative ALM model cost value, good insights can be derived from the points...
noted above. Exhibit 4 provides a checklist for qualitatively ascertaining your institution’s expected ALM model costs. Examine each point and “grade” your situation. A preponderance of marks in one portion of the scales indicates the expected general cost level of an ALM model for your institution.

**Comparison of Benefits and Costs of ALM Models**

When is cost too high to justify buying a model? That depends on the net of benefits versus costs.

Exhibit 5 combines the benefit and cost relationships depicted in Exhibits 1 and 3. Before point A, an ALM model is not justifiable because total all-in costs are greater than total benefits. Beyond point C, a higher-level ALM model or further model options are not justifiable because costs exceed obtainable benefits.

Simple “yes or no” situations such as A or C are rare. The question confronting decision makers is most often 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 to first establish the fundamental advantages of having any ALM model (that is, rule out being before point A). Then sequentially compare the extra benefits derived from higher-level (more powerful and complex) models or model options to their incremental all-in costs. The best ALM model for your institution lies where increases in the all-in costs related to adding more model power just begin to overtake increases in all-in benefits associated with the 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.

**Levels of ALM Models**

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

**Entry-level ALM models** are the simplest of ALM solutions. They provide basic 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., CMO’s, callable investments or convertible FHLB advances). They generally have fundamental limitations (the chart of accounts may be limited in size) and core deposit behavior modeling is usually weak. 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. In addition, intermediate level ALM models can now often be upgraded in key areas, such as record level processing (which in prior years was available only on advanced level models). Since this class of model has remained roughly constant in price, a significant gain in their innate benefit-to-cost ratios has taken place.

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

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 yield curve shape change IRR analysis capability) can mandate a more powerful model.

**Advanced level ALM models** are the 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
EXHIBIT 4: 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>Lower ALM model costs</th>
<th>Mid-level ALM model costs</th>
<th>Higher ALM model costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Initial Outlay Required</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry-level ALM models</td>
<td>Advanced-level ALM models</td>
<td></td>
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<tr>
<td><strong>2. Installation Requirements</strong></td>
<td></td>
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</tr>
<tr>
<td>Simple model and simple balance sheet</td>
<td>Advanced model and/or very complex balance sheet</td>
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<tr>
<td><strong>3. Implementation Requirements</strong></td>
<td></td>
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<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>
<td></td>
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<tr>
<td><strong>4. Behavior Assumption Service Fees</strong></td>
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<tr>
<td>Few options and less than 10% core deposits</td>
<td>Many options, derivative instruments and more than 40% core deposits</td>
<td></td>
</tr>
</tbody>
</table>

Continued on next page
EXHIBIT 4: ALM Model Costs Self-Grading Checklist

(Continued)

5. Ongoing Operating Costs

- Simple model, easy to use
  model, simple balance
  sheet, limited types of
  model applications

- Advanced model, specialized
  users required, very complex
  balance sheet, broad range
  of model applications

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)
other advanced features justify their 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 models for assessing performance and risk for mortgage pipelines, mortgage servicing rights, derivative instruments and value at risk (VaR) are now common where required by business models or institution size. Models combining both prepayments and credit risk inputs are also now seen, as are those that test for other than temporary impairment (OTTI). However, such models are still rare unless required for special applications, and are noted here just for reference.

By following the benefit versus cost principles above, you will significantly narrow your model choice process, and its cost, because models that are either underpowered or overpowered are ruled out for further review. However, there are two final issues to consider before moving on to vendor model selection.

**The Broader Context of ALM Models**

Choosing the right ALM model is the first step toward success. The full balance sheet management and risk control value of an ALM model will only be apparent when it is fully implemented in your institution’s overall ALM process solution.

Exhibit 6 illustrates the summary elements of a “data-to-decisions” ALM process solution. Success starts in element 1 with...
the right ALM model, its implementation and supporting model control environment. 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 surrounding 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 manner.

The sum is much more than the parts. ALCO, senior management and the Board are now fully empowered with timely, quantitative insights into the future performance and risk potential of the institution. These advantages lead to a key suggestion: Use the data-to-decisions ALM process solution as your ultimate goal when choosing an ALM model. With that broader perspective, ALM model features and their benefits are highlighted as to their importance and can be better specified to support your success.
Review Elements for Choosing the Right ALM Model

Once the general level of your ALM model is determined, you can assemble the specific set of ALM models to evaluate. The best place to start your list is in the “In-House Model Vendors’ Responses to FMS Questions and Open-ended Descriptions” section later in Part 1. There you will find information from our sponsor vendors.

**ALM Model Selection Criteria: General Requirements**

Before you begin examining ALM models, use Exhibit 7 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, in particular, options. Review your marks from Exhibit 2 to reinforce key areas of need. Undertaking this exercise alerts you to your micro-level 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. Examine especially whether the ALM model is functionally capable of modeling the contractual re-pricing and maturity behaviors of every category represented and the special indeterminate behaviors of core deposits, lines of credit, 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.

**Re-pricing mismatch** is caused by all elements of the balance sheet because of the varying physical re-pricing opportunities present across categories. Re-pricing balances are input into an ALM model through its detailed downloads of maturity and re-pricing information from your institution’s underlying systems. Verify that these downloads can be easily done and that they include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances. 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.

**Maturity mismatch** is also caused by all elements of the balance sheet because of 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, rates, etc., to all balances.

**Amount of re-pricing** for a given general interest rate change depends on each specific asset or liability category’s driver rate (the financial market rate that re-pricing is tied to), beta relationship (specified re-pricing that occurs for any given change in the driver rate), and any re-pricing lags (how fast re-pricing occurs) specified. Review how each ALM model handles these behavior elements for categories tied to common financial sector driver rates. Also, explore how categories, such as core deposits, handle re-pricing. Finally, be sure to review how temporary teaser rates are treated.

Re-pricing limits (e.g., caps and floors) on existing balances normally come directly from system downloads, but verify this. A key issue to review is how categories are aggregated from underlying record-level data. Models vary significantly in this regard, in some cases averaging together important differences in re-pricing limits information. Also, determine how replacement and new volume re-pricing limits can be input.
<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>
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<tbody>
<tr>
<td><strong>Commercial Loans</strong></td>
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<td>Fixed or floating (caps/floors/etc.)</td>
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<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>Fixed or floating (caps/floors/etc.)</td>
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<td>Teaser rates/other special features</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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<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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<td>Complex (derivative) products</td>
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<td><strong>Time Deposits</strong></td>
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<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>Callable/convertible/other options</td>
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<td><strong>Off Balance Sheet</strong></td>
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<td>Simple swaps/caps or floors/etc.</td>
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<tr>
<td>Complex (derivative) products</td>
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<td><strong>Other Items of Note</strong></td>
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<tr>
<td>Mortgage servicing portfolio</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Mortgage origination pipeline</td>
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Note: Expand this matrix to the level of category detail required by your institution’s balance sheet.
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 model 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 also often have prepayments, and caps and floors are another common source of balance sheet optionality. Understand how all are handled in the system.

Switch options (behaviors that change dramatically at a specific time and interest rate level) are often 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. Again, understand how they are administered.

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 vary uniquely in each interest rate path examined.

In short, ascertain that each ALM model can adequately recognize and treat all of the option-related behaviors in your institution’s balance sheet. Option modeling is often 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 some 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 record level model treatments. This is a key enhancement because it allows relatively inexpensive models to conduct instrument-level modeling (including options).

Review in detail how complexity risk is handled (for example, how are CMO cash flows obtained and entered into the model?). If importing external cash flows is a supported method, determine what input sources are supported by the model, interest rate scenarios allowed, and the cost of the services involved.

If you are interested in stochastic modeling applications, they 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. Thus, 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 that test for basis-risk-related IRR and yield curve shape changes require unique option inputs in such interest rate forecasts.

Indeterminate behaviors are most notably found in core deposits. Contractually, these categories can re-price immediately (but on an administered basis) and have overnight maturities. However, they normally have limited re-pricing or interest rate related supply sensitivity and long average lives. Review how each model allows you to define core deposit re-pricing (its magnitude, lags, and floors), how it treats re-pricing balances versus maturing balances, and how it defines existing balances decay (runoff). Do the same for other indeterminate categories such as credit cards and lines of credit.

In stochastic modeling applications, the required range of indeterminate 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 behavior inputs specific to each scenario. This advanced feature can be valuable in non-stochastic model uses also, as unique inputs are automatically created by scenario.

IRR analysis capabilities are essential. Determine how standard IRR scenarios are available to the model (e.g. rate shocks and linear rate ramps are in most cases internally generated). Also establish how external interest rate scenario
data (such as non-linear rate ramps that assess basis risk and yield curve shape changes) can be entered. External interest rate scenario data should be unloadable directly through a spreadsheet interface, however, that is not always available. In model equity-at-risk analyses, review how present values and effective durations are calculated. Key issues relating to core deposits include capabilities to input rate scenario specific decay rates and how non-interest expense inputs are incorporated.

Off-balance-sheet positions are often simple and well within the capabilities of even intermediate level ALM models. However, these positions can be complex enough to require the intake of specific cash flows or specialized advanced modeling. 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 great concern given recent experiences and regulatory concerns. Liquidity and contingency funding models ideally should be based on the same data as the institution’s ALM model. This is not only for consistency, but also because model information incorporates all cash flow (i.e. sources and uses of funds) influences. Ascertain whether liquidity-related analyses can be produced by the model itself or how readily model cash flow data can be brought into your institution’s liquidity and contingency funding models.

Ease of model use should be specifically 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 model? If no major problems surfaced, that is an indication that the ALM model will be easy (or at least straightforward) to use. Be sure to include your institution’s model user team in this part of the evaluation.

Vendor condition, user support and current user references are also areas to review. At a general level, determine the financial condition of the vendor, the history of recent model updates, the types of user support offered, and 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 might warrant 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 produces meaningful forecast outputs. Running the model should take a reasonable amount of time, using non-specialist 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 8) for each model under consideration.

**Data extract, download and input data capabilities** are essential to the efficient running of an ALM model. As a rule, minimize manual data entry as much as possible. 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. Can separate contractual re-pricing and maturity balances be easily identified?
4. How are record-level contractual inputs, such as amortization, balloon point, caps and floors, teaser rates, etc., brought into the model?

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

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

**Accurate assignment of category rates and re-pricing inputs** is an important part of using an ALM model. A key issue is being able to automatically define asset and liability pricing relationships (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 re-pricing relationships?
4. How are the rates on future balance sheet categories input and updated?
5. How can cap and floor rates, teaser rates, time limits on teasers, etc. be applied to specific categories in the model?

**Easy creation of new volume growth and re-pricing/maturity inputs** ensures that future balances can grow or diminish along specified paths and are placed at appropriate points or across proper maturity ranges. Questions to ask:

1. How are the potential 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 other behaviors assigned to new volumes?
3. What controls does the model have to avoid negative new volumes?
4. How are category-level new volumes replicated or assigned to other categories?
5. Can defined groups of assets and liabilities be assigned a common growth rate?
6. Can the growth of all assets and liabilities be jointly specified (e.g., holding the entire balance sheet constant or defining a universal percentage of growth)?

**Comprehensive option input capabilities** are necessary given increasing optionality in balance sheets. The model must be capable of defining unique option specifications in every period, for every category, in every interest rate scenario. Questions to ask:

1. How are options such as loan prepayments and puts/calls defined by category in Base Case?
2. How are prepayments, puts/calls and other option-related behaviors for existing balances applied in individual interest rate scenarios?
3. How are options applied to future balances in Base Case and each rate scenario?
4. Deposit based options such as bump up CD’s or early withdrawals are increasingly common. Are there any model limitations to modeling these options?
5. 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 or other inputs to institution-specific conditions? What is the cost of external services?
6. Can custom equations for option behaviors be embedded? How is this done?
Accurate definition and modeling of indeterminate behavior categories, primarily core deposits but also including line of credit (LOC) type holdings, is underdeveloped in many ALM models. However, because of the unique nature of indeterminate behaviors and the frequently significant size of underlying balances, accuracy here is vital to precise results. Questions to ask:

1. How is core deposit/LOC re-pricing (both the beta and lags) specifically defined?
2. Can floors (or caps) be imposed on category-level core deposit/LOC rates paid?
3. Can different core deposit re-pricing behaviors (e.g., asymmetric re-pricing and lags) be applied in different rate scenarios? How is this established?
4. How are maturing (decay/runoff) balances defined in each interest rate scenario?
5. What vendor or externally sourced national average-type core deposit re-pricing and average life/value inputs are available? What are the sources and what is the cost?
6. How can external indeterminate 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 indeterminate behaviors be embedded in the model? How is this done?

Ready availability of IRR rate 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., interest rate floors)?
3. What vendor-supplied or external sources are available for advanced IRR tests (e.g., scenarios where each rate moves at its own speed to examine basis risk or to test for yield curve shape change risk)? How is such data imported into the model? What are the sources of such scenarios and what is their cost?
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 sources of the external forecasts and at what cost?
5. What is the historic accuracy of vendor-provided 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 future 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. Does the model calculate all present values from specific scenario cash flows? If not, what approximation approach is employed?
3. What user override options are available if alternate values (e.g., external investment pricing data or outsourced core deposit valuations) are employed?
4. Is a stochastic (Monte Carlo) valuation approach available? Is the functionality standard or an added cost option? If the latter, what is the cost of the upgrade?
5. How are present values and durations for core deposits specifically calculated? How are non-interest-related expense inputs incorporated?

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 menu 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 business plan analyses (e.g., by scenario) 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 ALM model inputs/outputs be moved directly to profitability/funds transfer pricing (FTP) applications?

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

1. What are the presentation capabilities of the standard model reporting?

2. How are standard regulatory IRR analysis reports and typical business plan projection reports produced?

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

4. How can ALM model outputs be directly exported to common spreadsheet software?

5. How are documentation reports of ALM model data, category set up, inputs and assumptions produced?

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

**Support for sensitivity/stress testing and outcomes/assumptions testing** is important for meeting new regulatory guidance. Questions to ask:

1. How can specialized alternate interest rate scenarios be defined? This includes non-standard traditional rate shock and rate ramp type projections and user specified non-linear scenarios for testing for basis risk and yield curve risk.

2. How can individual interest rates or selected subsets of interest rates be changed to test for specific sources of basis risk (e.g. LIBOR versus Prime)?

3. Are there any limits on defining extreme rate tests (e.g. a +500 bp rate shock)?

4. Is there standard functionality that compares (back tests) prior period model forecasts to subsequent actual outcomes? Over what time horizons can this be done?

5. Is there standard functionality that compares (back tests) prior period model option or behavior inputs (e.g. prepayments or core deposit decay rates) to subsequent actual outcomes? Over what time horizons can this be done?

**Model’s interface with liquidity analyses** is a newly important area to assess. Using the ALM model as a cash flow source for liquidity and contingency funding plan models is the best solution for leveraging the information in the model. Questions to ask:

1. What liquidity projections are produced in the model or in directly related software?

2. Can model base liquidity projections be altered to produce “what-if” sensitivity test or contingency funding plan type stress testing?

3. How can ALM model data be exported to in-house liquidity and contingency funding plan models?

4. What capabilities does the model have for producing detailed maturity gap analyses as liquidity analysis tools?

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

1. What is the corporate history of the vendor and its current financial situation?

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 demographic that use the model?

The delivery mechanics of the purchase close out the inquiry. 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?
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?

ALM Model Selection Criteria: Advanced Requirements

ALM models are increasingly asked to perform advanced tasks as part of expanded balance sheet management challenges. Such applications are most often driven by larger and more complex balance sheets, and often lead to more detailed views of performance and risk. In addition, regulatory mandates are increasing and adding complexity.

Advanced features in ALM models are listed below. Keep in mind that not all institutions need these features. As above, use the notes along with the Self-Evaluation Checklists (Exhibits 2 and 4) and the ALM Model Decision Matrix (Exhibit 8).

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 single-path, rate-dependent, present-value methodologies, cannot fully value an existing embedded option or accurately measure value changes as rates change.

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 mandates often require stochastic valuation capabilities. Questions to ask:

1. What methodologies are available to calculate stochastic present values?
2. What methodologies are available to define the implied forward yield curve? What approaches can be applied to smooth the estimated curve?
3. 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?
4. Can rate paths be developed from random feeds and what advanced controls (e.g., the degree of lognormality or variance dampening techniques) can be applied?
5. How are option inputs and indeterminate behaviors applied to cash flows in each stochastic rate path?
6. Can custom equations (e.g., based on vendor or institution-specific analyses) be embedded for model inputs such as loan prepayments or core deposit behaviors?
7. 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 (for example CMO’s or structured FHLB borrowings). 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 by scenario? 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 used by many institutions. Although many ALM models can effectively handle simple off-balance-sheet items, not all 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 specialized reporting requirements (e.g., FAS 133 accounting treatments) supported in the model?

**Budgeting, profitability and funds transfer pricing** (FTP) are increasingly combined with traditional ALM-related activities. Some models offer advantages in interfacing with these applications. Questions to ask:

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. 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?

**Credit risk adjustments** to loan inputs in ALM models are beginning to be mooted. This is an advanced level of capability but perhaps at some point will be a required function. Questions to ask:

1. Can loan inputs in the model incorporate credit quality adjustments? That is, can expected non-performing loans be identified and segregated?
2. What separate treatments can be applied to expected recoverable balances versus loan balances expected to be written off?

**Final Comments on Choosing an ALM Model**

It is usually a long process to properly assess ALM models based on their real value to your institution. However, the time and effort spent is well worth it. Making a correct choice ensures a solution that provides benefits for years.
## EXHIBIT 8: ALM Model Decision Matrix

<table>
<thead>
<tr>
<th>Row Number</th>
<th>Function/Feature</th>
<th>Notes on Importance</th>
<th>Importance Rank (A)</th>
<th>Model Capabilities</th>
<th>Notes on Capabilities</th>
<th>Capability Rank (B)</th>
<th>Weighted Rank (C)</th>
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<tr>
<th>Initial Cost of Model</th>
<th>Annual Maintenance/Other</th>
<th>Notes on Costs</th>
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<th>Overall Benefit/Cost Comparison Grade</th>
<th>Notes to Overall Grade</th>
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**Importance Rank Values (A)**

4 = Must have; 3 = Very important; 2 = Like to have; 1 = Future need; 0 = Not necessary

**Capability Rank Values (B)**

4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor; 0 = Does not have

**Weighted Rank Values (C)**

Calculated as Importance Rank x Capability Rank

**Overall Benefit/Cost Comparison Grade**

4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor; 0 = Not recommended
A. GENERAL INFORMATION

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

2. Describe current client base (charters, asset range, operating characteristics)
   FARIN ALM clients include community-based financial institutions, commercial banks, thrifts and credit union charters.

3. Number of in-house clients
   252

4. Relevant client characteristics
   Client Asset Ranges: $30 million to $10 billion
   Average Assets: $575 million
   Type of Institutions:
   Commercial Banks: 53%
   Credit Unions: 41%
   Thrifts: 6%
   Geographic Locations: 38 States plus Puerto Rico and Canada

B. MODEL USER SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   8:00am to 6:00pm Central Time

3. Number of support staff available
   7

4. Location(s) of the phone support function:
   Madison, WI and Seattle, WA

5. Web-based user support (enter “yes” or “no”)
   Yes
6. Other support characteristics as deemed relevant

FARIN offers an on-line support site with FAQs, instructional videos, key assumption downloads and model upgrade links. We also 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 user’s access to the most up-to-date information and answers to issues.

In addition to the initial user training, FARIN offers client directed, face to face training sessions.

C. MODEL INFORMATION

1. Model name
   FARIN Foresight

2. Level and version
   5.2.17.2

3. Last update
   May 2013

4. Operating system(s) and other required software
   Windows 7 SP 1 (or higher), x86 or x64

5. Is a vendor-supplied outsource service using the same 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.

6. What other vendor-provided financial management products interface with the model?
   FARIN’s iPrice Loan and Deposit Pricing system share many elements. Using our export function, clients link to other programs such as cost accounting applications, management reporting systems, mortgage servicing rights, credit risk assessment systems and more.

   FARIN’s Core Analytics (non-maturity core deposit study) results are loaded directly into the model.

7. What is included in the vendor-provided model installation?
   Model installation includes database build, creation of a customized chart of accounts with client interaction, development of row match rules, 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 or the client’s location, basic model installation with client IT staff.

8. Do you offer support beyond initial model installation, i.e. 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).
D. DATA EXTRACT AND INTAKE

1. Briefly describe the model’s intake processes for balance sheet data (e.g. general ledger, maturity, re-pricing 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.

2. 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.

E. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below

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 used by the institution as any account in the model’s chart of accounts.

● Re-pricing 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 re-pricing and maturing balances for categories that have continuous and call/put embedded options

Continuously callable instruments can be modeled using 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 separate items in FARIN Foresight and can be combined on any instrument as needed.
● Re-pricing 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, and caps. This information is used on existing positions to determine rates. For planned purchases, the overall account characteristics define the basic structure, and then assumptions on current rates, repricing rates, calls, etc., are handled as an assumption within the plan.

● Re-pricing 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.

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?
   No

3. Can the model effectively amortize discounts/premiums?
   Yes, 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.

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

F. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?
   Account-level pricing information can be entered by hand, through uploads or by creating a set of client-specific drivers.

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

3. How are pricing and re-pricing relationships defined and updated?
   Pricing and repricing relationships must be handled in two discussions.
   First, for the existing contracts such as adjustable-rate loans FARIN offers two options. The data can be received
on the loans during the import function or the client can 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 the offer rate can be set using a traditional spread/index relationship, or FARIN 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.

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

FARIN stores 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.

5. How does the model define re-pricing 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 forecasts 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.

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

FARIN supports 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. The 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.

7. 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, Foresight calculates 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.
8. Can the model export outputs and reports to spreadsheets or other products?

Yes, all reports in the 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.

9. Can the model produce back tests of prior forecast and behavior assumptions?

Yes, the model has the capabilities to generate back testing reports detailing the variance amounts of prior forecasts and assumptions.

10. 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.

11. Does the model have stochastic forecasting capability? 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, setting a budget number for Net Income.

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.

12. 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.
G. OPEN-ENDED COMMENTS

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 the client’s 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 and 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 updating
- 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
- Integrated liquidity analysis and testing
- 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 and liquidity analysis.

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.
A. GENERAL INFORMATION

1. Vendor contact information
   Lesley Karstens
   ProfitStars®
   17110 Marcy Street Suite 200
   Omaha, NE  68118
   800-356-9099 (phone)
   402-431-8822 (fax)
   Web: www.profitstars.com

2. Describe current client base (charters, asset range, operating characteristics)
   PROFITstar® clients include community banks and credit unions across the United States, Canada, Guam, and the
   Caribbean, with assets from $10 million to $12 billion.

3. Number of in-house clients
   1,648

B. MODEL USER SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   Monday - Thursday, 7:30 a.m. to 6:30 p.m. CT
   Friday, 7:30 a.m. to 5 p.m. CT

3. Number of support staff available
   There are 20 staff members dedicated to phone support. In addition, there are four trainers and five ALM
   consultants on staff.

4. Location(s) of the phone support function:
   The majority are located at ProfitStars’ Omaha, NE, office. There are also some Client Services Analysts who
   work remotely.

5. Web-based user support (enter “yes” or “no”)
   Yes
6. Other support characteristics as deemed relevant

- Online Help, FAQs, and Recorded Self-Study Sessions are available, along with the ability to log on to web-based support sessions with Client Services.
- Automated process for sending application errors to our development team.
- Comprehensive CRM system that tracks and analyzes support cases and projects.
- Regularly scheduled webinars and in-person training courses that cover a spectrum of topics ranging from basic software use to ALM concept and theory.
- Annual client conferences that provide in depth financial management training. Typical attendance is more than 300 clients.

C. MODEL INFORMATION

1. Model name
   PROFITstar® Classic™

2. Level and version
   2012b.09

3. Last update
   March 29, 2013

4. Operating system(s) and other required software
   Client: Windows® Vista (SP2 or later), Windows 7, Windows 8 (desktop mode only)
   Beginning with v2013 (scheduled for Fall 2013), Microsoft .Net framework version 4.5 and SQL Server® will be required.

5. Is a vendor-supplied outsource service using the same model available?
   Yes, ProfitStars offers an ALM Reporting Service.

6. What other vendor-provided financial management products interface with the model?
   In addition to ALM, PROFITstar® is used for budgeting and financial reporting. Budget Manager allows for distributed budgeting to branch/cost center managers and others supplying input to the budget process. Portfolio is used for CUSIP-level modeling of Investments and Borrowings. PROFITability® provides for Organizational and Product dimension modeling and analysis of FTP and allocations. PROFITstar and PROFITability share the same database. Just one monthly update is needed to an application providing ALM, budget/forecasting, monthly reporting, and profitability analysis.

7. 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 implementation is completed by the assigned Client Services Analyst prior to training on the model. We offer initial Basic Training via WebEx, classroom, or one on one.
8. Do you offer support beyond initial model installation, i.e. consulting or extended implementation assistance?

Yes, we offer both training and consulting on an ongoing basis. Additional training/consulting is available through webinars, workshops, client conferences, and users’ groups, as well as individual training either face to face or via the Web. Client Services assistance is also available following the installation. The Client Services Analysts work in a team environment and respond to calls and cases as they come in through either the 800 number or the Client Portal.

D. DATA EXTRACT AND INTAKE

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

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

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

The PROFITstar 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 (Type Code, Class Code, Collateral Code, Fxd/Var Indicator) to provide additional breakout. The client is provided with a detailed listing of data requirements and field needs to provide appropriate modeling of amortization, re-pricing characteristics, participations, embedded options, etc.

Files that can be imported into the model include: General Ledger, Loans, Investments, Deposits, Borrowings, Global Rates, Prepayment Assumptions and Statistics.

E. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below

   ● Re-pricing and maturing balances for categories without embedded options
     This is done using the information provided in the application file download.

   ● Interest rate adjusted re-pricing 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.

   ● Re-pricing 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.

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

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?

   Ceilings and floors can be imported on existing volume and setup on new volume. Teaser rates are modeled using key rate ties.

3. Can the model effectively amortize discounts/premiums?

   Yes, this is done using PROFITstar Portfolio, which allows for CUSIP level modeling/analysis of investments.
4. 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’s Databank and used in formulas and reporting.

F. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?

For current volume, this comes from the data provided in the application files that is downloaded into PROFITstar on a monthly basis. For new volume, amortization, pricing, and re-pricing assumptions are set at the chart of account level.

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

- Key Driver Rates: Historical rates import as part of the monthly update process. (Forecasted rates can also be downloaded through a service provided by IHS Global Insights.)
- Portfolio Rates: Weighted average rates import at the chart level on a monthly basis.
- Offering Rates: Manual adjustment of any rates that have changed since the previous month.

3. How are pricing and re-pricing relationships defined and updated?

Key rate ties can be setup at the chart of account level. Historical key rates such as Prime and Treasury rates are downloaded each month from our website as part of the monthly update process.

4. 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.

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

Decay rates are setup at the chart of account level for flat, rising and falling rate scenario. For present value calculations, core deposits are discounted to determine value.

6. 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, rate shock delays and non-parallel yield curve movements in PROFITstar. A yield curve projection wizard is available to take the user through the setup of various shapes for multiple yield curves.

7. 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, incorporate rate ramps and rate shock delays, as well as compare the impact of the shock 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).

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

Export options in reporting include: PDF, HTML, text, comma-delimited. ProfitStars has a dashboard called Optimizer™ which includes a Report Center that can be used to store, organize, and share reports throughout the institution.
9. Can the model produce back tests of prior forecast and behavior assumptions?

ProfitStars has a back-testing service available.

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

ProfitStars has a service available that provides for setup of Liquidity Analysis and Reporting from the PROFITstar model.

11. Does the model have stochastic forecasting capability? If so, describe it.

NA

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

The user can create user-defined tables for use in modeling prepayment/decay behavior.

G. OPEN-ENDED COMMENTS

Increasing regulatory pressures facing financial institutions today can be challenging. It’s more important than ever to have the right strategies in place to face these challenges and be better prepared for your next exam. By using a strategic approach to managing risk and closely integrating your initiatives with your asset liability management (ALM) and profitability programs, you’ll gain a better insight into making effective decisions and growing your bottom line. Today, savvy financial institutions can take advantage of Financial Performance tools from ProfitStars to uncover hidden profit potential, track ALM and budgeting more effectively, accurately tie compensation to performance, enhance net interest margin, and generate better profitability analysis for their organization, products, and clients.

PROFITstar has consistently been rated as the most comprehensive and user-friendly model on the market. Feedback we get from previous users of other ALM systems tells us that PROFITstar is easier to use for modeling “what if” scenarios and for reporting, while also offering the same or better functionality than their previous model. Robust reporting, including standard and customized reports from the Report Wizard and Report Writer, are available. Report Central is used to easily package, produce, and distribute reports at month-end. PROFITstar also seamlessly integrates with 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.

In 2013, we released our distributed budgeting tool, Budget Manager, in a hosted environment. Budget Manager integrates with PROFITstar and allows the budget administrator to seamlessly gather input from individuals throughout the organization and incorporate those assumptions into the overall plan.

In addition, the Optimizer dashboard highlights key performance indicators from all of the products in the ProfitStars Performance Suite (PROFITstar, PROFITability, and Relationship Profitability Management™). Optimizer also includes a daily dashboard and report center where reports from any application can be stored and shared.

When it comes to Financial Performance solutions, ProfitStars simply offers you the best, most-comprehensive lineup on the market today – including budgeting, asset liability management, financial reporting, profitability management, customer relationship management, loan and deposit pricing, as well as commercial lending solutions.

PROFITability brochure: http://www.profitstars.com/ProductBriefs/PSPB_PROFITability.pdf
Relationship Profitability Management (RPM) brochure: http://www.profitstars.com/ProductBriefs/PSPB_RPM-2.pdf
A. GENERAL INFORMATION

1. Vendor contact information
   Jeffrey Caughron
   Associate Partner
   The Baker Group LP
   1601 Northwest Expressway – 20th Floor
   Oklahoma City, OK 73118
   jcaughron@gobaker.com
   800-937-2257
   www.gobaker.com

2. Describe current client base (charters, asset range, operating characteristics)
   Community-based financial institutions, primarily banks and credit unions, ranging in size from $50mm to $3billion

3. Number of in-house clients
   250

4. Relevant client characteristics
   C-corp and S-corp community banks in 38 states, both metropolitan and agricultural. Also natural person credit unions.

B. MODEL USER SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   M-F 8am – 5pm, CST

3. Number of support staff available
   17

4. Location(s) of the phone support function:
   Oklahoma City, OK, Austin, TX, Springfield, IL

5. Web-based user support (enter “yes” or “no”)
   Yes

6. Other support characteristics as deemed relevant
   Online training tutorials and webinars
C. MODEL INFORMATION

1. Model name
   Interest Rate Risk Monitor® (IRRM)

2. Level and version
   Version 4.0 (Release 6)

3. Last update
   2013

4. Operating system(s) and other required software
   Windows XP or newer – no additional required software

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

6. What other vendor-provided financial management products interface with the model?
   Advanced Portfolio Monitor (APM), a proprietary bond analytics package, and Investment Portfolio Accounting (IPA).

7. What is included in the vendor-provided model installation?
   Software Download and Full support

8. Do you offer support beyond initial model installation, i.e. consulting or extended implementation assistance?
   Yes, software support plus report interpretation, analysis and consultation.

D. DATA EXTRACT AND INTAKE

1. Briefly describe the model’s intake processes for balance sheet data (e.g. general ledger, maturity, re-pricing information) from my existing data processor(s)
   A data extract file is provided to the client that is unique to their data processor and which pulls all necessary data from the GL including balance, rate, amortization, re-pricing, cap/floor characteristics, option dynamics and maturity data, among others. Simultaneously, investment portfolio data flows through IPA and APM, then into IRRM. Certain supplemental data input including YTD income, expense, taxation, gains/losses, etc. is manually entered.

2. Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.)
   The unique chart of accounts & account attributes (fixed, variable, amortization, maturity, callable, tax treatment, etc.) are set up in the IRRM and categorized based on balance sheet makeup.
E. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below
   ● Re-pricing and maturing balances for categories without embedded options
     No limitations
   ● Interest rate adjusted re-pricing and maturing balances for categories that have continuous and call/put embedded options
     No limitations
   ● Re-pricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
     No limitations
   ● Re-pricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)
     May be modeled with either decay rates or maturity distribution percentages across time buckets.

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?
   No limitations

3. Can the model effectively amortize discounts/premiums?
   Yes, amortization/accretion of discount/premium is handled in the IPA and APM, then flows into IRRM.

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

F. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?
   These characteristics are entered exactly as the structure of the instrument dictates.

2. How are interest rates and driver rates input and periodically updated?
   Book yields and rates are pulled from the client’s data processor via the extract file. Reinvestment rates (current market rates) are updated quarterly per client’s instruction. Reinvestment rates serve as unique driver rates for each asset and liability. The single exception is non-maturity deposits which have a driver rate set equal to the one-year FHLB advance rate (which is considered a re-placement cost).

3. How are pricing and re-pricing relationships defined and updated?
   Each asset and liability is modeled per the structure of the instrument with respect to re-pricing cash flows. Book yields and rates are pulled from the data processor, re-investment rates are input per the client’s instruction, and present valuation methodology determines fair value pricing.
   Investment prices are pulled directly from APM where market pricing is accessed via multiple third-party sources. Dynamic re-pricing cash flows for investments are modeled in APM and pulled into IRRM.
As to rate changes (which affect pricing), each asset and liability is assigned a unique rate shift sensitivity (beta) for each different rate scenario. Also, each asset and liability is assigned a unique time lag for each rate scenario. IRRM models rate changes (and therefore fair value changes) per the interaction of rate change, shift-sensitivity, and time lag.

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

FHLB advances are modeled per the structure of the instrument. Option features are modeled per the strike yield and date. Rate differentials between the current market and book rate determine whether the option is in the money.

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

Each core deposit is modeled with a unique set of maturity distribution percentages and/or decay rates across time buckets. Rate shift assumptions (betas) and time lags are also applied as unique inputs for each instrument and for each rate scenario.

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

Yield curve simulations are completely flexible. Short versus long rate anchors are defined by the user (10yr v 1yr, 5yr v 6mo, etc.). Short rates may be modeled to go up by a greater or lesser amount than the long rate, and everything in-between is interpolated to simulate flattening or steepening scenarios.

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

IRRM produces reports that forecast balance, rates, yields, cash flows interest income/expense, margins, spread, ROA and ROE (among other things) across 12mo and 24mo horizons for all rate scenarios.

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

Yes

9. Can the model produce back tests of prior forecast and behavior assumptions?

Yes

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

IRRM produces dynamic cash flow reporting and liquidity ratios which can easily be incorporated into client liquidity reporting and contingency funding analysis.

11. Does the model have stochastic forecasting capability? If so, describe it.

Stochastic inputs may be incorporated, though the model does not generate random probabilistic inputs.

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

Yes, inputs such as prepayment and core deposit behaviors are institution-specific.
G. OPEN-ENDED COMMENTS

*Additional information can be found at: http://www.gobaker.com/interest-rate-risk-monitor

This easy-to-use software allows Asset/Liability Managers to efficiently determine the bank’s interest rate risk to net interest income and equity. IRRM reduces regulatory and accounting burdens by providing reliable SFAS 107 calculations, “what if” interest rate risk management simulations and an accurate process for projecting the bank’s future profitability.

IRRM enables you to better manage the future impact of changing interest rates to your institution’s profitability and equity position. Specific program functions include:

- Projected profitability and volatility of equity capital under various balance sheet and interest rate scenarios
- Measurement of price volatility for the entire balance sheet including modified duration, effective duration and convexity
- Projected balances and yields per account for 12- and 24-month budgeting purposes
- Comparative changes in net interest income and interest expense under nine different rate shift scenarios
- Monitored asset mix and profitability—both ROA and ROE—over integral rate shift horizons up to 24 months
- Incorporation of embedded options such as principal payments, decay rates, life caps, periodic collars and reset frequencies for all assets and liabilities
- An unlimited number of simulation analyses
- Unlimited historical data storage
- An unlimited number of accounts

IRRM allows your bank to comply with regulatory and accounting requirements by providing critically important management information.

- GAP analysis and Rate Sensitivity Measures
- Net Interest Income Change analysis
- Market Value of Equity (MVE) analysis for SFAS 107
- Balance Sheet Effective Duration and Convexity

IRRM provides reports and charts in unique and logical formats that may either be printed or displayed for ALCO meetings and board presentations with data including:

- Data may be downloaded from Baker’s portfolio accounting system, APM and other data processing sources to improve your bank’s reporting efficiency
- Monitors performance versus ALCO defined benchmarks
- Unlimited batch report lists in any output order
- Easy to use Windows-based application
- Full graphic presentations using integrated reports, charts and graphs
- Printed reports in black/white or color

IRRM operates on any PC that meets minimum hardware and software requirements. See us for current specifications.

*The Baker Group, LP is the sole authorized distributor for the products and services developed and provided by The Baker Group Software Solutions, Inc.
In-House Model Vendors

ZM FINANCIAL SYSTEMS, INC
www.zmfs.com

A. GENERAL INFORMATION

1. Vendor contact information
   ZM Financial Systems, Inc
   5915 Farrington Road, Suite 201
   Chapel Hill, NC 27517
   919-493-0029
   Email: sales@zmfs.com
   Website: www.zmfs.com

2. Describe current client base (charters, asset range, operating characteristics)
   ZM Financial Systems develops, sells and supports a web-based ALM solution specifically designed for community financial institutions ranging from $100 million to $2 billion in assets.
   In addition, ZM Financial Systems offers an ALM and investment analytics system for larger financial institutions ranging from $2 to $80 billion in assets and for many large Broker/Dealers.
   Nearly 20 companies provide ALM outsourcing and investment management services using the ZM Financial Systems model.

3. Number of in-house clients
   55 in-house clients and over 100 financial institutions outsource ALM and investment management services to vendors using the ZM Financial Systems model.

4. Relevant client characteristics
   Nearly 100 community financial institutions utilize the ZM model for ALM and investment management needs either through licensing the ZM Financial Systems model directly or through a 3rd party provider.

B. MODEL USER SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes, we provide phone-based user support but do not offer a toll-free number.

2. Hours during which phone support function operates
   Support Staff are available via telephone and email from 8am to 8pm Eastern Time during normal working days.
   Email support for urgent issues is almost 24/7.

3. Number of support staff available
   There is a total of five (5) support staff to assist clients with their support needs.

4. Location(s) of the phone support function:
   There are two (2) support staff located in Scottsdale, Arizona and three (3) support staff located in Chapel Hill, North Carolina.
5. Web-based user support (enter “yes” or “no”)
   
   Yes

6. Other support characteristics as deemed relevant
   
   Initial training is provided free of charge as part of client support and usually conducted via WebEx. Many support issues are also communicated via WebEx. Following implementation of the model, unlimited web and phone-based product support is provided to clients at no charge. Support costs are included in the annual license fee.

C. MODEL INFORMATION

1. Model name
   
   onlineALM.com – Community financial institutions solution. (onlineALM.com employs the calculation engines from ZMdesk, which is used by many large financial institutions for advanced fixed-income and derivatives analytics.)

   ZMdesk – For larger financial institutions and broker/dealers.

2. Level and version
   
   onlineALM.com – Version 4.00.1305.14088 | Web code 4.00.0514.0

   ZMdesk – Version 4.00.1305.15

3. Last update
   
   May 2013

4. Operating system(s) and other required software
   
   The community financial institutions model, onlineALM.com eliminates the burdens of implementing and maintaining cumbersome software and systems. onlineALM.com is housed on our servers and maintained by us. Community financial institutions only need to access onlineALM.com via the web to perform all ALM modeling needs.

5. Is a vendor-supplied outsource service using the same model available?
   
   Outsourcing is available but not supplied by ZM Financial Systems. There are nearly 20 companies that use the ZM model to provide ALM outsourcing and investment management services.

6. What other vendor-provided financial management products interface with the model?
   
   The ZM model interfaces with the following vendor-provided financial management products:
   
   • Intex
   • Moody’s (formerly Markit)
   • Bloomberg
   • Interactive Data Corporation (IDC)
   • Yield Book
   • Reuters
   • Andrew Davidson & Company (ADCO)
   • LPS Applied Analytics (Formerly AFT)
   • TPG Bond Accounting Software
7. What is included in the vendor-provided model installation?

Following is a typical implementation plan for a community financial institution:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Client Responsibility</th>
<th>ZMFS Responsibility</th>
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<tbody>
<tr>
<td>1</td>
<td>Data Transformation</td>
<td>Map current position instrument data to ZMFS data templates</td>
<td>Provide documentation</td>
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<tr>
<td>2</td>
<td>Chart of Accounts</td>
<td>Provide desired chart of accounts meeting ZM template format</td>
<td>Provide documentation and assist with completion of initial chart of accounts</td>
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<td>3</td>
<td>Create Initial Assumptions</td>
<td>Provide documentation and assumptions for:</td>
<td>Populate assumption inputs for:</td>
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<td>- Mortgage prepay</td>
<td>- Mortgage prepay</td>
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<td>- Non-mortgage prepay</td>
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<td>- Non-maturity repricing</td>
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<td>- Non-maturity decay</td>
<td>- Non-maturity decay</td>
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<td>4</td>
<td>Process Initial Results</td>
<td>Work with ZMFS to discuss output; correct data inconsistencies</td>
<td>Complete run of initial setup from data import to standard reports</td>
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<tr>
<td>5</td>
<td>Reporting</td>
<td>N/A</td>
<td>Instruct client on system reporting capabilities and reporting documentation</td>
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<tr>
<td>6</td>
<td>Model Fine Tuning</td>
<td>Work with ZMFS to:</td>
<td>Work with client to:</td>
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<td></td>
<td>- Discuss output and any inconsistency</td>
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<td>- Modify assumptions, rerun model and generate reports</td>
</tr>
<tr>
<td>7</td>
<td>Model Training – approximately 4 to 6 hours</td>
<td>Attend web-based training</td>
<td>Conduct web-based training</td>
</tr>
</tbody>
</table>

8. Do you offer support beyond initial model installation, i.e. consulting or extended implementation assistance?

ZM Financial Systems can provide post implementation assistance. In addition, ZM Financial Systems has relationships with many consultants and consulting firms that use the ZM Model and can provide post implementation and consulting services.

D. DATA EXTRACT AND INTAKE

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

The model has three basics steps:

1. Load the chart of accounts which creates the groupings of instruments and manual accounts like equipment.
2. Load all the individual instruments. The model is instrument based so all the individual instruments need to be mapped and loaded. The software does have compositing function. Securities data can be obtained via automatic links to 3rd party sources.
3. Set EVE and NII assumptions like discount curves, reinvestment instruments and balance sheet growth.
4. Set run assumptions like evaluation date, market data date, prepayment model, scenarios for yield curve or economic shocks, etc.
2. Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.)

The model is instrument level based rather the account or portfolio based.

E. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below

   ● Re-pricing and maturing balances for categories without embedded options
     The model easily handles re-pricing and maturities on bullet instruments.
   
   ● Interest rate adjusted re-pricing and maturing balances for categories that have continuous and call/put embedded options
     The model also easily handles a wide variety of instruments with embedded puts/calls and other options types like triggers.
   
   ● Re-pricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
     The model also easily handles re-pricing on a whole host of adjustable and floating rate instruments.
   
   ● Re-pricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)
     The model also easily handles instruments with ambiguous maturities like core deposits or credit cards.

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?

   No, the model handles all types of periodic, lifetime, relative, initial, first reset caps and floors. It also handles fixed-to-floating, floating-to-fixed, ratchets, one-ways, range accrual, range floaters, etc.

3. Can the model effectively amortize discounts/premiums?

   Yes, the model accurately handles FASB 91, as well as other methods like, principal weighted, to a yield, to a date, straight line, and impaired or workout.

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

   Yes, the software has an advanced mortgage servicing valuation module that contains many inputs and assumptions unique to MSR.
   
   Yes, the software can handle off-balance-sheet accounts and these accounts can contain a wide variety of instruments including but not limited to caps, floors, swap, options, futures, swaptions, etc.

F. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?

   Pricing spreads (i.e., nominal or option-adjusted) and re-pricing limits (i.e. periodic or lifetime caps on adjustable floating rate instruments) can be entered manually through instruments data templates either in Excel or through our ETL tool, or if CUSIP based via various 3rd party links like Bloomberg, Reuters, or IDC.
2. How are interest rates and driver rates input and periodically updated?

Interest rates on the most commonly traded markets like US Treasury and Libor are provided via download from our website. Other rates like Municipal, Overnight Index Swap, Eurodollar futures, etc. can be retrieved via automatic links to 3rd part vendors like Bloomberg.

Driver rates on non-market yield curves and indexes can be entered manually or via Excel spreadsheets.

3. How are pricing and re-pricing relationships defined and updated?

For Securities these are provided by links to 3rd party data providers like Intex, Moody’s, Bloomberg, etc. For non-securities these are entered manually or through Excel data templates or our data mapping tool.

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

The model handles a wide variety of embedded options including calls and puts. Option exercised decisions can be determined by the model automatically or based on user input criteria.

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

Re-pricing and decay rates can be modeled in a variety of ways from simple betas and decay rates, through multidimensional tables, or via complex formulas. Present values is the same as with any instrument -- discount the cash flows at either a static or option adjusted spread over many simulated interest rate paths.

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

The model has a wide variety of ways to ramp or shape yield curves and indexes. Basically, users can change any maturity point on any yield curve at any point in time jointly or independently.

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

The model produces all the most common value (e.g., OAS), risk metrics (e.g., effective/option adjusted duration and convexity) and many Greeks (e.g. vega). These results are provided in a wide variety of standard and customizable reports or via save results in the database.

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

Yes, all indicative data for rates and volatilities, instrument attributes and EVE and NII results can be exported to Excel.

9. Can the model produce back tests of prior forecast and behavior assumptions?

Yes, the model can be processed at any point in time and the results can be saved for future effectiveness testing.

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

The model can produce daily cash flows under a wide variety of stressed (e.g., Normal, Mild, Moderate, Severe, and Extreme) economic and banking specific environments and scenarios.

11. Does the model have stochastic forecasting capability? If so, describe it.

Yes, the model can generate Earnings and Value and Risk using many commons risk drivers and under many common statistical distributions.
12. Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?

Yes, the model has the ability to take user defined behavioral models like prepayment, repricing and decay.

G. OPEN-ENDED COMMENTS

onlineALM is a completely web-based asset-liability management solution designed to inform community institutions on the risk/reward tradeoffs to balance sheet strategy selection. The program features an easy-to-use interface for data and assumption manipulation, a sophisticated instrument-level option-adjusted cash flow engine and a comprehensive reporting package. There is no software to update or maintain. Using only a web browser and Excel, you can upload instrument data, launch income and value simulations and then retrieve reports from your inbox. onlineALM brings together the latest technologies in financial modeling and web programming to deliver accurate results on a stable platform. This tool enables users to draw out crucial quantitative insights essential for analyzing, documenting and executing strategies that can improve the institution’s future performance.

Business Benefits
- Forecast earnings under different new business and market rate assumptions
- Assess long-term interest rate risk with economic value analysis (EVE)
- Comply with regulations for interest rate risk management
- Create consolidated budgets
- Unmatched modeling accuracy gives you the confidence to take action based on your results

Usability Benefits
onlineALM’s web architecture allows unique usability advantages over installed software.
- Easy-to-navigate web interface simplifies the assumption-building and A/L production process
- Analysis and reports are available from any internet-connected computer
- Market rates, yield curves and residential mortgage prepayment models are maintained for you
- Users can build custom yield curves, prepayment/decay tables and rate response models
- Attractive, pre-formatted reports meet IRR management and regulatory purposes
- Chart of accounts is customizable

Robust Analytics
onlineALM employs the calculation engines from ZM Financial System’s in-house model, ZMdesk, which is used by many large financial institutions for advanced fixed-income and derivatives analytics.
- Instrument-level calculations
- Premium and discount accounting
- Support for callable bonds and step schedules
- Multi-factor mortgage prepayment models (incentive, seasoning, seasonality, burnout)
- CUSIP-specific data wash and CMO cash flows available for additional fee from IDC and Markit
- Choice of simulating the balance sheet with lattice and Monte Carlo option-adjusted valuation

Reporting
onlineALM offers a comprehensive suite of reports for your asset/liability and earnings forecasting needs. Reports are available to download in either Adobe Acrobat (.pdf) or Microsoft Excel (.xls) format.
- Forecasted balance sheets and income statements out to ten years
- Economic Value of Equity
- Repricing and cash flow gap; daily gap bucketing is supported
- New business, prepayment/decay, repricing and valuation assumption reports
- Margin, yield and rate/volume/mix analysis
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- Economic value exposure, effective duration and effective convexity
- Key rate duration and key rate duration PV01 analysis
- Clients can generate the above reports for a variety of business and market scenarios discussed in the next section.

Market Scenarios
Assumptions regarding the interest rate environment are a necessary part of the ALM and forecasting process. onlineALM offers a scenario builder for creating and maintaining alternate market scenarios under which they can model their balance sheet, income statement and economic value of equity (EVE).

1. Instantaneous, parallel and continuous "shock" to the level of interest rates
2. Lagged, parallel and continuous change in the level of interest rates
3. Ramped change in the level of interest rates
4. Slope of the yield curve (yield curve risk) – understanding the impact of "non-parallel" rate changes is an emerging requirement for regulators and progressive practitioners
5. Change in the level/slope relationship between yield curves (basis risk) – US Treasury, LiborSwap and custom yield curves can be shocked independently
6. Prepayment sensitivity – create scenarios where prepayments are more or less sensitive than predicted by standard prepayment assumptions
7. Option adjusted spread (OAS) sensitivity – create shock scenarios for OAS
8. Volatility sensitivity – create shock scenarios for the user-editable six-point vector for volatility

Business Scenarios
onlineALM enables you to define custom balance sheet growth and reinvestment rules. This allows senior management to forecast using different business strategies to see impact on the bottom line. Using onlineALM, clients can model unlimited "what if" scenarios.

- Define growth as maintain balances, target balances or forecast only the new volume
- Reinvest cash flows and new money into user-defined instruments
- Flexibility to model scenario-specific growth assumptions
- Ability to model forward-settling instruments

Data Input
As with any modeling solution, supplying accurate data about the instruments currently on your balance sheet is paramount. onlineALM makes this process easy and transparent. Data is uploaded to onlineALM using simple Microsoft Excel templates. This allows you to work in a familiar application prior to uploading to onlineALM. The data requirements document describes required and optional fields in detail. Various data validation routines are embedded in the program, while data import and any error message logs are available for review and documentation purposes. Clients not familiar with data transformation can have ZM Financial Systems create an automated routine to prepare core system extracts for uploading instruments to onlineALM.

About ZMFS
ZM Financial Systems was formed in 2003 by experienced A/L and portfolio management software professionals. Our founding principle is that accurate A/L, valuation and trading analytics systems should also be quick to implement and easy to use. We offer web-based solutions for community banks and in-house software for larger organizations.
Periodic ALM Model Risk Assessment

Choosing the right ALM model is just the start of your commitment. There is also the need to maintain the model at a high level of forecast accuracy. Doing so requires a periodic review of the model and its analyses, something now recognized in regulatory guidance and typical ALM policy mandates. The section below examines this need.

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 ongoing upkeep requirements, ALM models tend to collect errors and omissions over time. It is even possible that the original model installation was not completed correctly, or that users have made inappropriate changes to category setup definitions or other technical specifications after the installation. Thus, for many reasons, ALM models can drift into a state of low forecast precision that creates model risk, which is defined as making an incorrect decision based on inaccurate model outputs.

Model risk is a business concern because it can lead to lost earnings and unforeseen risks. It is also a regulatory concern since poor financial decisions can lead to impaired capital.

The OCC (Office of the Comptroller of the Currency) and FED (Federal Reserve) have the strongest recent statement of model risk assessment needs, in Bulletin 2011–11/SR 11-7. It provides extensive discussions of the issues involved and requires that an annual ALM model validation (audit) be conducted by an independent third party. Other regulatory agencies have similar, if less specific, directives.

The business and regulatory mandates are clear: Control model risk. To achieve this goal, ALM models must be formally assessed on a periodic basis. Such a review in its broadest form has four components.

1. **Model Certification.** The fundamental capability of the model to correctly address balance sheet data and produce accurate projections – the “model math” – must be affirmed by an independent third party expert. This certification of excellence is your assurance that the model is an accurate analysis tool.

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

3. **Model Validation.** Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options is required to prove that the model actually produces accurate forecasts of earnings and value.

4. **Model Governance.** Finally, the model must be supported by an appropriate set of user controls, policies and procedures. The model control environment and policy directives must be formally assessed.

Many providers offer ALM model risk assessments (a.k.a. model verification or model validation). Below are discussions of underlying issues and key criteria to consider in evaluating potential solutions, oriented around the key sources of model risk.

The ALM Model Itself as a Risk Source

ALM models are complex software programs. In vendor-provided models, prerelease analyses, independent third party certification, ongoing internal reviews and 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 employed; shortfalls in the fundamental forecast accuracy of a vendor-provided ALM model are rare. Thus, this area of model risk is normally minimal.

Such a statement, however, does not apply to ALM models developed in-house or for non-vendor supported models. In
those cases, comprehensive testing and precision certification by a third party must be completed and fully documented. Further, the affirmation process needs to 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 arise from using wrong data or data that does not foot across the model. In most cases, however, model data is comprehensively assessed in reviews of feeds from underlying core systems or managed as part of 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.

  A point to note here — the integrity of record level data needs to be affirmed by periodic micro-level data audits. These are normally conducted by internal audit.

- **Category setup** definitions tell the model how to interpret incoming record-level data. Because these specifications define the categories analyzed in the model, the attributes are crucial to the success of all subsequent model applications. As such, they are a source of fundamental model risk that can arise from their initial installation specifications and any ongoing changes over time. A key point here is that category specifications are often changed by line of business managers, so an active dialog needs to be maintained.

- **Contractual inputs** are behavior definitions that can be read directly from underlying asset and liability contracts. Pricing spreads, teaser rates, balloon points and re-pricing limits (caps and floors) are common examples, as are call and put features (in investments and wholesale funding sources). These inputs are a source of model risk that arises from initial specifications and ongoing evolution.

- **Option inputs and indeterminate behavior assumptions** are weak links in many model implementations and as such need to be monitored very carefully. These sources of model risk include prepayment inputs for contractual maturity loans of all types (not just first mortgages) and pay down rates for indeterminate maturity loans. Loan behavior inputs also need to specify the interrelationships among loan types (e.g., second mortgage prepayments or HELOC pay downs linked to 1–4 family mortgage prepayments).

  Inputs defining core deposit supply, re-pricing, decay (defines average life), present value-related behaviors, embedded CD options (e.g. bump up CD’s) and CD early withdrawal inputs are also important. Accuracy is of the utmost importance as these inputs are key determinates of IRR positions.

- **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 often risk concerns. Ample evidence of spreadsheet errors is available in the business literature, yet model implementations normally have few controls over them. Address this issue in an uncompromising manner, preferably by treating each model output-related spreadsheet as a “model” itself and focusing on its embedded risk potential as such.

- **The model governance solution** provides the surrounding support for an ALM model. It rounds out the technical elements of the model with the processes needed to employ it as a financial management decision-making tool.

  The model control environment is defined by user process documentation, verification of user modeling activities, and model change controls. 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 model and model inputs change control documents. Model risk typically arises when the model control environment is weak, raising the probability that user errors will occur or changes to model specifications will go undocumented.

  The institution’s ALM process solution (a.k.a. its model governance) revolves around the asset/liability management committee (ALCO) and its functions, along with Board involvement. A best practice solution embodies the center and
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Model risk often stems from an incomplete ALCO function, poor IRR exposure limits, or a lack of Board involvement and/or oversight.

**Controlling ALM Model Risk**

The goal of an ALM model is to produce accurate forecasts. This requires a multifaceted solution, given the many possible 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. As noted, 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 is constructed in such a way that it could forecast correctly. The model risk assessment must also prove that the model actually does forecast correctly. That is, as developed above, the model must be validated as well as verified.

Validation of your model’s forecast accuracy needs to include reviews of a constant interest rate (Base Case) scenario and a range of rate ramp or shock scenarios. Testing across a range of interest rates assesses whether interest rate sensitivity forecasts correctly capture all balance sheet behaviors.

While special diagnostic systems are typically employed, a model’s validity can also be demonstrated through comparisons of first month margin forecasts vis-à-vis actual prior month values and by comparing model forecasts of NII IRR direction against recent actual margin sensitivity data.

Two important notes apply to the validation of model-produced forecasts.

1. Model accuracy cannot be adequately judged by producing parallel forecasts in another model run. This is for two reasons: First, running your exact current model through another separate model (which is necessary for comparability) tests little beyond the ability of the two models to properly complete computations. 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 you, using an independent third-party expert. Having every user affirm the model’s basic calculation accuracy has no purpose when it can be proven once and for all in a formal model certification.

2. Model accuracy cannot be adequately judged by running “outcome back tests” of prior model forecasts against subsequent actual outcomes. There are several reasons for this. First, back tests are by nature rearward looking while model risk is future oriented. Second, information on a model’s ability to forecast option influences in higher magnitude scenarios is usually minimal. Interest rates rarely vary enough over a typical back test period to reach extreme levels. Third, detailed back testing is costly to complete for earnings at risk forecasts and virtually impossible to complete for equity at risk forecasts. Finally, in the limit, a back test only assesses the model’s computational capabilities. Again, that is best accomplished via an independent model certification.

   There are, however, instances where outcome back tests have value, such as pretesting a new model installation or when an empirical touchstone is desired to measure model forecasts against. There is also a degree of regulatory preference for periodic back testing so there may be times when it is advisable to do. Back tests of 90 days (one quarter) are generally the norm in such cases.
Implementation of a comprehensive model control environment is the third step in controlling model risk. This includes the previously discussed documentation, checklist, and change controls. It extends, however, to include user cross training and backup users to provide production depth. The model control environment also encompasses directions that stipulate how often and by whom model specifications, inputs, and assumptions must be examined and updated, acceptable sources of any new information and documentation of data adjustments.

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 done by ALCO. This internal function is a complement to the policy-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 implications of increasing option influences.

3. The model and its implementation specifications must be described in the institution’s policy guidance. This is most commonly done in an appendix that documents the full “implicit contract” between the Board and ALCO with regard to model applications.
Evaluating 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 not sufficient. So the challenge is how to ensure that a proposed more encompassing model risk assessment is adequate?

In particular, how do you evaluate potential providers? A wide spectrum of ALM model risk assessment deliverables is offered, and each provider has a unique approach and brings varying qualifications to the effort. Thus, what should you specifically seek out—and seek to avoid—in model risk assessment providers and what they offer.

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 so should you. Questions to ask when considering potential providers 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 your 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 your 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 your regulators?

Evaluate the Provider’s Model Experience and Expertise

Value added content in an ALM model verification comes from robust qualifications and broad industry experience and expertise. Questions to ask the potential provider 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? What other models have they assessed?

Review the Provider’s Model Risk Assessment Process

ALM models are multi-faceted, and as such, ALM model verifications need to address all dimensions of model risk. Questions to ask the potential provider 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 verification techniques are used and why?

4. What specific model value/forecast validation techniques are used and why?

5. What are the 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 Risk Assessment Report Deliverable**
An ALM model verification is a consultative process. Thus, the deliverable needs to not only assess model risk, but also to recommend responses to model areas in need of upgrade. Questions to ask the potential provider are:

1. What is the conceptual or theoretical reason for each report element?
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 recommended by the verification report?
4. Can the provider help your institution enhance its model control environment and ALCO process solution, including the defining or fine-tuning of IRR exposure limits?

**Determine Acceptance of Provider’s Model Risk Assessments by Regulators**
The business related aspects of an ALM model verification should be its primary value. However, there is no question that regulatory compliance also needs to be a vital element in the final deliverable. Questions to ask the potential provider 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?
3. Does the provider offer assistance if regulators challenge the report? Specifically, what types of support are provided?

**Obtain References from Recent Model Risk Assessment Clients**
The ALM model verification provider needs to be your partner through the project, and references from other clients are your best way to gauge the degree to which this will happen. Ask any potential provider if they will provide references from recent clients with your institution’s asset size, charter type, and general operating characteristics. If they will not, walk away.

Then, ask the references about the provider’s report quality and content, delivery timing, and the quality of staff. Also, ask them to share any internal audit or regulatory responses to the report.
A. GENERAL INFORMATION

1. Vendor contact information
   ALM First Financial Advisors, LLC
   2911 Turtle Creek Blvd., Ste. 500
   Dallas, Texas 75219
   800.752.4628
   info@almfirst.com
   www.almfirst.com

2. Describe recent client base (charters, asset range, operating characteristics)
   Client charters include:
   - Federal Savings Bank
   - Federal Savings Association
   - National Bank
   - Savings Bank
   - Credit Union
   Assets range from $33M - $54B with majority between $100M - $8B

3. Number of risk assessment clients over the past three years
   Approximately 20 per year

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   - ZMdesk
   - IPS Sendero AL
   - PROFITstar
   - Brick & Associates ALM Software
   - ALM Software employed by First Empire, Baker Group, DCG, FTN, and Catalyst Strategic Solutions
   - QRM
   - SunGard Bankware
   - Fiserv Wisdom
   - C Myers
   - Risk Analytics (FIMAC)

2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   For a majority of model validations, ALM First performed a parallel analysis for a client without knowing their model level and version. ALM First only knows the model level and version when we are contracted to opine on the model.
C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
(given the following somewhat arbitrary definitions, check all that apply)

- Model Certification: Assessment of a model's fundamental ability to correctly address balance sheet data and produce accurate projections – the "model math".

- Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.

- Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.

- Model Governance: Assessment of an institution's model control environment, policy directives, and procedures.

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
   
   No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

   No

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

   Vendor software:
   ZMdesk 4.0
   IPS-Sendero AL 3.4
   Proprietary NMD model

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   Patterned after guidelines as described in regulatory bulletins, ALM First's risk assessment process provides a sophisticated analysis of a depository institution's interest rate risk by applying rigorously developed methodologies from experienced financial professionals to some of the most technologically advanced analytical models.

2. Do you take physical possession of the model for the assessment?

   No.

3. What specific model verification techniques do you use, and why?

   ALM First performs a thorough data scrub at the instrument level in order to identify, note, and offer suggestions for incomplete, missing, and inconsistent data. Furthermore, ALM First analyzes the model setup, inputs, and assumptions at the account level in order to opine on best practices. From a reporting perspective, ALM First ensures that the ALCO and board receive the appropriate amount of analyses while also vetting that the risk modelers adequately document and test assumptions and are separated from the risk takers at the firm based on industry best practices, regulatory guidance, and cost/benefit.
4. What specific model value/forecast validation techniques do you use and why?

ALM First performs a parallel ALM analysis in order to determine how much the client’s forecasted balance sheet instrument behaviors differ from market expectations from a behavioral gap, NII and economic value perspective. Through the parallel analysis, ALM First can identify anomalies in projected income and value in order to drill down to the assumptions or model limitations causing the issue.

5. What are your specific model verification and validation deliverables

ALM First provides a written overview followed by specific observations that are intended for consideration by the institution from a best practices and cost/benefit of implementation perspective that addresses modeling inputs, assumptions, and methodologies, strengths and weaknesses of the ALM model, content and format of reports, and documentation and controls related to the ALM process. Moreover, ALM First provides a non-maturity deposit analysis, executive summary, behavioral gap analysis, NII analysis, economic value analysis, and a personal presentation of findings.

6. What quality assurance processes do you use?

With respect to quality assurance, in conjunction with each ALM analysis, the analysts update a procedural checklist along with a summary report that includes items like, but not limited to, incomplete data, modeling assumption modifications, account stratification changes, and sources for non-interest items. The Valuation and Risk Analytics Manager reviews all ALM reports. The Valuation Manager maintains the centralized assumptions to be employed in the ALM analyses along with all relevant market data that were utilized to derive the assumptions while the Director of Development and Analytics reviews the assumptions and their source data monthly for reasonableness.

Additionally from a quality control perspective, analysts meet weekly to discuss ALM methodology. Regular training sessions for analysts are held on ALM topics such as modeling, assumptions, and banking products. The Valuation Manager audits ALM reports on a monthly basis and provides modeling and data handling suggestions to the analysts. Most centralized templates are password protected to prevent accidental manipulation. Moreover, most folders are password protected so that only analysts on the team can access the data and reporting tools.

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

Yes. ALM First believes that they follow industry best practices from an ALM perspective. ALM First believes that their approach and software are industry-recognized and above standard in nature.

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?

1) ALM Narrative
2) ALM Analysis
3) Modeling Inputs, Assumptions, and Methodologies
4) ALM Model
5) Reports
6) Documentation and Controls
2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?

Yes. Some sample comments:

1. No re-price dates are provided for any of the unsecured lines of credit loans, adjustable home equity loans, and adjustable mortgage loans. It is recommended that the re-price dates be provided to get more accurate cash flows.

2. Structures for adjustable loans are not provided. It is recommended that period caps, floors, and re-price spreads are included in the model to capture the true structure of the loans and therefore produce more accurate results.

3. Original terms and remaining number of payments are not provided for adjustable rate accounts. It is suggested the original term or the number of payments remaining is included in the loan file for proper calculation of maturity dates and to ensure cash flows are being placed in the correct time periods.

4. The lifetime floor for HELOCs listed in the rate file is higher than the book rate. It is recommended the lifetime floor be more correctly aligned with the average rate of the account.

5. Based on the client attribute report, the financial institution does not use prepayment speeds for auto loans and home equity loans, ALM First recommends that the financial institution use prepayment speeds for these accounts.

6. Based on the attribute report provided by the financial institution, there is a disconnect between the account type and the secondary market spread being applied. It is recommended the financial institution reassess and be more consistent when applying secondary market spreads. For example, no secondary market spreads are used for the majority of new and used auto loans but a secondary market spread is used for indirect lending new vehicles.

7. A few mortgage loans are incorrectly grouped based on the term and product code provided in the loan file. Also, the original terms for some mortgages do not correlate with the payment frequency provided in the loan file. For example, a 15 year fixed mortgage that pays bi-weekly should not have the same original term as a 15 year fixed mortgage that pays monthly. It is recommended the original terms of bi-weekly mortgages be correctly assigned.

8. The payment frequency for all investments is set to monthly. The payment frequencies for agency fixed, agency callables, foreign bonds, and treasuries should be set to semi-annually in A/L Sendero, ALM First recommends the client get prices from a direct pricing source if possible.

9. Bump up certificates should be modeled slightly differently in A/L Sendero to account for individuals taking advantage of the onetime rate increase. If such data are not available, internal assumptions could be used and applied using overrides in the A/L Sendero model.

10. It is recommended that, where possible, the financial institution discounts loans according to a term structure of interest rates (yield curve) rather than at a single rate. Discounting along a curve assigns a unique rate to each cash flow based on that cash flow’s remaining term, while using a single rate applies that specific rate to all cash flows. A yield-curve discounting approach is more accurate, especially for instruments such as mortgages, whose cash flows are sensitive to interest rate changes. Along with asset accounts, this yield-curve discounting would also apply to non-maturity deposits and certificates of deposits which could utilize the appropriate FHLB curve.

11. Running the model in different rate environments (ramped scenarios, twisted scenarios, different shock scenarios etc.) on occasion can highlight areas of balance sheet risk and income risk not captured in the normal, parallel shocks.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?

Yes.
4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits?

   Yes.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?

   Yes. NCUA, FDIC, and OCC.

2. What has been the feedback examiners have provided on your reports?

   No issues – exceeds regulatory requirements.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?

   Yes, we support our client’s education about our methodology and the analysis before, during, and after the completion of the risk assessment. We are available for conference calls and on-site visits in order to serve our clients.
A. GENERAL INFORMATION

1. Vendor contact information
   
   Dan Shumovich, Principal, Risk Advisory Services
   McGladrey LLP
   515 South Flower Street, 41st Floor
   Los Angeles, California 90071
   Phone: 212.330.4668
   E-mail: Dan.Shumovich@mcgladrey.com
   Web: www.mcgladrey.com

2. Describe recent client base (charters, asset range, operating characteristics)

   McGladrey LLP is the 5th largest accounting, tax and consulting firm in the United States. Financial institutions
   compose one of the largest industry segments for the Firm, with approximately 1,500 clients served nationwide,
   ranging in size from $50 million to in excess of $10 billion in total assets. Primary services delivered to financial
   institution clients include financial statement audit, tax assistance, enterprise risk management, internal audit,
   regulatory compliance, bank secrecy act/anti-money laundering, loan review, Sarbanes-Oxley/FDICIA, information
   technology controls/security, valuation and process improvement, among other areas.

   Specific experience performing interest rate risk and asset/liability modeling reviews includes financial institutions
   ranging in size from $50 million to $4 billion in total assets, who perform interest rate risk and asset/liability modeling
   in-house, or through the use of an outsourced third-party provider. Our clients are regulated by the OCC, the FDIC,
   the Federal Reserve, the NCUA, as well as various state regulatory agencies.

3. Number of risk assessment clients over the past three years

   McGladrey has performed approximately 150 interest rate risk and asset/liability modeling reviews over the past 3
   years for financial institutions ranging in size between $50 million and $4 billion in total assets.

4. Other relevant client characteristics

   McGladrey’s experience in delivering interest rate risk and asset/liability modeling reviews has included a variety
   of complex and non-complex financial institution balance sheets, including commercial, consumer and foreign
   institutions characterized by varying levels of embedded balance sheet risk and off-balance sheet instruments.

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)

   The Baker Group
   Farin & Associates, Inc.
   Fiserv, Inc.
   FTN Financial
   Plansmith Corporation
   PROFITstar
   Sendero
   The Darling Group
   Pacific Coast Bankers Bank
   Mike Higgins & Associates
2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   Approximately 100 in the last 2 years.

3. Any relevant comments regarding your experience with particular models, or preferences?
   All models and service providers have shared characteristics and seek to accomplish common goals with their modeling approach and reporting. We apply the Interagency Standards as the basis for our model validation services and independent analysis. We then customize our approach based upon usage and risk characteristics of each individual institution, as well as the modeling approach and vendor solution in place.

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
   (given the following somewhat arbitrary definitions, check all that apply)

   _____ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
   _____ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
   _____ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
   _____ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE
   1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
      No.
   2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.
      No.
   3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?
      No.

E. RISK ASSESSMENT PROCESS
   1. How would you describe your model risk assessment process?
      We perform an independent evaluation of the interest-rate risk and asset/liability management program in place at the financial institution within the context of Interagency Standards. The scope of our procedures includes a review of the board of directors’ oversight and management’s responsibilities as they relate to the financial institution’s IRR/ALM environment, as well as a review of the IRR/ALM modeling process, including the appropriateness of the use of the model, data supporting model inputs, the model input process and model output reports. We rely on management-provided financial information, existing policies and procedures, internal control descriptions and industry standards in performing our procedures. Specifically, we rely on The Joint Agency Policy Statement on Risk Assessment Vendors.
Interest Rate Risk, the Advisory on Interest Rate Risk Management, the Interagency Advisory on Interest Rate Risk Management Frequently Asked Questions and the Supervisory Guidance on Model Risk Management as the basis for conducting our independent reviews.

2. Do you take physical possession of the model for the assessment?

We generally only interact with the model with the assistance of management to ensure their understanding and agreement with any information obtained from, or updated within, the model.

3. What specific model verification techniques do you use, and why?

Our process involves obtaining/viewing all key assumptions and significant inputs to the model, and comparing these items to source documentation maintained by management. We will also evaluate the reasonableness of these items in comparison to regional and national trends.

4. What specific model value/forecast validation techniques do you use and why?

Our process involves obtaining and reviewing model output reports and comparing the projections contained within these reports to the financial institution’s actual operating results over both short and long-term horizons. As part of this process we also update the simulation for variances in key inputs and significant assumptions known to take place during the year in order to determine the ultimate impact of these variances on the model output reports. Finally, we evaluate model output reports for directional consistency given the composition of the financial institution’s balance sheet as of the measurement date.

5. What are your specific model verification and validation deliverables

Our deliverable is a comprehensive report which documents the background and scope of our testing, any issues, observations or recommendations identified and management responses to the foregoing, as applicable. Specifically, our report focuses on the following areas:

- IRR/ALM policies and procedures;
- Corporate governance related to IRR/ALM, including review and approval of IRR/ALM policies, procedures, model assumptions and model output reports;
- Follow-up to any comments and/or criticism received related to IRR/ALM in communications from regulatory agencies, internal auditors or others;
- Model certification(s) provided by the model vendor;
- The conceptual soundness of the model, including documentation supporting model inputs and assumptions;
- Confirmation that the model has been appropriately implemented and is being used, and is functioning, as intended;
- The integrity of IRR/ALM inputs and assumptions;
- IRR/ALM model output reports and overall model performance;
- Back-testing and the validity of the modeling process and key inputs and significant assumptions;
- Sensitivity testing and inputs and assumptions that have a strong influence on model output;
- Customization of the vendor model, if any;
- Staff training and knowledge of the IRR/ALM model; and
- Compliance with internal policies and procedures relating to use of the IRR/ALM model.

6. What quality assurance processes do you use?

All fieldwork and reporting for our IRR/ALM procedures are performed by dedicated financial institution specialists. In addition, our Firm’s national presence ensures that we have experience with the national and regional economic and regulatory concerns impacting the financial institution. All testing and deliverables related to our IRR/ALM procedures are ultimately reviewed and signed by a partner or director specializing in this topic area.
7. Are industry standard and best practices defined in your deliverable?
   Yes. Our reports not only identify areas of regulatory and policy non-compliance, but also include observations
   and recommendations based on industry standards and best practices.

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?
   The conceptual framework for our reports is taken from applicable regulatory guidance addressing interest rate
   risk, asset/liability management and model risk management. Our reports mirror the regulators' increasing focus
   on these areas in recent examination cycles.

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what
   are some recent examples?
   Yes. We feel it is important to prioritize findings and best practice recommendations to ensure that our clients are
   aware of the significance of these items, as well as the internal and/or external costs of remediation and compliance.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
   Yes. We are always available to assist clients in understanding, addressing and responding to observations and
   recommendations included in our reports. However, we have to avoid making decisions on behalf of management or
   acting in a management capacity, as this could impair our independence.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or
   fine-tuning of IRR exposure limits??
   Yes. One of the primary components of our validation process is the evaluation of internal control and reporting
   structures surrounding the ALM/IRR process. This includes a comprehensive review of applicable policies and
   procedures to ensure that expected levels of monitoring and control are present. We also evaluate risk limits in
   comparison to both regulatory and industry best practices.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   Yes. Our reports have been reviewed by the OCC, the FDIC, the Federal Reserve and the NCUA, as well as
   various state regulatory agencies.

2. What has been the feedback examiners have provided on your reports?
   Our reports have been positively received by the aforementioned regulatory agencies. They have acknowledged that
   our validation procedures and reports are consistent with the regulatory frameworks in place for interest rate risk,
   asset/liability management and model risk management.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support
   do you provide?
   We are always available to discuss our review process and the contents of our reports with any parties, with whom
   such discussion is deemed necessary by management, including boards of directors, audit committees, regulatory
   agencies, operating personnel and others. With this said, as the basis of our procedures and the format of our report
   are anchored in applicable regulatory guidance, regulatory challenges to our validation process and/or the contents
   of our reports are very infrequent.
Risk Assessment Vendors

A. GENERAL INFORMATION

1. Vendor contact information
   Jerry Boebel, CFA
   ProfitStars®
   800-356-9099
   jboebel@profitstars.com
   17110 Marcy Street, Suite 200
   Omaha, NE  68118
   Web: www.profitstars.com

2. Describe recent client base (charters, asset range, operating characteristics)
   Our recent client base includes natural person credit unions, state-chartered banks, national-chartered banks, and bank holding companies. Recent clients range in asset size from $40 million to $3 billion.

3. Number of risk assessment clients over the past three years
   340

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   PROFITstar® - All levels and all versions.

2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   PROFITstar - 240

3. Any relevant comments regarding your experience with particular models, or preferences?
   NA

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
   (given the following somewhat arbitrary definitions, check all that apply)

   _________ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
   _________ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
   _________ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
   _________ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.
D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.

   The PROFITstar model is our own proprietary software. It is developed, sold, and supported by ProfitStars.

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

   ProfitStars does not receive any payments from any security brokers.

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

   We are the providers of the PROFITstar software.

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   Our process focuses on four model components:
   • Data-related risks. (Are the data files from the core system accurate?)
   • Contractual inputs. (Do the data inputs provide the correct level of granularity?)
   • Category setup. (Are individual cash-flows aggregated or separated appropriately?)
   • Behavioral assumptions. (Are prepayment speeds, decay speeds, and discount rate assumptions used appropriately?)

2. Do you take physical possession of the model for the assessment?

   Yes

3. What specific model verification techniques do you use, and why?

   • Manual review of model settings.
   • Manual review for data-related risk.
   • Manual review of contractual inputs on a representative sample size.

4. What specific model value/forecast validation techniques do you use and why?

   • Back-test of projected net interest margin vs. actual results.
   • Regression analysis on pricing assumptions.

5. What are your specific model verification and validation deliverables

   For our validation reports, we include:
   • Executive summary.
   • Rate correlation analysis.
   • Back-test of projected net interest margin vs. actual net interest margin results.

6. What quality assurance processes do you use?

   Final reports are reviewed by department managers.
7. Are industry standard and best practices defined in your deliverable?
   Yes.

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?
   Our report components are a direct response to regulatory requirements.

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
   Yes. All recommendations are categorized in the executive summary as HIGH priority, MODERATE priority, or LOW priority.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
   Yes

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits??
   No

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   Yes. Our reports have been reviewed by:
   • NCUA
   • OCC
   • FDIC
   • Multiple district Federal Reserve Banks
   • Multiple state DFIs

2. What has been the feedback examiners have provided on your reports?
   Feedback provided by field examiners to our clients has been positive. Our independence has been questioned on one occasion in the past three years (more than 340 reports). Ultimately, our report was accepted by the regulator in this single instance.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
   Yes, we would provide assistance to our clients if challenged. None of our reports have been challenged to date.
H. OPEN-ENDED COMMENTS

Your data inputs and assumptions should reflect the true behavior of the financial instruments on your balance sheet. Missing data, inaccurate inputs, or invalid assumptions can dilute the results of your risk measures, affect your institution’s earnings potential, or lead your organization in the wrong strategic direction – all of which could negatively impact your next examination. At the same time, regulatory guidelines also mention back-testing as a key component of any model validation process. A back-test report offers you another line of defense to ensure that your forecast assumptions are accurate, so you’re not caught off guard by net interest margin results that can sometimes change over time.

Now you can avoid critical modeling pitfalls by having us complete a Technical Model Validation and Back-Test Service on your PROFITstar model.

Model Validation product brochure:

Model Validation and Back-Testing Services product brochure:

Model Validation sample report for banks:

Model Validation sample report for credit unions:
http://www.profitstars.com/pdfs/ModelValidationSampleReportCreditUnion.pdf

Back-Testing sample report:
A. GENERAL INFORMATION

1. Vendor contact information
   R2Metrics, Inc
   6930 Cahaba Valley Road, Suite 201
   Birmingham, Alabama 35242
   analytics@r2metrics.com
   205.991.9415

2. Describe recent client base (charters, asset range, operating characteristics)
   Commercial banks and credit unions, $50 million to $2 billion in asset size

3. Number of risk assessment clients over the past three years
   >20, (excludes bond portfolio risk assessments which have been >50)

4. Other relevant client characteristics
   Many of these clients have been pushed by regulators to validate the accuracy of some aspect of their ALM/IRRM process

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   ZM Financial, IPS Sendero (both in house and outsourced), Saber, BancPath, Vining Sparks, Higgins Associates, Olson, Baker Group

2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   ZM Financial - 5
   IPS Sendero (both in house and outsourced) - 13
   Saber - 4
   BancPath - 1
   Vining Sparks - 3
   Higgins Associates - 2
   Olson - 1
   Baker Group - 2

3. Any relevant comments regarding your experience with particular models, or preferences?
   Key R2M personnel have been involved in assessing accuracy of financial modeling for over 17 years in various capacities including ALM, bond portfolios, and bond and interest rate swap transactions. Our goal in each case was to determine if the model results were accurate and could be relied upon by management for short and long term interest rate risk forecasts
C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
(given the following somewhat arbitrary definitions, check all that apply)

____x____ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.

____x____ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.

____x____ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.

____x____ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

Other - see E1

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
   No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.
   Yes, we license our software, primarily BondRisk and SwapRisk and through related programs, to 14 different bond dealers and 2 ALM providers. Through the licensees, our calculation engines are used by over 600 different community banks on a monthly basis.

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?
   Yes, BankRisk, it is the model we use to perform the comparative analysis mentioned above.

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   We provide reviews of all pertinent assumptions, data accuracy, back testing and modeling soundness. Once the 4 areas mentioned above have been reviewed, our primary focus is providing a comparative sensitivity analysis by running our BankRisk model in parallel with the primary ALM model and trapping out all modeling discrepancies by individual balance sheet category and by assets and liabilities in total. If, in the review stage, certain important assumptions are perceived by R2M personnel to be inappropriate, we may question management on how they arrived at these assumptions, and often the consensus is that they need changing.

   Once changes are made and both models are rerun, we will compare the yield and cost sensitivity of individual asset and liability categories over 1 month, 6 month, 1 yr, 2 yr, and 5 year time horizons. Where significant discrepancies exist, R2M personnel will work with management and personnel at the primary ALM vendor to ascertain which model is correct, and then that model will be rerun. We do this until all substantial modeling discrepancies have been eliminated.

   We then go through the same thing for EVE calculations. Usually the process of fixing the yield and cost sensitivity issues will bring the EVE calculations substantially into line, but the possibility exists that some modeling calculation issues may impact EVE, but not expected yields and costs. We always find significant modeling errors on initial comparisons, and even where R2M has been retained to assess accuracy on an ongoing basis, there is often not
consistency in the primary ALM model due to changes in personnel at either the financial institution or the ALM provider, changes in market rates which impact refinancing probability, betas, etc.

It is our conclusion from this process that even with conceptually sound models, it is all but impossible even for the most knowledgeable and experienced consultants to “eyeball” an IRRM analysis and know whether, for instance, fixed commercial loans would be up in yield by 40, 60, or 80 basis points at up 2% shock scenarios over a 2 year time period, whether a step up agency will be called in 6 months or two years, and how significant early redemption risk is in the CD portfolio, but this type of analysis on all categories is critical to achieve accurate model results.

2. Do you take physical possession of the model for the assessment?
No, just the results

3. What specific model verification techniques do you use, and why?
Based on the results in E1 above, we may ask for principal cashflows for individual categories in all shock scenarios, early redemption methodologies on cd's, option and prepayment modeling in the case of bonds, and structured convertible, puttable, expandable FHLB advances, structured repos, etc, as well as cap/floor modeling on loans

4. What specific model value/forecast validation techniques do you use and why?
See E1, above

5. What are your specific model verification and validation deliverables
We deliver up to a 10 page comparative analysis which highlights model discrepancies, as well as an opinion letter, and if applicable, how the differences were resolved.

6. What quality assurance processes do you use?
See E1, above

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

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?
Improve the accuracy of the primary ALM and increase the confidence level of management and the board when considering short and long term risk management decisions

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
Yes, bond portfolio option and prepayment related methodology, refine (or even implement in some cases) more robust premium amortization routines for bonds, correct principal cashflow schedules on loans, incorporate periodic cap and floors loan and bond modeling, correct unlikely betas and decay rates for certain deposits, as well as betas for certain loan types, incorporate or amend early redemption penalties for CD’s, correct bank owned life insurance dividend yield expectations, etc.
3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
   Definitely, often they will rerun their primary model at least once and then ask us to do another comparative analysis.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits??
   Yes, as appropriate, and this is often the result of reviewing modeling.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   Yes, various state banking agencies, FDIC, OCC, NCUA, Federal Reserve.

2. What has been the feedback examiners have provided on your reports?
   Not a great deal of feedback but generally positive.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
   Yes, we would provide such things as individual item modeling, cashflows on an individual item of category basis, yield forecasting as needed, all calculations, all historical data and backtesting, Model Validation certificate.

H. OPEN-ENDED COMMENTS

On more than a dozen occasions over the last 6 months we have reviewed models that have been given the “all clear” by external auditors and independent consultants only a year earlier, only to find numerous categories mis-modeled and estimates of short and long term risk substantially different from what corrected numbers revealed.

A comparative analysis of yield and cost sensitivity and market value changes is a blend of quantitative and qualitative factors and ultimately requires a significant understanding of all items typically found in a bank or credit union balance sheet. We have never run a comparative analysis, especially the first time, where we did not find substantial modeling issues.

Often errors reflect a lack of understanding in the assumption setting process, but data accuracy and model conceptual soundness have also been found to contribute to inaccurate results. There are so many dials and so many ways that modeling can lose accuracy that we feel all financial institutions will benefit from a second opinion and a comparative analysis periodically.

In the past, we have been hired to ascertain why net interest margin declines have occurred when management/board expected a different outcome. Occasionally, there has been reluctance from the primary model vendor to provide the simple information needed to compare results, and thereby avoid scrutiny of its results. However, once the assumptions have been fully reviewed and the comparative analysis has been performed, bank or credit union managements and boards can have substantially more confidence in addressing perceived short and long term interest rate risk.
A. GENERAL INFORMATION

1. Vendor contact information
   Hugh Blaxall, President
   215.822.9097
   HBlaxall@VelliganBlaxall.com

   Brian A. Velligan, CEO
   610.526.1869
   BVelligan@VelliganBlaxall.com

   Velligan-Blaxall Consultants, LLC
   113 Rodney Circle
   Bryn Mawr, PA 19010
   www.VelliganBlaxall.com

2. Describe recent client base (charters, asset range, operating characteristics)

   VBC, LLC has a national reach and works with Banks and Credit Unions ranging from de-novos to institutions with multi-billion dollars in total assets. We have also consulted with institutions chartered abroad. We work with a large variety of institutions with different charters and ranging from strong earnings and low risk to others under financial stress or regulatory scrutiny.

3. Number of risk assessment clients over the past three years

   We have worked with over 100 institutions. We pride ourselves in our long term relationships and breadth of services provided.

4. Other relevant client characteristics

   For institutions that are looking to outsource their financial risk management our services are very attractive. These clients are looking to benefit from our wide experience and broad perspective as we bring an outside perspective and simultaneously help them manage their costs by avoiding hiring expensive experts on as full-time staff.

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)

   Fiserv  ALM 3.4
   Fiserv  Vantage Risk and Budgeting Manager V2.2
   ZMFS onlineALM 4.00
   ProfitStar V2011a.79
   Bancware Convergence ALM 4.7
   Risk Analytics ALM V5.6
   PALMS
   Financial Compass V8.3.30
2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?

(a) Fiserv ALM - 5  
(b) Fiserv Vantage – 2  
(c) ProfitStar – 5  
(d) Bancware Covvergence – 3  
(e) Risk Analytics ALM – 3  
(f) PALMS – 2  
(g) Financial Compass (Plansmith) – 1  
(h) Proprietary models - 5

3. Any relevant comments regarding your experience with particular models, or preferences

Most financial institutions we have worked with seem to select models relevant to their balance sheet composition and complexity more so than asset size. Others have “acquired” a model license through an acquisition and chosen to continue that contract.

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED

(given the following somewhat arbitrary definitions, check all that apply)

- Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
- Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
- Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
- Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.

No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

No

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

We offer outsourced ALM modeling using either:
Fiserv ALM 3.4
ZMFS onlineALM 4.00
E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

Our risk assessment process consists of three components, defined as “MAP” audit:

(a) Model Review (M) – this stage of the process is designed to obtain a comprehensive understanding of the entity and the model results/reports. Verify sample data sets, model setup, review and assess stress test scenarios. Assess compliance with internal policies, regulatory guidance and industry best practices.

(b) Assumptions Review (A) – during this stage we review and assess the operating environment, key assumptions employed in modeling, sources, validity, documentation and approval process.

(c) Process Review (P) – the final component of our MAP process reviews Board approved policies, Governance structure, internal control measures, procedures, skill level and training.

2. Do you take physical possession of the model for the assessment?

Not usually.

3. What specific model verification techniques do you use, and why?

Review model maintenance reports, frequency, authorization of account setup/definitions. Verify output and model calculations (samples based on materiality).

Objective is to establish consistency of methodology from one period to the other, stability of models, adequacy of control and documented procedures over models.

4. What specific model value/forecast validation techniques do you use and why?

Benchmark against market data (of liquid instruments or any publicly available data that are relevant and measurable).

Benchmark forecasts with Client internal actual results. Review loan/CD/Investment activity or originations to assess reasonableness and relevance of input assumptions and output results.

5. What are your specific model verification and validation deliverables

Include relevant exhibits with final report and executive summary. If a particular internal policy or regulatory requirement is not complied with, relevant and applicable documentation with recommendations will be included in an exhibit.

6. What quality assurance processes do you use?

In a word, experience. All of our associates have at least ten and some have over twenty years’ of real world experience with ALCO. The partners and most of our associates have been involved with ALCO for over fifteen years. We employ agreed upon procedures with each Client to ensure data integrity. Also to protect confidentiality, a secure website is available for Client data uploads, accessible only to authorized users. Data provided to our company will only be available to employees who work directly with the Client on a specific validation. Questions, answers, and test material are documented and maintained for reference.

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

Yes, as well as regulatory expectations as outlined in issued guidance.
F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?
   Compliance, industry best practices, relevance to the institution, materiality, effectiveness of measures employed, subjectivity and limitations of models.

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
   Yes. These would include alternative stress tests scenarios, including non-maturity deposit decay and repricing betas as well as prepayment speed stress tests. These are scenarios prescribed by the regulators.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
   Generally, yes, but it depends on the scope of the initial engagement. We are happy to help as long as the help does not produce a conflict.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits?
   Yes. The entire team started our careers working for financial institutions; specific duties included implementing, maintaining, and managing the ALCO process.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   NCUA, FDIC, FHFA, FRB, OCC.

2. What has been the feedback examiners have provided on your reports?
   In any contact we have received directly, their comments have been entirely positive. Their comments to our clients have also been very favorable.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
   Although the Partners have been providing this service at two firms for nearly fifteen years, we have never experienced a regulatory challenge. We have assisted clients with answering questions from regulators and found that the regulators were satisfied with our explanations. We have communicated directly with regulators via a conference call or discussed regulator questions with our clients so the client can provide the feedback to the regulator.

H. OPEN-ENDED COMMENTS

Our mission is to deliver the highest level of personalized service. We provide the best quality insights and analysis to position you for the future. Our aim is to be a long-term extension of your internal team and integral to your success.
When is an Outsourced IRR Analysis the Right Answer?

As noted in Part 1, most institutions hold balance sheets that are diverse collections of many financial instruments. Numerous types of assets and liabilities, with multiple re-pricing and maturity specifications, different driver rates, varying re-pricing limits, and often, embedded options, are represented. Because of the many contributing and often offsetting behaviors, projecting the earnings at risk and equity at risk outcomes for such balance sheets requires the use of an ALM simulation model.

However, an in-house ALM modeling solution, and its associated IRR analysis capability, have high costs that bear heavily on their benefits. As a result, many institutions choose to forego some benefits of an in-house ALM modeling solution (such as full control of analysis activities and an as-needed simulation capability) by outsourcing IRR analyses, the keystone regulatory and business output of any ALM modeling solution.

Outsourced ALM models normally have a cost advantage over in-house models because the expense of the model itself, and the fact that the supporting systems and staff can be allocated across a wide user base. A motivator of the recent increase in the popularity of outsourced model solutions is the desire to reduce such costs in an adverse economic climate.

While a small degree of new, indirect, alternate costs are incurred when outsourcing, namely more time spent coordinating production and ensuring forecast accuracy, these rarely offset the reduction in direct costs enjoyed.

Outsourcing is most effective when analyses are routine and require minimal manual customization, which is why outsource services typically run standard regulatory reports rather than business plans. In addition, outsourcing makes the most sense when model applications are simple and do not require significant interaction between the outsource provider and the institution.

When choosing an outsource solution, look at the provider first, and then at the ALM model being used. The same criteria you use for a purchased model should be used in reviewing an outsourced one, and thus a thorough review of Part 1 of this publication is advisable.

Whether outsourced approach is appropriate naturally varies from institution to institution. Below, we outline elements to consider in the decision.

**Magnitude and Sources of the Institution’s IRR**

The most obvious constraint on outsourcing IRR analyses is balance sheet complexity. Outsourced IRR analysis solutions have made great strides recently in producing more custom and granular IRR analyses. However, if an institution has a complex balance sheet, with many structured products, holdings with embedded options, and very unusual types of assets or liabilities, an in-house solution is probably required to properly model and forecast such instruments. Note that balance sheet size is an independent influence here. A large but non-complex balance sheet can also be a candidate for using outsourced IRR analyses.

**Baseline Earnings and Other Risk Positions**

A higher level of dependable baseline earnings and no undue exposures to capital, credit, liquidity, or other risk positions is often a sign that an IRR analyses produced by an outsourced provider may be appropriate. The reason is that a less hands-on third party IRR analysis solution is appropriate if a greater earnings cushion and fewer risks are present.

**Cost and Staffing Considerations**

An in-house ALM model requires a budget commitment for its initial cost and ongoing annual maintenance. The initial cost is normally significant and maintenance is not inexpensive. Outsourced IRR analysis solutions spread the expense of the underlying ALM model and its maintenance across a broad user base, reducing each institution’s required contribution.
Obviously, with an outsourced IRR analysis service model installation and supporting staff are not required. The provider’s staff sets up each client’s outsourced model in an efficient multi-user environment and mass-produce similar (but each one custom) IRR analyses. This reaps economies of scale.

Understandably, the recent gain in popularity for outsourced IRR analyses is in part driven by the desire to reduce costs in an adverse economic climate. Although a small amount of indirect costs must be incurred when outsourcing an ALM modeling solution, namely time spent coordinating information transfer and ensuring IRR analysis accuracy, these requirements often pale in comparison to in-house costs.

**Invoking Comparative Advantage**

Many institutions that could maintain an in-house IRR analysis capability have decided to outsource the function because financial staff formerly assigned to that area can be more productively employed doing other tasks. This recognizes the institution’s comparative advantage in better utilizing their staff expertise, another argument for outsourcing routine IRR analyses to a third party.

**Regulatory Mandates for a Quickly Implemented IRR Analysis Solution**

Implementing an in-house IRR analysis solution takes time. Frequently, however, there are instances where it is not feasible to obtain in-house produced IRR analyses quickly enough to meet regulatory mandates. In such a case, outsourced IRR analyses are the answer. After immediate needs are met, the decision to bring the IRR analysis solution in-house or keep it in an outsource mode can be made in a more studied and thorough manner.

**Institution Culture and IRR Analysis**

Institution culture can influence whether the optimal degree of commitment to IRR analysis is in-house or outsourced. Where upper management and the Board understand, trust and aggressively use ALM model outputs as a basis for financial decision making, IRR analyses should normally be more advanced and an in-house solution is favored. Where IRR analysis is viewed as primarily a regulatory mandate without significant business value, a less robust (but lower cost) outsourced IRR analysis solution is likely adequate.

In summary, the less innate IRR an institution has, and the simpler and less diverse sources of that IRR, the better fit it is for outsourced IRR analysis. In addition, the greater the baseline earnings, the more muted the risk positions, the greater the need to reduce budget costs and headcount, and the less the regulators pressure to obtain IRR tests quickly, the more likely an institution is a candidate for outsourcing.

Finally, an embedded management culture that views IRR analysis as primarily a regulatory compliance task, the better the outsource fit. Take a close look at your institution’s culture and situation, and decide.
A Framework for Choosing the Right IRR Analysis Outsource Provider

Choosing an IRR analysis outsource provider involves a more qualitative methodology than choosing an ALM model. A service (i.e. IRR analysis) is being purchased, and the quality dimensions of the relationship embedded in the service are key decision factors.

It is best to first establish the level of IRR analysis required, and then to choose a provider.

Establishing the Level of IRR Analysis Required

The benefits of an outsourced IRR analysis solution arise from its ability to quantify existing balance sheet holdings and forecast embedded earnings at risk and equity at risk positions. The key is to ensure that the level of outsourced IRR analysis produced meets the institution’s specific balance sheet complexity and regulatory mandates. A number of factors define the innate level of IRR analysis needed from outsourced IRR analyses.

Degree of capital leverage is a key determinant of IRR analysis needs. A lower capital-to-assets ratio puts a premium on accurately assessing and controlling risk. IRR analyses will need to provide more detailed and more precise insights if a lower capital position is present because more accurate projections of potential outcomes are needed.

Net interest margin (NII: interest income less interest expense) is another crucial determinant of IRR analysis need. Where NII is more limited, there is less of a cushion to changes in earnings. More precise understanding and control of balance sheet outcomes thus become more vital, increasing IRR analysis needs.

Degree and nature of IRR is a strong influence on the analytical level needed from IRR analysis. The mandate to precisely quantify and monitor interest rate related earnings and equity sensitivities increases with greater levels of IRR and when more (and more complex) IRR sources are present in the balance sheet.

Regulatory requirements are a defining element in determining the required level of IRR analysis. Generally, examiners look for IRR analyses that are appropriate in light of the institution’s balance sheet size and complexity, current IRR position, other risk exposures, and general financial management style. There is a definitive floor here, however: Any outsourced IRR analysis solution chosen must meet regulatory needs.

Institution’s ALM-related culture is also an influence on the level of required IRR analysis. Where upper management and the Board understand and trust ALM model outputs as a basis for financial decision-making, IRR analyses must be more advanced. Where IRR analysis is viewed as a regulatory mandate without significant business value, IRR analysis can be more generic and less timely.

The general guiding principle that can be drawn from the discussion above is that an outsourced IRR analysis solution needs to be more precise when risk exposures or special needs are greater.

Needs from an outsourced IRR analysis provider start high and rise quickly as basic regulatory mandates must be met first. Needs increase more slowly as the model addresses less vital needs. Eventually, the model’s incremental IRR analysis contributions are exhausted and the benefits curve flattens.

IRR analysis needs are rarely quantifiable. But the factors above can be combined with balance sheet information to obtain a sense of general IRR analysis needs. Self-grade your institution’s situation and establish a general (e.g. “low” versus “high”) need level.

At this point, let us assume that an outsourced IRR solution has been established as an acceptable choice for your institution. Let us also assume that you have developed a general sense of how powerful the outsourced IRR analysis solution needs to be. Let’s now consider how to make a decision on which outsourced IRR analysis solution provider to select.
Choosing the Right IRR Analysis Outsource Provider

The first cut that IRR analysis outsource providers have to make is that their analytical capabilities meet your institution's needs. That is, to be successful, an outsourced IRR analysis solution must be able to define and forecast your balance sheet's complete set of potential IRR related behaviors. This requires that for every asset and liability category, in every time period, and in every interest rate scenario, the outsource provider’s ALM model must be able to accurately define cash flow characteristics from underlying data, apply contractual inputs and behavior assumptions, and forecast IRR outcomes correctly.

Major elements to consider in your review of each provider’s capabilities follow.

**Re-pricing mismatch** is caused by all elements of the balance sheet due to the varying physical re-pricing opportunities present across categories. Re-pricing balances are input into an ALM model through its detailed downloads of maturity and re-pricing information from your institution’s underlying systems. Verify that these downloads can be readily done in the outsourced environment and that data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances. Also review how pricing is assigned for existing balances and how new balances entering future balance sheets can be defined. Manual data input and adjustments should be minimal.

**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 also be easily done in the outsource environment. It should be easy to assign amortization, option-related behaviors, decay, etc., to all balances. Again, verify that manual data input is minimal.

**Amount of re-pricing** for a given general interest rate change depends on each specific asset or liability category’s driver rate (the financial market rate that re-pricing is tied to), beta relationship (specified re-pricing that occurs for any given change in the driver rate) and any re-pricing lags (how fast re-pricing occurs) specified. Review how the outsource provider’s ALM model handles these behavior elements. Also, establish how categories with administered re-pricing, such as core deposits, are treated. Finally, confirm whether temporary teaser rates can be properly defined for IRR purposes.

**Embedded options** on both sides of the balance sheet are significant IRR sources. They create cash flow changes unique to specific interest rate scenarios and require special ALM modeling capabilities from outsourced IRR analysis providers.

Continuous option IRR influences (behaviors that take place over time in portfolios of financial instruments) derive from ongoing loan prepayments, most notably 1–4 family mortgages, mortgage-backed securities (MBS’s) and other mortgage-related categories. Consumer and commercial loans often also have prepayments. Decay (runoff) from existing core deposit balances and CD early withdrawals are liability side examples.

Many continuous options are non-contractual in nature (e.g. core deposit decay rates) or indirectly tied to their exercise through not always optimizing retail holders. The result is that existing contracts, other than national pool MBS investments, often foretell very little about how the options will behave. As a result, behavior assumptions depicting institution specific behaviors must be externally defined (based directly on institution history or that of a closely defined peer group). This is normally the institution’s responsibility.

The ALM model utilized to analyze IRR must have the capability of accepting category level, quantified behavior inputs for all relevant loan and deposit categories. Best practice solutions support inputs that are granular (by category), reset to new levels as interest rates evolve over time, and incorporate unique behaviors in each interest rate scenario. Thus, establish how outsource IRR analysis providers accommodate each type of behavior assumption relative to best practices. Providers of outsourced IRR analyses must permit control of these inputs by individual users, as the behaviors defined are intensely institution specific.

Caps and floors are a further source of continuous option IRR influence. Re-pricing limits (e.g., caps and floors) on existing balances normally come directly from system downloads, but be sure to verify this. Also, determine how new volume re-pricing limits are input.
Switch option IRR influences (behaviors that change at a specific time and interest rate level for unique financial instruments) are often encountered in the investment portfolio in the form of calls or puts on holdings. On the funding side, convertible FHLB advances are a common example. Likewise, CDs may include embedded options such as "bump up" features. Determine what the outsourced IRR analysis provider's capabilities are in these areas.

**Complexity risk** (option-related risk magnified by derivative structures) is found in collateralized mortgage obligations (CMO's) and other investments. Complexity risk is difficult to model correctly in IRR analyses without importing instrument level, scenario specific cash flows because behaviors are specific to individual instruments and vary uniquely in each interest rate path examined. Inquire how cash flows for such instruments are obtained and modeled in outsourced IRR analyses.

**Off-balance-sheet positions** (when present) are normally within the capabilities of outsourced IRR analysis providers. However, these positions can be complex enough to require the intake of specific cash flows or specialized advanced modeling. Review your institution’s off-balance-sheet holdings and investigate whether the provider has the IRR analysis capabilities that meet special needs.

### Meeting Your Institution’s Needs

The second cut that IRR analysis outsource providers have to make is that their IRR tests, program mechanics, cost, and general quality criteria meet your institution’s needs. Consider here the following areas for inquiry.

**IRR analysis testing dimensions** are essential. Determine what IRR test scenarios are available to the model (e.g. regulatory oriented rate shocks and linear rate ramps). Also, check whether non-linear rate tests that assess basis risk and specific yield curve shape changes are available. Establish the source of those scenarios and inquire if externally supplied non-linear IRR tests can be entered. Regulatory mandates now require more than just rate shock assessments, so be sure to establish these capabilities.

In equity-at-risk tests, review the methodology used to calculate present values, including how discount rates are established. A key issue relating to core deposits is whether non-interest expense inputs can be incorporated (best practice valuations can include this).

Stochastic valuation applications rarely add significant incremental accuracy. However, they do assess option values more accurately, especially in complex instruments. Inquire as to the outsourced IRR analysis provider’s capabilities in this area if it is relevant.

**IRR analysis program mechanics** are the day-to-day details that are important in the often long-term relationship represented by an outsourced IRR analysis service. These elements must be specifically and fully evaluated:

- How do you transfer balance sheet data, inputs, and assumptions to the IRR outsource solution provider?
- At what point and by who is the “run-ready” IRR model approved?
- How fast are IRR analyses provided after the final model is approved?
- How are completed IRR reports sent back to the institution?
- Who is responsible for IRR position quality assurance?
- If needed, how are reruns of a period’s report handled?
- Are their written guidelines for service users and provider staff?
- How are disputes remediated?

**Service cost, vendor condition, and current user references** are obviously key areas to review. The cost of outsourced IRR analysis is determined in competitive markets. Thus, you get what you pay for! Institutions with less complex balance sheets and less innate IRR, and with otherwise favorable conditions as outlined above, can obtain lower cost basis level analyses. For institutions in alternate circumstances, higher level (and more costly) services will be required.
At a general level, determine the business history and financial condition of the provider, number of current active clients, the history of recent deliverable enhancements, and the number (and location) of support staff available. Also, ascertain whether clients similar to your institution in terms of asset size, charter type and operating characteristics use the outsourced IRR analysis provider under review. Specific client references are valuable — inquire about program mechanics, delivery time, and report quality in particular.

**Final Comments on Choosing an IRR Analysis Outsource Provider**

The last cut that an IRR analysis outsource provider has to make is that the relationship being entered into fits with your institution's risk management culture. Technical quality of the IRR analyses delivered will be a foregone conclusion after the due diligence above.

However, also think about how closely the outsource service meshes with your institution's risk management process.

- Are reports available in time for the requisite Board meetings?
- Do the IRR position presentations meet the communication needs of ALCO and your Board?
- Are supporting IRR interpretation and education solutions available?
- Do you and your staff get along well with the provider’s staff?

The factors noted are obviously not quantitative elements, but outsourced IRR analysis is, first and foremost, a service, and the provider relationship will be important over the long term.
A. GENERAL INFORMATION

1. Vendor contact information
   ALM First Financial Advisors, LLC
   2911 Turtle Creek Blvd., Ste. 500
   Dallas, Texas 75219
   800.752.4628
   info@almfirst.com
   www.almfirst.com

2. Describe current outsource client base (charters, asset range, operating characteristics)
   Client charters include:
   • Federal Savings Bank
   • Federal Savings Association
   • National Bank
   • Savings Bank
   • Credit Union
   Assets range from $33M - $54B with majority between $100M - $8B

3. Number of outsource clients
   More than 180

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   8:00AM – 5:00PM CT

3. Number of support staff available
   8

4. Location(s) of the phone support function
   Dallas, Texas, USA

5. Web-based user support (enter “yes” or “no”)
   Yes
6. Other support characteristics as deemed relevant
ALM First personnel are available via corporate phones, web-based email, and VPN that allows them to connect to the ALM First network from any location.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT
1. Model name
   - ZMdesk 4.0
   - IPS-Sendero AL 3.4
   - Proprietary on-line what-if tool
   - ALM First On-Demand

2. Level and version
   - ZMdesk 4.0
   - IPS-Sendero AL 3.4

3. Last update
   - ZMdesk 4.0 – 4/30/13
   - IPS-Sendero AL 3.4 – 3/31/13

4. Do you also offer the model as an in-house solution?
   We can consult clients on how to set up these models.

5. What other vendor-provided financial management products interface with the model?
   ALM analysis, what-if analysis, MSR valuation, liquidity analysis, investment portfolio analysis

D. MECHANICS OF OUTSOURCE RELATIONSHIP
1. How are balance sheet data, inputs, and assumptions transferred to you?
   Clients upload data to data rooms on ALM First’s secure website.

2. At what point and by who is the “run-ready” IRR model approved?
   After a financial analyst has completed all quality control procedures and a Financial Advisor has reviewed the model and output.

3. How fast are IRR analyses provided after the final data is approved?
   For initial valuations, approximately 3 weeks. For subsequent analyses, under 10 business days.

4. How are completed IRR reports sent back to my institution?
   ALM First posts the reports in .pdf format on its secure website.

5. Describe your typical IRR client report.
The report presents results and assumptions for behavioral gap, 2-year net interest income simulation, and economic value analysis along with narratives that describe changes from previous analyses. Depending on the client contract, the report will include strategic advice for the balance sheet and/or investment portfolio.
6. Who is responsible for IRR position quality assurance?

The Financial Advisor is ultimately responsible for quality assurance while the Valuation Manager maintains centralized assumptions to be employed in the analyses and is responsible for auditing ALM analyses.

7. If needed, how are reruns of a period’s report handled?

The Financial Advisor will determine an acceptable timeline with the client and provide a revised analysis that satisfies the re-run criteria.

8. Are there written guidelines for service users and provider staff?

Yes

9. How are disputes remediated?

Any person receiving any verbal or written client complaint forwards the complaint to the ALM First Partners. If appropriate, the Partner will call the client directly as soon as possible or send an email within 10 business days acknowledging receipt of the complaint, indicating the matter is under review. The Partner will forward the complaint letter to the appropriate person(s) for research, review, and information to respond to the client.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?

Data are uploaded via a data management system, IPS-Sendero DMS into IPS-Sendero AL or via Excel into ZMdesk.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?

Yes. ALM First utilizes contractual data for repricing balances, and when data are unavailable, ALM First employs reasonable assumptions based on market research.

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?

The extent of manual input depends largely on the completeness and quality of the client’s data. Typically, ALM First finds that most clients are unable to provide all of the desired fields for modeling purposes.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?

Data is loaded at the loan level so it is very easy to assign. Manual input is only required when data is not provided.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?

ALM First can incorporate rate response coefficients, lags, and a variety of driver rates.
6. How are categories with administered re-pricing, such as core deposits, treated?

Sensitivity of the account rate to market rates is estimated by performing a regression on the account rate versus the effective Fed funds rate. The resulting beta coefficient provides a measure of how sensitive the institution is to changing their dividend rates due to changes in market rates.

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes

8. How does your model handle embedded options on both sides of the balance sheet? Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)? Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature…e.g. core deposit decay rates? How?

ZMdesk is a stochastic, option-pricing model that enables ALM First to value options through a rigorous methodology. Additionally, ALM First employs ZMFS’ 1st lien residential mortgage loan prepayment model in order to project prepayment speeds on various collateral types in conjunction with ALM First adjustments based on empirical data and market research. Moreover, ALM First uses empirical data and market research to apply projected prepayment speeds and early withdrawals to assets and liabilities.

Specifically for NMD decay analysis, ALM First calculates vectored decay rates based on account age for each NMD type and for base, rising, and declining rate environments. Balance changes are tracked for each account individually. Balance change and beginning balance are aggregated by age, and the weighted average monthly decay rate is calculated.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Existing balance cap and floors are loaded from client data. New volume repricing limits are input based on the client’s current offerings, or if the client is no longer offering the product, they are based on market data.

10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

ZMdesk’s option model employs logic to compute expected call dates based on economic incentives. Bump up features are estimated by analyzing historical client data and applying accordingly in various interest rate scenarios.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

ALM First applies prepayment speeds to Moody’s deal files for virtually all structured products.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

ALM First’s model is extremely flexible, and ZMFS claims that their calculation engine can model any instrument type. To date, there has not been an instrument that ALM First could not model with sophistication.
13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

Any IRR test scenario is available in our model. Typically, ALM First will provide instantaneous, sustained, and parallel rate shocks from -300 to +500 plus a few twisted yield curve scenarios in the standard deliverable; however, any IRR test scenario can be modeled for what-if purposes as the balance sheet necessitates.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

ALM First values interest-bearing assets and liabilities using rates derived from market sources, rather than an institution’s offer rates, when possible. For example, auto loans are valued by discounting projected cash flows at a secondary-market spread, which includes estimates for servicing costs, over swap rates. Moreover, the projected cash flows include assumptions for prepayments, which are based on historical data stratified by age.

15. Does your model include any type of stochastic valuation applications?

Yes. ZMdesk employs Monte Carlo simulation for pricing.
A. GENERAL INFORMATION

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

2. Describe current outsource client base (charters, asset range, operating characteristics)
   FARIN ALM clients include community-based financial institutions, commercial banks, thrifts and credit union charters.

3. Number of outsource clients
   56

4. Other relevant client characteristics
   Client Asset Ranges: $30 million to $10 billion
   Average Assets: $575 million
   Type of Institutions:
     Commercial Banks: 53%
     Credit Unions: 30%
     Thrifts: 17%
   Geographic Locations: 20 States

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   8:00am to 6:00pm Central Time

3. Number of support staff available
   7

4. Location(s) of the phone support function
   Madison, WI and Seattle, WA

5. Web-based user support (enter “yes” or “no”)
   Yes

6. Other support characteristics as deemed relevant
   FARIN offers an on-line support site with FAQs. We also 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.

Training is provided to the client according to their selected level of service.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name
   FARIN Foresight

2. Level and version
   5.2.17.2

3. Last update
   May 2013

4. Do you also offer the model as an in-house solution?
   Yes

5. What other vendor-provided financial management products interface with the model?
   FARIN’s iPrice Loan and Deposit Pricing system share many elements. Using our export function, clients link to other programs such as cost accounting applications, management reporting systems, mortgage servicing rights and credit risk assessment systems and more.

   FARIN’s Core Analytics (non-maturity core deposit study) results are loaded directly into the model.

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   The client uploads the data to our secured web site. The analyst then pulls the data down to work on.

2. At what point and by who is the “run-ready” IRR model approved?
   This is a collaborative effort between the client and the FARIN analyst. After the data is loaded into the model, reports are sent to the client to verify accuracy.

3. How fast are IRR analyses provided after the final data is approved?
   The normal turnaround time is 10 – 14 business days.

4. How are completed IRR reports sent back to my institution?
   The reports are placed on our secured server and the client downloads the report from there.

5. Describe your typical IRR client report.
   The report consists of a detailed Executive Summary including an overview of the analysis, charts, graphs and commentary. The report also includes detailed IRR and liquidity reports.

6. Who is responsible for IRR position quality assurance?
   The primary responsibility for quality assurance is the Senior Vice President of Client Care.
7. If needed, how are reruns of a period's report handled?
   If reruns of reports are needed, the Financial Analyst responsible for the client relationship completes the task.

8. Are there written guidelines for service users and provider staff?
   Yes, our guidelines are contained within the contract. In addition, clients are provided with a document outlining the processes.

9. How are disputes remediated?
   In cases of a dispute the client’s Financial Analyst is initially charged with resolving the dispute. If needed, the issue is escalated to the Senior Vice President of Client Care.

Farin’s outsourced services use the Foresight model. What follows are selected descriptions of that model. A full description of the model is included in the Farin portion of the In-House section of this book.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?
   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.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
   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.

F. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below
   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 used by the institution as any account in the model’s chart of accounts.
   ● Re-pricing 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 re-pricing and maturing balances for categories that have continuous and call/put embedded options
  Continuously callable instruments can be modeled using 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 separate items in FARIN Foresight and can be combined on any instrument as needed.

- Re-pricing 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, and caps. This information is used on existing positions to determine rates. For planned purchases, the overall account characteristics define the basic structure, and then assumptions on current rates, repricing rates, calls, etc., are handled as an assumption within the plan.

- Re-pricing 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.

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?
   No

3. Can the model effectively amortize discounts/premiums?
   Yes, 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.

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

G. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?
   Account-level pricing information can be entered by hand, through uploads or by creating a set of client-specific drivers.

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

3. How are pricing and re-pricing relationships defined and updated?

Pricing and repricing relationships must be handled in two discussions.

First, for the existing contracts such as adjustable-rate loans, FARIN offers two options. The data can be received on the loans during the import function or the client can 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 the offer rate can be set using a traditional spread/index relationship, or FARIN 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.

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

FARIN stores 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.

5. How does the model define re-pricing 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 forecasts 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.

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

FARIN supports 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. The 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.

7. 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, Foresight calculates 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.

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

Yes, all reports in the 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.

9. Can the model produce back tests of prior forecast and behavior assumptions?

Yes, the model has the capabilities to generate back testing reports detailing the variance amounts of prior forecasts and assumptions.

10. 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.

11. Does the model have stochastic forecasting capability? 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, setting a budget number for Net Income.

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.

12. 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.
H. OPEN-ENDED COMMENTS

A growing trend in ALM is the use of an outsource provider for ALM services. To meet this need, FARIN offers 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 the client to build a set of outsource services and reports as one would for an in-house solution. No compromises are required, and the client receives the custom solution they need for effective decision making and regulatory reporting.

FARIN Insight allows the client to securely access the 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, the client gets 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 FARIN staff acting as the client's back-office. With FARIN Insight, the client can take on the parts of the ALM process they feel equipped to handle, and then can have FARIN fill in the rest. When/if the client desires to move the model to an in-house environment, the installation is easy as the Insight service utilizes the same Foresight model offered as an in-house option, meaning there is no system conversion.

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.

The Insight solution is unique in its flexibility to meet client’s needs. The model can be configured in multiple ways to allow the client, if they want, access to the model to review and run reports, update assumptions and run forecasts.

As an integral part of the service, the FARIN analyst will conduct a detailed review of the quarterly report with the client.

Services are tailored to meet the client's 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 the 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.
A. GENERAL INFORMATION

1. Vendor contact information
   Brandon Baker, Product Manager
   ProfitStars®
   800-356-9099
   bjbaker@profitstars.com
   17110 Marcy Street, Suite 200
   Omaha, NE 68118
   Web: www.profitstars.com

2. Describe current outsource client base (charters, asset range, operating characteristics)
   Community banks and credit unions with assets ranging from $23 million to $1.8 billion.

3. Number of outsource clients
   82 (as of May 8, 2013)

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   Monday - Thursday, 7:30 a.m. to 6:30 p.m. CT
   Friday, 7:30 a.m. to 5 p.m. CT

3. Number of support staff available
   6

4. Location(s) of the phone support function
   Predominately in Omaha, NE. We do employ several staff members in other Jack Henry & Associates offices across
   the country.

5. Web-based user support (enter “yes” or “no”)
   Yes

6. Other support characteristics as deemed relevant
   We provide data file transfers via an encrypted FTP site.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name
   PROFITstar®

2. Level and version
   PROFITstar® Classic™, version 2012b.09
3. Last update
   March 29, 2013

4. Do you also offer the model as an in-house solution?
   Yes

5. What other vendor-provided financial management products interface with the model?
   • PROFITability® (FTP engine, organizational profitability, product profitability)
   • Portfolio Manager (CUSIP-level analysis of investments / borrowings)
   • PROFITstar Budget Manager (distributed budgeting system)

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   Our clients upload data files from their core processing systems to our encrypted FTP site.

2. At what point and by who is the “run-ready” IRR model approved?
   After the data is loaded and validated, the model is approved by the ALM analyst that is assigned to work with that particular client institution.

3. How fast are IRR analyses provided after the final data is approved?
   Analysis is provided immediately after data is approved. Our contractual delivery times range between 10 to 15 business days from receipt of all client data.

4. How are completed IRR reports sent back to my institution?
   We deliver PDF files via our encrypted FTP site.

5. Describe your typical IRR client report.
   Our full report set includes:
   • Executive summary of key risk measurement results vs. policy limits.
   • Brief commentary on current balance sheet changes.
   • Key historical ratios and financial management metrics vs. targets.
   • Projected key ratios and financial management metrics vs. targets.
   • Projected balance sheet results (base scenario, 12 and 24 month views).
   • Projected income statement results (base scenario, 12 and 24 month views).
   • Summarized balance sheet duration/EVE results.
   • Detailed balance sheet EVE results.
   • Summarized EAR results.
   • Detailed EAR results.
   • Analysis of projected net interest margin.
   • Comparison to peer results.
   • Repricing and maturity GAP results.
   • Documentation of assumptions:
     o Prepayment / decay assumptions.
     o Pricing betas and lags.
     o Fair value discount rates used.

6. Who is responsible for IRR position quality assurance?
   Manager of consulting services.
7. If needed, how are reruns of a period’s report handled?
   Immediately upon client request.

8. Are there written guidelines for service users and provider staff?
   Yes.

9. How are disputes remediated?
   We do not employ a mediator, we handle any disputes directly with our clients.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?
   PROFITstar can upload data files from any core processing system. Loans, investments, deposits, and debt
   instruments are read in at the instrument level. We do not use aggregated data or duration-based estimates.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
   Yes.

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets
   defined? How extensive is any manual data input and adjustments?
   Pricing for existing instruments is automatically downloaded into our model based on contractual terms for each
   instrument. Pricing on future originations is provided via a client input sheet and reconciled to recent originations.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization,
   option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input
   and adjustments?
   PROFITstar reads contractual cash flow characteristics and options at the instrument level via data files produced
   directly from the client’s core processing system. We seek to have no manual data input whatsoever.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and
   any re-pricing lag when re-pricing for a given general interest rate change?
   PROFITstar is able to assign a lag, beta, and a driver rate specific to each category and specific to each rate
   scenario. We also provide regression analysis used to support the beta and lag assumptions.

6. How are categories with administered re-pricing, such as core deposits, treated?
   The category is assigned a driver rate with assumptions for beta and lag specific to each rate scenario. All dollars in
   that category (new money and old money) reprice with the same characteristics.

7. Can temporary teaser rates be properly defined for IRR purposes?
   Yes.

8. How does your model handle embedded options on both sides of the balance sheet?
   Options are read at the instrument level.

   Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit
   categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories;
   consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)?
   Yes.
Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature...e.g. core deposit decay rates?

Yes.

How?

Our model allows for user-defined tables:

- Decay tables – three dimensions (rate scenario, time period, category type)
- Prepayment tables – five dimensions (rate scenario, time period, category type, coupon, vintage)

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Existing balances have caps and floors downloaded at the instrument level. New volume caps and floors are manually input at the category level.

10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

For investments, call features are entered at the instrument level. Model users can forecast an option to be exercised based on projected rate levels, based on projected instrument market values or as a binary action (call or no-call) at each scheduled call date.

PROFITstar can model convertible advances. It cannot model bump CDs.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

We utilize bond market data provided by Interactive Data’s BondEdge.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

PROFITstar can model interest rate derivatives by manually inputting the positions. PROFITstar cannot model income effects resulting from off-balance sheet loan portfolios.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

The mandated regulatory immediate and permanent shocks as well as non-parallel scenarios are available. Non-linear tests can be entered into PROFITstar manually. The model cannot import externally supplied non-linear tests.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

For investments, we rely on estimated shocked market values provided by Interactive Data’s BondEdge. For loan instruments, we build a curve of rates for each loan category derived from the ABS and MBS secondary markets. For deposits and borrowings, we build a curve of rates derived from wholesale funding resources such as FHLB advances and swaps.

15. Does your model include any type of stochastic valuation applications?

Not currently.
When rates change, earnings shift. What does that mean to your bottom line? Financial institutions need to manage their risk threshold by creating "what if" simulations of forecasted financial statements, assess liquidity and interest rate risk, satisfy board and examiner risk sensitivity, as well as provide regular reporting to the Board and ALCO. PROFITstar ALM Reporting Service provides you with the expertise and resources to manage and monitor this risk and deliver the analysis you need, allowing you to spend more time implementing strategies and less time on analytics.

With more than 25 years of industry experience and expertise, our team works with you to create a focused strategy based on your needs. We require no hardware, no license agreement, and no ALM expert on staff within your organization. ProfitStars’ team of trained experts will get you up and running by producing a series of reports and insights about your clients, officers, products, chart of accounts, and more – all with a minimal resource commitment from you. Let ProfitStars help you succeed in today’s market by freeing your time to focus on other critical business tasks.

ALM Reporting Service product brochure:

ALM Reporting Service - basic level fact sheet:

ALM Reporting Service - custom level fact sheet:

1st Financial Federal Credit Union case study:
http://www.profitstars.com/CaseStudies/PSCS_ALM_FirstFFCUV2.pdf

Farm Credit Services of Mid-America press release:
http://www.profitstars.com/PressReleases/PSPR_FarmCreditServices.pdf
A. GENERAL INFORMATION
1. Vendor contact information
   R2Metrics Inc
   6930 Cahaba Valley Road, Suite 201
   Birmingham, Alabama 35242
2. Describe current outsource client base (charters, asset range, operating characteristics)
   All banks and credit unions $50 million to $3 billion in asset size
3. Number of outsource clients
   > 600 banks and credit unions monthly through the calculation engine provided through BondRisk/SwapRisk, about 20 banks use BankRisk on a quarterly basis

B. OUTSOURCE SUPPORT PROGRAM
1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes
2. Hours during which phone support function operates
   24 hours a day 7 days a week
3. Number of support staff available
   5
4. Location(s) of the phone support function
   Birmingham, AL
5. Web-based user support (enter “yes” or “no”)
   Yes
6. Other support characteristics as deemed relevant
   Email and iPhone support

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT
1. Model name
   Proprietary in house models including BondRisk, BankRisk, SwapRisk, Comparative Sensitivity Analysis, Liquidity Stress Testing, etc
3. Last update
   All models are continuously updated and enhanced
4. Do you also offer the model as an in-house solution?
   Yes
5. What other vendor-provided financial management products interface with the model?
   IPS Sendero

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   Via email files or share file

2. At what point and by who is the “run-ready” IRR model approved?
   CEO -- Dan Matheson

3. How fast are IRR analyses provided after the final data is approved?
   Depends on product – BondRisk/SwapRisk 5-15 minutes, BankRisk 24 hours

4. How are completed IRR reports sent back to my institution?
   Via email, sharefile, or by mail services

5. Describe your typical IRR client report.
   BankRisk (including 10 page loan details similar to BondRisk) 55 pages, BondRisk 30-35 pages, SwapRisk 8+ pages, Comparative Sensitivity Comparison 11 pages, Liquidity Stress testing 5 pages

6. Who is responsible for IRR position quality assurance?
   All employees are responsible but primarily the CEO and President

7. If needed, how are reruns of a period’s report handled?
   As many as are needed to get accurate answers

8. Are there written guidelines for service users and provider staff?
   Yes

9. How are disputes remediated?
   We will always do what the client wishes. If the client is unhappy with the analysis, they will not have to pay for it.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?
   Bond portfolio thru bondrisk engine which works with bond accounting information provided. All other information is downloaded into a pre-processing excel spreadsheet. R2M personnel will assist in mapping all categories, fielding questions, etc.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
   Yes, it is customized on an item by item basis.

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?
   Questions 1 and 2, at an applicable yield/swap curve plus an applicable spread. Manual data is usually minimal and once the financial institution is “set up” subsequent modeling runs are usually 95% automated.
4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?

The program allows for extensive customization in all the relevant categories mentioned above. Amortization, option related behaviors, and decay rates can be assigned to individual balance sheet items or by categories. Manual data input averages about 20% of the total time needed to populate the needed fields.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?

Driver rates are specific to each category and the model allows for lag vectors with 3 shifts.

6. How are categories with administered re-pricing, such as core deposits, treated?

Betas and decay rates are assigned by management with collaboration and questions as needed from R2M personnel.

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes, all items are discounted using applicable swap rates plus/minus a spread so the teaser rate is a part of that calculation.

8. How does your model handle embedded options on both sides of the balance sheet?

All optionality is modeled in the most precise way possible but for many loan and some bond categories the best one can do is approximate. Periodic and lifetime caps and floors on loans are handled with option pricing routines from a market valuation perspective. Bond portfolio analytics are extremely sophisticated with yield forecasts that adjust for changes in mortgage speeds and average lives, yield maintenance prepayment modeling, call probability, amortization/accretion expense, floating coupons, periodic and lifetime caps and floors. Many difficult to model bonds are also modeled with OAS methodology such as step up agency bonds. Our bond portfolio calculations are used by over 600 banks/credit unions monthly, and by one substantial ALM vendor and one smaller ALM provider. Our bond swap analysis is relied upon by 12 bond dealers. Decay rates, betas, time lags, and early redemption issues are also captured on deposits in a robust fashion.

Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)?

Yes to all above categories.

Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature….e.g. core deposit decay rates? How?

Yes, model can define runoff characteristics and resulting average lives for deposits including surge balance reversal as well as customized prepayment speeds, reinvestment rates, and betas for deposits and loans, as well as early redemption modeling on an individual CD basis.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Periodic and lifetime caps and floors is a field in the data download. How are new volume re-pricing limits input? New volume can be input as floating with periodic and lifetime caps and floors, which can be adjusted up or down with the interest rate scenario.
10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

Calls and puts are modeled in bonds as well as other balance sheet categories where they would be relevant, such as structured repo, callable cds, and certain FHLB structured products. On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features? Convertible advances employ option pricing methodology and “bump up” features are modeled by net present value discounting. All balance sheet items can use a customized option methodology to depict option related risk in at least an approximate sense.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

Through various third parties. If the client does not have a data source, R2Metrics has a third party vendor that will supply that information, and it will be a small add-on to the cost of the analysis.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

We routinely model interest rate caps, floors, swaps, and swaptions and the firms CEO has over 23 years of experience in derivative trading, modeling and hedging applications.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

Shocks, ramps, forward rates, forward rate shocks, and customized scenarios are all available.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

New/replacement volume discount rates are provided by management and reviewed by R2M personnel as needed. R2M personnel construct a “swap” curve which adjusts these rates for the term involved. Where these rates are significantly different than observed market rates, R2M personnel will alert management that these rates may not be realistic for valuation purposes, but management has the ultimate call.

15. Does your model include any type of stochastic valuation applications?

We use OAS and option pricing methodology for certain balance sheet items to estimate values and cashflows, but stochastic analysis would have to be specifically requested by the client.

F. OPEN-ENDED COMMENTS

Our model is extremely flexible as literally all aspects of the model can be customized. R2M personnel are heavily and routinely involved on a day to day basis with modeling new and unusual financial structures, primarily in the bondrisk space. This experience makes it highly likely that any modeling challenges on loans, deposits, advances etc, can be addressed so that outcomes are at least reasonably accurate, and often there is no precisely accurate solution. R2M personnel are also routinely involved in explaining and defending methodologies to bank management, boards, regulators, and other applicable parties.

R2M personnel also provide ALM and IRRM consulting services, and not only measure interest rate risk but also craft independent market based hedging solutions to reduce or eliminate unwanted long or short term interest rate risk. We believe we are a “low cost” provider of IRRM modeling services, and we believe our turnaround times are extremely fast once all data has been gathered. We will rerun reports based on changes in assumptions until the client is completely satisfied with the results.
A. GENERAL INFORMATION

1. Vendor contact information
   Cindy Watson, Managing Director
   Sterne Agee & Leach, Inc.
   800 Shades Creek Parkway, Suite 775
   Birmingham, AL 35209
   Phone: 205.271.6234
   E-mail: cwatson@sterneagee.com
   Web: www.sterneagee.com

2. Describe current outsource client base (charters, asset range, operating characteristics)
   Asset range: $40 million to $11 billion
   Average Assets: $725 million
   Types of Institutions: Commercial Banks, Thrifts and Credit Unions
   Geographic Location: 32 states

3. Number of outsource clients
   125

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   M-F 8:00 a.m. – 5:00 p.m. CST

3. Number of support staff available
   8 ALM Analysts

4. Location(s) of the phone support function
   Home office - Birmingham, AL

5. Web-based user support (enter “yes” or “no”)
   Yes

6. Other support characteristics as deemed relevant
   Our ALM Analysts provide a variety of services such as evaluation, training and development of strategies for managing interest rate risk (IRR) and enhancing profitability. The analysts are also available to present at ALCO/Board meetings either in person or via teleconference.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name
   ZMdesk
2. Level and version
   Version 4.0

3. Last update
   May 2013

4. Do you also offer the model as an in-house solution?
   No

5. What other vendor-provided financial management products interface with the model?
   BondAdvisor, our fixed income analytics report that measures and reports all relevant security characteristics, including price risk measures, yield variability, and cash flow volatility.

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   Clients supply all data through Sterne Agee’s secure web upload portal. Instrument level detail is gathered through data extracts from the institution’s core processor. Files are accepted in CSV, Excel, and a variety of other fixed-width formats. In the initial setup, an analyst works closely with the client to interpret the data. The files are then processed through an in-house software application that transforms the information into a format that is compatible with ZMdesk. Assumptions are documented in a spreadsheet and provided to the client for updating. Each institution is assigned a specific ALM analyst that will work with them every period to help build an accurate and reasonable set of assumptions.

2. At what point and by who is the “run-ready” IRR model approved?
   The institution’s current position, data files, other interest-bearing assets and liabilities, and assumptions are loaded into ZMdesk by its assigned analyst. A base scenario is then processed in ZMdesk and reviewed for accuracy and reasonableness. Questions that arise at this point are discussed with the client and if changes are required the base scenario is processed and reviewed again. Given an acceptable base forecast, all scenarios are processed and a completed report is produced. The completed report is reviewed and approved by both a Senior and Supervisory ALM Analyst. If issues arise at this point, they are again discussed with the client and if changes are necessary all scenarios are re-processed and a final report is produced.

3. How fast are IRR analyses provided after the final data is approved?
   2 to 3 business days

4. How are completed IRR reports sent back to my institution?
   Client is prompted by email to retrieve completed report from Sterne Agee secure portal

5. Describe your typical IRR client report.
   **SABER (Sterne Agee Bank Earnings Report)** includes five-year dynamic and static forecasts of the institution’s Balance Sheet, Income Statement, yields and various key ratios. IRR is measured with Net Interest Income Simulation, Economic Value of Equity Analysis, Re-pricing Gap and Duration Analysis. Scenario analyses includes +/- 100, 200, 300 and 400 basis point rate shocks plus 4 nonparallel interest rate scenarios. Additional scenarios are available upon request. A liquidity analysis includes static liquidity ratios, a cash flow gap and stress tests simulating core deposit runoff and reductions in available borrowing capacity. Back testing for the previous quarter and year are included in each report. A peer group comparison of key profitability, liquidity, balance sheet and capital ratios is provided. Assumptions are documented in a detailed and organized format. A high level Executive Summary is included for use in ALCO/Board meetings. Detailed documentation of the IRR measurements is included in the report. SABER is regularly updated to remain compliant with regulatory guidance as well as evolving client needs.
6. Who is responsible for IRR position quality assurance?

The systems and controls utilized in our process are reviewed annually by Certified Public Accountants to ensure their suitability and effectiveness. This review is documented in a SSAE 16 Report.

7. If needed, how are reruns of a period’s report handled?

Client simply informs assigned analyst of the need for a rerun via email or phone. Changes are made and report is rerun.

8. Are there written guidelines for service users and provider staff?

We have a well defined process designed to promote accuracy and efficiency. It is verbally communicated to the client at the beginning of the relationship.

9. How are disputes remediated?

On technical issues we always default to industry best practices. Other issues are worked out between the client and analyst.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?

The client extracts loan and deposit data from its core processor and submits via Excel, CVS or fixed-width files. We interpret and transform these files into a ZM compatible format through an in-house software application.

With regards to fixed income securities, the client provides an extract from their bond accounting that includes Cusip, current par, market price, book price and intent (AFS/HTM) for each instrument. Using these inputs, ZM extracts Cusip level information from our data provider to produce cash flows. FHLB Borrowings are modeled manually in the software based on the FHLB Advance Summary Report provided by the client.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?

Yes, the model uses instrument level detail with the ability to consider different indices, spreads, period and lifetime floors and caps, re-pricing frequencies, and re-pricing dates on existing and new volume balances.

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?

Pricing for existing instruments is obtained directly from the data extracts. The client provides new volume rates/spreads via the assumption spreadsheet which they update for each report. These assumptions are manually entered in the chart of accounts spreadsheet that is imported into ZM by the analyst. The chart of account master spreadsheet contains numerous automated controls and validations that enhance accuracy and efficiency.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?

Maturity points, amortization and option-related behaviors on existing instruments are included in the data extracts from the client’s core processor. This information for new volume instruments is manually entered in the chart of accounts by product type and imported into ZM by the analyst.

Core deposit decay rates are assigned using either client-specific studies or peer averages. In the chart of accounts, core deposit model lines are assigned a decay table according to product type, asset size, and urban vs. non-urban attributes based on data from McGuire Performance Solutions. Manual input is primarily limited to other interest-bearing assets and borrowings.
5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?

Yield curve changes as defined by each scenario and re-pricing betas drive the level of change in rates for each asset/liability. Since the model is capable of parallel and non-parallel rate scenarios, it uses the corresponding index to determine the magnitude of the change. Given a change in the key driver rate (e.g., Fed Funds Target), the interest rates on re-pricing and new balances will adjust in each scenario according to the beta and re-pricing lags specified by the client in the assumptions. For example, in a +100 bp rate shock scenario, the interest rate on a MMDA account with a 40% beta and a 1 month lag will rise 40 bps in the second month of the forecast.

6. How are categories with administered re-pricing, such as core deposits, treated?

The client provides current rates, betas and re-pricing lags by product type. These are defined in the chart of accounts accordingly.

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes

8. How does your model handle embedded options on both sides of the balance sheet? Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)? Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature….e.g. core deposit decay rates? How?

The model accepts provider defined and institution specific prepayment speeds, decay rates and early CD withdrawal assumptions.

Our version of ZM interfaces with a third party provider for MBS/CMO/Residential loan prepayment speeds. LPS Applied Analytics, our source for these assumptions, provides prepayment speeds that consider collateral level characteristics as well as current mortgage spreads to determine the most appropriate prepayment speed. All non-mortgage loan categories utilize customized prepayment tables which may be defined by the client.

For core deposits we utilize industry peer decay rates provided by McGuire Performance Solutions. The peer groups are based on institution type, asset size and urban vs. non-urban attributes. The decay rate tables are built within ZM and assigned by product type in the chart of accounts.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Re-pricing limits on existing balances are modeled at the instrument level. The rates on adjustable instruments move accordingly in each scenario based on the index, spread and beta within the defined limits. New volume re-pricing limits are manually entered in the chart of accounts by product type and handled in the same manner.

10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

Our system is very capable of modeling complex instruments. For callable bonds and convertible borrowings, the model stochastically calculates the OAS using a Monte Carlo simulation and the client-provided market price in order to determine the call/conversion dates. If the present value of cash flows is greater than the call price, the bond is called. Otherwise, the model continues to step forward to each successive call date until the bond is either called or matures.
11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

For MBS/CMO principal payment projections, ZM interfaces with Intex Solutions, Inc. for deal cash flows whose prepayment speeds are supplied by LPS.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

We have comprehensive analytical ALM software that is able to model complex off-balance sheet instruments when provided the necessary data.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

SABER includes the regulatory oriented stress test rate shocks of +/- 100, 200, 300 and +400, plus two steepening and two flattening yield curve scenarios. Linear rate ramps and additional non-linear rate scenarios are available upon request. The client can also create their own user-defined scenarios for modeling.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

Securities - Market prices are sourced from the client’s bond accounting file and/or our data provider. The OAS (option adjusted spread) is calculated versus the appropriate curve (Libor, Treasury, etc.) and is held constant in each scenario. It is then added to the discount curve for each instrument in each scenario and used as the basis to determine present value.

All other instruments - A spread/OAS or market yield provided by the client is used to formulate the discount curve (can be a custom curve such as FHLB in addition to the standard LIBOR or Treasury curves).

15. Does your model include any type of stochastic valuation applications?

ZM utilizes a Monte Carlo simulation to determine the OAS. The calculation is determined using probability weights over multiple rate paths. The method for determining the OAS aids the model to best pinpoint the most likely receipt of principal cash flow in each unique scenario.

F. OPEN-ENDED COMMENTS

As a provider of ALM services for banks, thrifts and credit unions, we focus on providing a valuable management tool which meets supervisory expectations for sound IRR management. With our extensive experience and resources, we assist in the process of measuring, monitoring and managing IRR. We perform the complex and time consuming work of managing data and software while you focus on managing the assumptions and interest rate risk.

ZMdesk is a robust and comprehensive ALM tool which can handle an unlimited amount of balance sheet growth, pricing and rate scenarios. Our SABER Report is a well organized and easy to understand presentation of your interest rate risk profile that includes both high level summary data targeted at ALCO/Board members and granular details targeted at management and examiners. Our experienced ALM Analysts will review SABER with you and your ALCO/Board members.

Sterne Agee has been the American Bankers’ Association preferred strategic alliance partner for Asset/Liability Management since January 2011.
A. GENERAL INFORMATION

1. Vendor contact information

   Jeffrey Caughron
   Associate Partner
   The Baker Group LP
   1601 Northwest Expressway – 20th Floor
   Oklahoma City, OK 73118
   jcaughron@gobaker.com
   800-937-2257
   www.gobaker.com

2. Describe current outsource client base (charters, asset range, operating characteristics)

   Community-based financial institutions, primarily banks and credit unions, ranging in size from $50mm to $3billion

3. Number of outsource clients

   575 across 38 states

4. Other relevant client characteristics

   C-corp and S-corp community banks, both metropolitan and agricultural. Also natural person credit unions.

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)

   Yes

2. Hours during which phone support function operates

   M-F 8am – 5pm, CST

3. Number of support staff available

   17

4. Location(s) of the phone support function

   Oklahoma City, OK, Austin, TX, Springfield, IL

5. Web-based user support (enter “yes” or “no”)

   Yes

6. Other support characteristics as deemed relevant

   Online training tutorials and webinars

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name

   Interest Rate Risk Monitor® (IRRM)
2. Level and version
   Version 4.0 (Release 6)

3. Last update
   2013

4. Do you also offer the model as an in-house solution?
   Yes

5. What other vendor-provided financial management products interface with the model?
   Advanced Portfolio Monitor (APM), a proprietary bond analytics package, and Investment Portfolio Accounting (IPA).

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   A data extract file is provided to the client that is unique to their data processor and which pulls all necessary data from the GL including balance, rate, amortization, re-pricing, cap/floor characteristics, option dynamics and maturity data, among others. Simultaneously, investment portfolio data flows through IPA and APM, then into IRRM. Certain supplemental data input including YTD income, expense, taxation, gains/losses, etc. is manually entered.

   Behavioral assumptions such as pricing betas, time lags, and prepayment propensities are developed in consultation with the client regarding the unique characteristics of the bank, its business model, market area, and customers.

   Reports are back-tested annually and assumptions reviewed and adjusted whenever deemed appropriate.

2. At what point and by who is the “run-ready” IRR model approved?
   By the Baker interest rate risk analyst assigned to the client and the Baker account representative.

3. How fast are IRR analyses provided after the final data is approved?
   Variable depending on balance sheet. Normally 2-3 weeks.

4. How are completed IRR reports sent back to my institution?
   Per client’s desire: Downloadable or email

5. Describe your typical IRR client report.
   IRRM reporting is extremely flexible and report batches are unique to client’s desires. Normally clients may request a 10-12 page executive summary for ALCO purposes, a 30 page Management report with greater detail, and a full report that may contain 120 - 250 pages depending on the size and complexity of the balance sheet.

   Additionally, specific examiner report batches are designed with greater detail on assumptions input, back-testing, and trend analysis. These reports may be 50 – 100 pages in length depending on the size and complexity of the balance sheet.

6. Who is responsible for IRR position quality assurance?
   Each client is assigned an IRRM analyst and a Baker representative. These two individuals, along with support from the financial strategies group (consisting of 9 additional strategists) review reports and offer interpretation and analysis.

7. If needed, how are reruns of a period’s report handled?
   Additional simulations or reports with alternative scenarios, stress tests, assumptions, etc. are run routinely per the client’s request.
8. Are there written guidelines for service users and provider staff?
   Yes… the “Introduction and Overview of the Interest Rate Risk Monitor®” among other documents.

9. How are disputes remediated?
   Reports are checked and cross-checked by the IRRM analyst, Baker Rep, and financial strategies group. Communication with clients is documented, and specific modeling requests are noted in the software itself. This documentation may be referred to whenever necessary.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?
   Through the data download described above. For loans and liabilities, a data extract file unique to the client’s data processor pulls all necessary data from the GL including balance, rate, amortization, re-pricing, cap/floor characteristics, and maturity data among others. Simultaneously, investment portfolio data flows through IPA and APM, then into IRRM. Certain supplemental data input including YTD income, expense, taxation, gains/losses, etc. is manually entered.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
   Yes

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?
   Each asset and liability is modeled per the structure of the instrument with respect to re-pricing cash flows. Book yields and rates are pulled from the data processor, re-investment rates are input per the client’s instruction, and standard present valuation methodology determines fair value pricing. Investment prices are pulled directly from APM where market pricing is accessed via multiple third-party sources. Dynamic re-pricing cash flows for investments are modeled in APM and pulled into IRRM. After initial setup, manual input is limited to a quarterly supplemental data-input sheet asking for YTD income and expense data, plus changes to re-investment rates and projected levels for loan loss reserves, non-interest income and non-interest expense.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?
   All maturity and cash flow information is pulled directly from the data download. This includes book balances, yields, rates, amortization characteristics, options, decay rates, caps, floors, etc. In most cases, there is no necessary manual input after initial setup.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?
   Each asset and liability is assigned a unique rate shift sensitivity (beta) for each different rate scenario. Also, each instrument is assigned a unique time lag for each rate scenario. IRRM models rate changes (and therefore fair value changes) per the interaction of rate change, shift-sensitivity, and time lag. These behavioral assumptions are applied to the re-pricing cash flows to produce changes in income/expense, and fair values.

6. How are categories with administered re-pricing, such as core deposits, treated?
   Each core deposit is modeled with a unique set of maturity distribution percentages and/or decay rates across time buckets. Rate shift assumptions (betas) and time lags are also applied as unique inputs for each instrument and for
each rate scenario. The exact decay rates or maturity distribution percentages are designed to reflect the unique characteristics of the bank based on historical depositor behavior. These NMD assumptions are also stress tested annually for each client. The driver rate for NMD is the 1yr FHLB advance rate (a proxy for replacement cost).

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes

8. How does your model handle embedded options on both sides of the balance sheet? Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)? Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature…e.g. core deposit decay rates? How?

For investments, all option-related behaviors (including both explicit and embedded options) are modeled in the APM where high level cash flow dynamics are performed. For loans, a unique prepayment speed is assigned for each category across each rate environment. Similarly, re-pricing behavior and balance fluctuation for core deposits are modeled uniquely across each rate scenario. Additionally, re-direction of cash flows may be modeled to show the effect of disintermediation trends corresponding with rate changes.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

These are modeled exactly as they are structured to govern the re-pricing of the instrument.

10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

Investments with options (both explicit and embedded) are modeled in APM and the resulting cash flow dynamics are imported into IRRM. Option features are modeled per the structure of the instrument including strike yield and date. Rate differentials between the current market and book rate determine whether the option is in the money. FHLB advances are modeled per the structure of the instrument.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

Cash flow dynamics for investments with options (explicit and embedded) are modeled in APM and the resulting dynamic cash flow are imported into IRRM.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

Off-balance sheet instruments are modeled and reported differently depending on the type, structure, and complexity.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

All required regulatory scenarios are available in IRRM. Rate shifts, instantaneous shocks, stress tests may be modeled per desired magnitude, normally up to 400bps. Yield curve simulations are also completely flexible. Short versus long rate anchors are defined by the user (10yr v 1yr, 5yr v 6mo, etc.). Short rates may be modeled to go up by a greater or lesser amount than the long rate, and everything inbetween is interpolated to simulate flattening or steepening scenarios.
14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

Standard present valuation methodology is used to calculate fair values and fair value changes including the fair value of equity. Book yields and rates are pulled from the client’s data processor via the extract file. For all assets and liabilities, discount rates are the unique re-investment rates for each instrument. The single exception is non-maturity deposits which have a driver rate set equal to the one-year FHLB advance rate (which is considered a replacement cost).

15. Does your model include any type of stochastic valuation applications?

Stochastic inputs may be incorporated, though the model does not generate random probabilistic inputs.

F. OPEN-ENDED COMMENTS

This easy-to-use software allows Asset/Liability Managers to efficiently determine the bank’s interest rate risk to net interest income and equity. IRRM reduces regulatory and accounting burdens by providing reliable SFAS 107 calculations, “what if” interest rate risk management simulations and an accurate process for projecting the bank’s future profitability.

IRRM enables you to better manage the future impact of changing interest rates on your institution’s profitability and equity position. Specific program functions include:

- Projected profitability and volatility of equity capital under various balance sheet and interest rate scenarios
- Measurement of price volatility for the entire balance sheet including modified duration, effective duration and convexity
- Projected balances and yields per account for 12- and 24-month budgeting purposes
- Comparative changes in net interest income and interest expense under nine different rate shift scenarios
- Monitored asset mix and profitability—both ROA and ROE—over integral rate shift horizons up to 24 months
- Incorporation of embedded options such as principal payments, decay rates, life caps, periodic collars and reset frequencies for all assets and liabilities
- An unlimited number of simulation analyses
- Unlimited historical data storage
- An unlimited number of accounts

IRRM allows your bank to comply with regulatory and accounting requirements by providing critically important management information.

- GAP analysis and Rate Sensitivity Measures
- Net Interest Income Change analysis
- Market Value of Equity (MVE) analysis for SFAS 107
- Balance Sheet Effective Duration and Convexity

IRRM provides reports and charts in unique and logical formats that may either be printed or displayed for ALCO meetings and board presentations with data including:

- Data may be downloaded from Baker’s portfolio accounting system, APM and other data processing sources to improve your bank’s reporting efficiency
- Monitors performance versus ALCO defined benchmarks
- Unlimited batch report lists in any output order
- Easy to use Windows-based application
- Full graphic presentations using integrated reports, charts and graphs
- Printed reports in black/white or color

IRRM operates on any PC that meets minimum hardware and software requirements. See us for current specifications.

*The Baker Group, LP is the sole authorized distributor for the products and services developed and provided by The Baker Group Software Solutions, Inc.
Velligan-Blaxall Consultants, LLC
www.VelliganBlaxall.com

A. GENERAL INFORMATION

1. Vendor contact information
   Hugh Blaxall, President
   215.822.9097
   HBlaxall@VelliganBlaxall.com
   Brian A. Velligan, CEO
   610.526.1869
   BVelligan@VelliganBlaxall.com
   Velligan-Blaxall Consultants, LLC
   113 Rodney Circle
   Bryn Mawr, PA 19010
   www.VelliganBlaxall.com

2. Describe current outsource client base (charters, asset range, operating characteristics)
   VBC, LLC has a national reach and works with Banks and Credit Unions ranging from de-novos to institutions with multi-billion dollars in total assets. We work with a large variety of institutions with different charters and ranging from strong earnings and low risk to others under financial stress or regulatory scrutiny.

3. Number of outsource clients
   About 100.

4. Other relevant client characteristics
   For institutions that are looking to outsource their ALM reporting and consulting our services are very attractive. These clients are looking to benefit from our wide experience and broad perspective as we bring an outside perspective and simultaneously help them manage their costs by avoiding hiring expensive experts on as full-time staff or even license an ALM model.

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes.

2. Hours during which phone support function operates
   M-F 9:00am – 7:00pm Eastern Time.

3. Number of support staff available
   8

4. Location(s) of the phone support function
   Pennsylvania.

5. Web-based user support (enter “yes” or “no”)
   No.
6. Other support characteristics as deemed relevant

VBC prides itself in that we provide customized service to each of our clients. We don't require your data or process to fit our mold; we tailor our service to meet the needs of your institution. This philosophy is part of our motto.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name
   Fiserv ALM (Formerly IPS-Sendero).
   onlineALM (from ZM Financial Systems).

2. Level and version
   3.4 (Fiserv/Sendero).
   4.0 (OnlineALM ZMFS)

3. Last update
   Spring 2013.

4. Do you also offer the model as an in-house solution?
   No.

5. What other vendor-provided financial management products interface with the model?
   Depending on the model selected, ADCO prepays, Intex Investment cash flows, IDC or Moody's/Markit data for investments.

D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   VBC maintains a secure SSL FTP website to upload client data files.

2. At what point and by who is the “run-ready” IRR model approved?
   The client is provided with a draft run of the reports and, after review, there is an iterative process that incorporates any changes discussed in order to produce a final copy.

3. How fast are IRR analyses provided after the final data is approved?
   There is a turnaround for the client's results of within two weeks.

4. How are completed IRR reports sent back to my institution?
   VBC maintains a secure SSL FTP website to download reports and information.

5. Describe your typical IRR client report.
   Typically, a report package includes two files in pdf format. One report is generally 20-30 pages and contains higher level reports for review by committees and boards. The other report contains supporting detail and can run 200-300 pages.

6. Who is responsible for IRR position quality assurance?
   On VBC's end, several staff cooperate on the modeling process of each client. As expected by the regulators, the client is fully-involved in the production process, including a full telephone review of the final draft of each report. This includes a quality control process to ensure that changes and new assumptions are implemented as expected.
7. If needed, how are reruns of a period’s report handled?

If a client requests a re-run, it can usually be handled very quickly once the request is made. Then, the re-run is provided to the client for further review.

8. Are there written guidelines for service users and provider staff?

Yes. For each client, VBC maintains guidelines and agreed upon procedures for review by the client, their auditor, other VBC staff, or regulatory bodies.

9. How are disputes remediated?

VBC does not allow discussions to grow into disputes. Any questions or concerns are of utmost importance to us and are discussed together until a satisfactory resolution is achieved.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?

Data feeds from the client’s core systems are utilized and generally processed at the instrument (product) level through the model. This best captures the individual characteristics of each instrument processed (i.e. reprice date, caps, floors, and other similar options).

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?

Yes. This information can also be pulled in using the data files from the client’s core systems.

3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?

Any information on existing balances is pulled in from the client’s data files. Future balance sheets may be built within the model or copied in from an outside source, but always at the direction of the client. Manual entries are kept to a minimum to ensure data integrity and avoid “human error”.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?

All cash flow and maturity information is directly imported or generated using the client’s data files. All option-related behaviors, decay, etc. can be easily handled within the model and with minimal manual input.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?

All of these items are set up initially as part of the implementation process with the client and can be changed at the client’s direction at any time.

6. How are categories with administered re-pricing, such as core deposits, treated?

Repricing assumptions are discussed with a client upon implementation and can easily accommodate a wide range of repricing behaviors.

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes, teaser rates can easily be modeled.

8. How does your model handle embedded options on both sides of the balance sheet? Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)? Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-
contractual in nature….e.g. core deposit decay rates? How?

Yes, all of these items can be handled by the model. Each category or account has unique parameters for prepayments, decays, etc. that can be modeled on an account or an instrument-level, whichever is most appropriate. These characteristics are developed with the client at the implementation (starting) phase of the relationship.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Existing and new volumes may be assigned caps or floors from the client’s downloads or input directly into the model, at any level, at the client's request.

10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

All embedded options can be handled by the model, including convertible advances, bump-ups, calls/puts, etc.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO's) and other investments?

Most investment information is obtained through a third party source such as Bloomberg L.P., which then allows the model to calculate cash flows. When necessary, cash flows from various third party systems can be utilized as overrides, particularly for CMO’s and other structured investment products.

12. What is your model's IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

Many off-balance sheet positions can be handled within the model, including Caps/Floors/Corridors, both current and forward starting, and loan servicing income.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

The model can generate and handle any of the common ramp and shock scenarios, as well as non-linear rate tests, such as non parallel yield curve shifts, forward curves, etc. In addition, any client-specific scenario, based upon market information or simply a client “what if”, can also be easily modeled.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

There are a variety of valuation discounting methodologies available. Discount rates and discount indices are discussed with the client upon implementation. During each subsequent modeling period, these components are updated using a combination of client input and published industry averages.

15. Does your model include any type of stochastic valuation applications?

Yes, stochastic valuations are available to any clients who wish to utilize them.

F. OPEN-ENDED COMMENTS

Our mission is to deliver the highest level of personalized service. We provide the best quality insights and analysis to position you for the future. Our aim is to be a long-term extension of your internal team and integral to your success.
A. GENERAL INFORMATION

1. Vendor contact information
   Sheri Davis (800)829-0321 x 5844
   sdavis@viningsparks.com

2. Describe current outsource client base (charters, asset range, operating characteristics)
   Banks and Credit Unions ranging in asset size from $25 million to greater than $3 billion.

3. Number of outsource clients
   360

B. OUTSOURCE SUPPORT PROGRAM

1. Toll-free, phone-based user support (enter “yes” or “no”)
   Yes

2. Hours during which phone support function operates
   8am to 5pm CST

3. Number of support staff available
   9 analysts and 4 strategists

4. Location(s) of the phone support function
   Vining Sparks' home office – Memphis, TN

5. Web-based user support (enter “yes” or “no”)
   Yes

6. Other support characteristics as deemed relevant
   Analysts provide one-on-one phone consultation as needed regarding data and assumptions. Strategists are available to review the report output with the customer, their ALCO or their board.

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT

1. Model name
   Risk Manager

2. Level and version
   3.75

3. Last update
   March 31, 2013

4. Do you also offer the model as an in-house solution?
   No
D. MECHANICS OF OUTSOURCE RELATIONSHIP

1. How are balance sheet data, inputs, and assumptions transferred to you?
   Customer data files may be emailed to us, submitted via our secure FTP or submitted via a client's secure site.

2. At what point and by who is the “run-ready” IRR model approved?
   Data is reviewed by the analyst when received by the customer. Assumptions are entered into the workbook by the client, and reviewed by the analyst for reasonableness.

3. How fast are IRR analyses provided after the final data is approved?
   Once the data is received, the client can expect to receive the assumptions workbook within 7 business days. Once we receive the completed workbook back, the client can expect a report within 7 business days.

4. How are completed IRR reports sent back to my institution?
   The completed report is sent in a .pdf format via email. Also included with the final report is a set of detailed Excel spreadsheets containing the model output used to create the final report.

5. Describe your typical IRR client report.
   The typical Risk Manager report contains IRR and EVE analysis covering 16 rate scenarios. Each report includes a set of “Standard Scenarios”. The Standard Scenarios assume no growth and utilize a Parallel Shock +400 and -300. The report also includes a set of “User Scenarios”. The client is able to define the parameters of this portion of the report. This may be parallel or non-parallel, shock or ramp, +400 and -300.

6. Who is responsible for IRR position quality assurance?
   We work closely with the client to ensure we are modeling the entire balance sheet in a manner that most accurately reflects the institution’s position.

7. If needed, how are reruns of a period's report handled?
   If needed, the customer relays the request and necessary changes to their assigned analyst.

8. Are there written guidelines for service users and provider staff?
   While there is not a written user’s manual for the clients, we do provide various written informational documents which explain our approach to specific areas of the model. The staff does maintain written guidelines specific for each institution to ensure consistency in the model from period to period.

9. How are disputes remediated?
   Any disputes or concerns that arise are discussed between the client and analyst to determine the appropriate course of action.

E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution’s underlying systems?
   The institution’s loans and deposits are standardized into appropriate sub groups. All detail information including maturity, and re-pricing information is interfaced directly into the model.

2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
   Yes
3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?

Existing pricing is based on actual data. The client provides new pricing information assumptions in the input workbook. Each individual loan and deposit category has its own pricing components.

4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?

Maturity details for each loan and deposit are interfaced into the model from the customer’s data files. Option-related behaviors for loans and deposits are defined by the customer using a prepay speed per scenario. Investment cash flows are imported into the Risk Manager model from Vining Sparks’ internal bond analytic models and are scenario specific, taking into account amortization, calls, etc.

5. How does your model handle a specific asset or liability category’s driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?

Prime is the driver for the model. Rate shifts for all rate scenarios are generated based on all criteria listed above. The beta relationship, lags and general interest rate change are incorporated for each rate shift scenario for all indexes used in the model.

6. How are categories with administered re-pricing, such as core deposits, treated?

Core deposits are assigned their own index based on their beginning rate. The rate movement for each deposit type is calculated using customer provided betas.

7. Can temporary teaser rates be properly defined for IRR purposes?

Yes. Isolating specials into their own account allows us to manage rate movement.

8. How does your model handle embedded options on both sides of the balance sheet?

Embedded options are analyzed per scenario.

Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS’s], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)?

Yes.

Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature….e.g. core deposit decay rates?

Yes.

How?

Prepays and betas will handle most of this. If a client has a unique item on their balance sheet, we have the capability of modeling the behavior manually, based on our communication with the client.

9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?

Existing re-pricing limits are included in the customer’s raw data and interfaced into the model. New volume re-pricing limits are input by the client into an assumptions workbook and are uploaded into the model.
10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings?

The majority of these instruments are in the client’s investment portfolio and are managed within the scenario cash flows from our investment feeds.

On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as “bump up” features?

On the funding side these instruments are usually unique and we discuss the behavior with the client and arrive at a strategy for handling. Many of these involve manual adjustments in all scenarios to mirror the expected behavior.

11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO’s) and other investments?

Cash flows for all investments are obtained from Vining Sparks’ internal bond analytics model.

12. What is your model’s IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?

Risk Manager has the capability to handle off-balance sheet positions. The customer and analyst discuss the behavior and best approach to modeling these positions. As with other unique instruments, many of these involve manual adjustments in all scenarios.

13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?

A typical report may be parallel or non-parallel, shock or ramp. We have the capability to run alternate scenarios using yield curves defined by the customer. The curve to be used is often determined through conversations between the client and strategist. To model specific anticipated balance sheet activity the customer may model growth at the general ledger account level.

14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?

Investment EV is obtained from Vining’s internal bond analytic model. The discount rate for loans is the new volume rate provided by the customer. Deposits are priced against the swap curve.

15. Does your model include any type of stochastic valuation applications?

No

F. OPEN-ENDED COMMENTS

The Risk Manager system has been designed to give our clients a tool for measurement of the various risks to the balance sheet without the overhead and expense of maintaining an in-house solution. The system is easy to use, but powerful enough to give the answers you need. Simulations are processed using information from your securities portfolio, FHLB advances, detail loan, deposit and general ledger files combined with industry norms and supplemental information from management. This data is processed each quarter using your assumptions for rate changes and balance sheet composition to give you a very high level of flexibility in the Asset/Liability measurement process.
Choosing the right IRR analysis outsource provider is the start of your commitment. However, it's only the start. Your selection must include a certified accurate ALM model as the basis for producing your IRR analyses. Over time, there is the need to affirm that your institution’s specific model implementation maintains a high level of forecast accuracy. Doing this requires a periodic review of the model and its analyses, something now recognized in regulatory guidance and typical ALM policy mandates. The section below examines this need.

Model Risk Concepts
ALM models used in IRR analysis are complex systems that require a significant level of data and ever-changing institution-specific contractual inputs and behavior assumptions. Because of their ongoing upkeep requirements, ALM models tend to collect errors and omissions over time. As a result, ALM models can drift into a state of low forecast precision that creates model risk, which is defined as making a wrong decision based on inaccurate model outputs.

Model risk is a business concern because it can lead to lost earnings and unforeseen risks. In addition, it is a regulatory concern because poor financial decisions can potentially impair capital.

The business and regulatory mandates are clear: Control model risk. To achieve this goal, ALM models used to produce IRR analysis must be formally assessed on a periodic basis. Such a review in its broadest form has four components. The first is conducted by the IRR analysis outsource provider. The last three (which relate to the institution specific ALM model used for the analyses) are your responsibility, the service user.

1. Model Certification. The fundamental capability of the model to correctly address balance sheet data and produce accurate projections – the “model math” – must be affirmed by an independent third party expert. The certification of excellence is your assurance that the ALM model used is an accurate IRR analysis tool.

2. Model Verification. Technical elements of the model used for your institution have the basic capacity to produce accurate IRR forecasts. The model verification process includes effective challenges and assessments of model data, setup attributes, contractual inputs, behavior assumptions, and reports.

3. Model Validation. Confirmation of model forecasts compared to expected category behaviors given their contractual terms and embedded options is required to prove that the model actually produces accurate IRR analyses.

4. Model Governance. Finally, the model must be supported by an appropriate set of user controls, policies and procedures. The solution is unique to each institution and it can be assessed in that context apart from the IRR analysis itself.
Evaluating IRR Model Risk Assessment Providers

There are multiple dimensions of assessing the institution specific model risk embedded in an outsourced IRR analysis. As a result, model risk assessments must be detailed and multifaceted. Simple checklist reviews of data and basic model inputs are not sufficient.

However, how does one ensure that a proposed, more encompassing model risk assessment is adequate? Below are discussions of underlying issues and criteria to consider in evaluating potential solutions, oriented around the sources of model risk.

Assess the Provider’s Independence
Regulators hold the independence of an IRR model verification provider as an essential qualifying point, and so should you. Questions to ask the provider are:

1. Is the provider connected in any way with, or does it receive payments from, the IRR analysis model vendor? If yes, is this compromised independence important to your institution?
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 compromised independence important to your institution?
3. Does the provider offer an outsource IRR model solution that competes with your outsourced IRR analysis provider? If yes, is this potential compromise of independence important to your institution?

Evaluate the Provider’s Model Experience and Expertise
Value added content in an IRR model verification comes from enhanced 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 IRR 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 IRR models like yours has the provider provided? What models have they assessed?

Review the Provider’s Model Risk Assessment Process
IRR models are multi-faceted, and as such, model verifications need to address all dimensions of model risk. Questions to ask the provider are:

1. Why is the provider’s model risk assessment process defined as it is?
2. What specific model technical verification techniques are used and why?
3. What specific model value/forecast validation techniques are used and why?
4. What are the specific model verification and validation deliverables?
5. What quality assurance processes does the provider’s production process use?
6. Are industry standard and best practices defined in the deliverable?
Consider the Provider’s Model Risk Assessment Report Deliverable
An IRR model verification is a consultative process. Thus, the deliverable needs not only to assess model risk, but also to recommend responses to model areas in need of upgrade. Questions to ask the provider are:

1. What is the conceptual or theoretical reason for each report element?
2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some examples?
3. Can the provider assist your institution in implementing the model enhancements and refinements from the verification report?

Determine Acceptance of Provider’s Model Risk Assessments by Regulators
The business related aspects of an IRR model verification should be its primary value, but there is no question that regulatory compliance needs to be a vital element in the final deliverable. Questions to ask the provider 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?
3. Does the provider offer assistance if regulators challenge the report? Specifically, what types of support are provided?

Obtain References from Recent Model Risk Assessment Clients
The IRR model verification provider needs to be your partner through the project, and references are your best way to gauge the degree to which this will happen. Questions to ask the provider are:

1. Can the provider provide references from recent clients with your institution’s asset size, charter type and general operating characteristics?
2. Ask the references about report quality and content, delivery timing and the quantity and quality of staff. Finally, ask them to share any internal audit or regulatory responses to the report.
A. GENERAL INFORMATION

1. Vendor contact information

ALM First Financial Advisors, LLC
2911 Turtle Creek Blvd., Ste. 500
Dallas, Texas 75219
800.752.4628
info@almfirst.com
www.almfirst.com

2. Describe recent client base (charters, asset range, operating characteristics)

Client charters include:
• Federal Savings Bank
• Federal Savings Association
• National Bank
• Savings Bank
• Credit Union

Assets range from $33M - $54B with majority between $100M - $8B

3. Number of risk assessment clients over the past three years

Approximately 20 per year

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)

- ZMdesk
- IPS Sendero AL
- PROFITstar
- Brick & Associates ALM Software
- ALM Software employed by First Empire, Baker Group, DCG, FTN, and Catalyst Strategic Solutions
- QRM
- SunGard Bankware
- Fiserv Wisdom
- C Myers
- Risk Analytics (FIMAC)

2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?

For a majority of model validations, ALM First performed a parallel analysis for a client without knowing their model level and version. ALM First only knows the model level and version when we are contracted to opine on the model.
C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
(given the following somewhat arbitrary definitions, check all that apply)

_____ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.

____x____ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.

____x____ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.

____x____ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
   
   No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

   No

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

   Vendor software:
   ZMdesk 4.0
   IPS-Sendero AL 3.4
   Proprietary NMD model

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   Patterned after guidelines as described in regulatory bulletins, ALM First’s risk assessment process provides a sophisticated analysis of a depository institution’s interest rate risk by applying rigorously developed methodologies from experienced financial professionals to some of the most technologically advanced analytical models.

2. Do you take physical possession of the model for the assessment?

   No.

3. What specific model verification techniques do you use, and why?

   ALM First performs a thorough data scrub at the instrument level in order to identify, note, and offer suggestions for incomplete, missing, and inconsistent data. Furthermore, ALM First analyzes the model setup, inputs, and assumptions at the account level in order to opine on best practices. From a reporting perspective, ALM First ensures that the ALCO and board receive the appropriate amount of analyses while also vetting that the risk modelers adequately document and test assumptions and are separated from the risk takers at the firm based on industry best practices, regulatory guidance, and cost/benefit.
4. What specific model value/forecast validation techniques do you use and why?

ALM First performs a parallel ALM analysis in order to determine how much the client’s forecasted balance sheet instrument behaviors differ from market expectations from a behavioral gap, NII and economic value perspective. Through the parallel analysis, ALM First can identify anomalies in projected income and value in order to drill down to the assumptions or model limitations causing the issue.

5. What are your specific model verification and validation deliverables

ALM First provides a written overview followed by specific observations that are intended for consideration by the institution from a best practices and cost/benefit of implementation perspective that addresses modeling inputs, assumptions, and methodologies, strengths and weaknesses of the ALM model, content and format of reports, and documentation and controls related to the ALM process. Moreover, ALM First provides a non-maturity deposit analysis, executive summary, behavior gap analysis, NII analysis, economic value analysis, and a personal presentation of findings.

6. What quality assurance processes do you use?

With respect to quality assurance, in conjunction with each ALM analysis, the analysts update a procedural checklist along with a summary report that includes items like, but not limited to, incomplete data, modeling assumption modifications, account stratification changes, and sources for non-interest items. The Valuation and Risk Analytics Manager reviews all ALM reports. The Valuation Manager maintains the centralized assumptions to be employed in the ALM analyses along with all relevant market data that were utilized to derive the assumptions while the Director of Development and Analytics reviews the assumptions and their source data monthly for reasonableness.

Additionally from a quality control perspective, analysts meet weekly to discuss ALM methodology. Regular training sessions for analysts are held on ALM topics such as modeling, assumptions, and banking products. The Valuation Manager audits ALM reports on a monthly basis and provides modeling and data handling suggestions to the analysts. Most centralized templates are password protected to prevent accidental manipulation. Moreover, most folders are password protected so that only analysts on the team can access the data and reporting tools.

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

Yes. ALM First believes that they follow industry best practices from an ALM perspective. ALM First believes that their approach and software are industry-recognized and above standard in nature.

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?

1) ALM Narrative
2) ALM Analysis
3) Modeling Inputs, Assumptions, and Methodologies
4) ALM Model
5) Reports
6) Documentation and Controls
2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?

Yes. Some sample comments:

1. No re-price dates are provided for any of the unsecured lines of credit loans, adjustable home equity loans, and adjustable mortgage loans. It is recommended that the re-price dates be provided to get more accurate cash flows.

2. Structures for adjustable loans are not provided. It is recommended that period caps, floors, and re-price spreads are included in the model to capture the true structure of the loans and therefore produce more accurate results.

3. Original terms and remaining number of payments are not provided for adjustable rate accounts. It is suggested the original term or the number of payments remaining is included in the loan file for proper calculation of maturity dates and to ensure cash flows are being placed in the correct time periods.

4. The lifetime floor for HELOCs listed in the rate file is higher than the book rate. It is recommended the lifetime floor be more correctly aligned with the average rate of the account.

5. Based on the client attribute report, the financial institution does not use prepayment speeds for auto loans and home equity loans, ALM First recommends that the financial institution use prepayment speeds for these accounts.

6. Based on the attribute report provided by the financial institution, there is a disconnect between the account type and the secondary market spread being applied. It is recommended the financial institution reassess and be more consistent when applying secondary market spreads. For example, no secondary market spreads are used for the majority of new and used auto loans but a secondary market spread is used for indirect lending new vehicles.

7. A few mortgage loans are incorrectly grouped based on the term and product code provided in the loan file. Also, the original terms for some mortgages do not correlate with the payment frequency provided in the loan file. For example, a 15 year fixed mortgage that pays bi-weekly should not have the same original term as a 15 year fixed mortgage that pays monthly. It is recommended the original terms of bi-weekly mortgages be correctly assigned.

8. The payment frequency for all investments is set to monthly. The payment frequencies for agency fixed, agency callables, foreign bonds, and treasuries should be set to semi-annually in A/L Sendero, ALM First recommends the client get prices from a direct pricing source if possible.

9. Bump up certificates should be modeled slightly differently in A/L Sendero to account for individuals taking advantage of the onetime rate increase. If such data are not available, internal assumptions could be used and applied using overrides in the A/L Sendero model.

10. It is recommended that, where possible, the financial institution discounts loans according to a term structure of interest rates (yield curve) rather than at a single rate. Discounting along a curve assigns a unique rate to each cash flow based on that cash flow’s remaining term, while using a single rate applies that specific rate to all cash flows. A yield-curve discounting approach is more accurate, especially for instruments such as mortgages, whose cash flows are sensitive to interest rate changes. Along with asset accounts, this yield-curve discounting would also apply to non-maturity deposits and certificates of deposits which could utilize the appropriate FHLB curve.

11. Running the model in different rate environments (ramped scenarios, twisted scenarios, different shock scenarios etc.) on occasion can highlight areas of balance sheet risk and income risk not captured in the normal, parallel shocks.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?

Yes.
4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits?
   Yes.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   Yes. NCUA, FDIC, and OCC.

2. What has been the feedback examiners have provided on your reports?
   No issues – exceeds regulatory requirements.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
   Yes, we support our client’s education about our methodology and the analysis before, during, and after the completion of the risk assessment. We are available for conference calls and on-site visits in order to serve our clients.
A. GENERAL INFORMATION

1. Vendor contact information
   Dan Shumovich, Principal, Risk Advisory Services
   McGladrey LLP
   515 South Flower Street, 41st Floor
   Los Angeles, California 90071
   Phone: 212.330.4668
   E-mail: Dan.Shumovich@mcgladrey.com
   Web: www.mcgladrey.com

2. Describe recent client base (charters, asset range, operating characteristics)
   McGladrey LLP is the 5th largest accounting, tax and consulting firm in the United States. Financial institutions
   compose one of the largest industry segments for the Firm, with approximately 1,500 clients served nationwide,
   ranging in size from $50 million to in excess of $10 billion in total assets. Primary services delivered to financial
   institution clients include financial statement audit, tax assistance, enterprise risk management, internal audit,
   regulatory compliance, bank secrecy act/anti-money laundering, loan review, Sarbanes-Oxley/FDICIA, information
   technology controls/security, valuation and process improvement, among other areas.

   Specific experience performing interest rate risk and asset/liability modeling reviews includes financial institutions
   ranging in size from $50 million to $4 billion in total assets, who perform interest rate risk and asset/liability modeling
   in-house, or through the use of an outsourced third-party provider. Our clients are regulated by the OCC, the FDIC,
   the Federal Reserve, the NCUA, as well as various state regulatory agencies.

3. Number of risk assessment clients over the past three years
   McGladrey has performed approximately 150 interest rate risk and asset/liability modeling reviews over the past 3
   years for financial institutions ranging in size between $50 million and $4 billion in total assets.

4. Other relevant client characteristics
   McGladrey’s experience in delivering interest rate risk and asset/liability modeling reviews has included a variety
   of complex and non-complex financial institution balance sheets, including commercial, consumer and foreign
   institutions characterized by varying levels of embedded balance sheet risk and off-balance sheet instruments.

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   The Baker Group
   Farin & Associates, Inc.
   Fiserv, Inc.
   FTN Financial
   Plansmith Corporation
   PROFITstar
   Sendero
   The Darling Group
   Pacific Coast Bankers Bank
   Mike Higgins & Associates
2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   Approximately 100 in the last 2 years.

3. Any relevant comments regarding your experience with particular models, or preferences?
   All models and service providers have shared characteristics and seek to accomplish common goals with their modeling approach and reporting. We apply the Interagency Standards as the basis for our model validation services and independent analysis. We then customize our approach based upon usage and risk characteristics of each individual institution, as well as the modeling approach and vendor solution in place.

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
   (given the following somewhat arbitrary definitions, check all that apply)
   
   ______ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
   
   ______ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
   
   ______ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
   
   ______ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE
   1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
      No.

   2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.
      No.

   3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?
      No.

E. RISK ASSESSMENT PROCESS
   1. How would you describe your model risk assessment process?

      We perform an independent evaluation of the interest-rate risk and asset/liability management model in place at the financial institution within the context of Interagency Standards. The scope of our procedures includes a review of the board of directors’ oversight and management’s responsibilities as they relate to the financial institution’s IRR/ALM environment, as well as a review of the IRR/ALM modeling process, including the appropriateness of the use of the model, data supporting model inputs, the model input process and model output reports. We rely on management-provided financial information, existing policies and procedures, internal control descriptions and industry standards in performing our procedures. Specifically, we rely on The Joint Agency Policy Statement on
Interest Rate Risk, the Advisory on Interest Rate Risk Management, the Interagency Advisory on Interest Rate Risk Management Frequently Asked Questions and the Supervisory Guidance on Model Risk Management as the basis for conducting our independent reviews.

2. Do you take physical possession of the model for the assessment?
We generally only interact with the model with the assistance of management to ensure their understanding and agreement with any information obtained from, or updated within, the model.

3. What specific model verification techniques do you use, and why?
Our process involves obtaining/viewing all key assumptions and significant inputs to the model, and comparing these items to source documentation maintained by management. We will also evaluate the reasonableness of these items in comparison to regional and national trends.

4. What specific model value/forecast validation techniques do you use and why?
Our process involves obtaining and reviewing model output reports and comparing the projections contained within these reports to the financial institution’s actual operating results over both short and long-term horizons. As part of this process we also update the simulation for variances in key inputs and significant assumptions known to take place during the year in order to determine the ultimate impact of these variances on the model output reports. Finally, we evaluate model output reports for directional consistency given the composition of the financial institution’s balance sheet as of the measurement date.

5. What are your specific model verification and validation deliverables
Our deliverable is a comprehensive report which documents the background and scope of our testing, any issues, observations or recommendations identified and management responses to the foregoing, as applicable. Specifically, our report focuses on the following areas:

- IRR/ALM policies and procedures;
- Corporate governance related to IRR/ALM, including review and approval of IRR/ALM policies, procedures, model assumptions and model output reports;
- Follow-up to any comments and/or criticism received related to IRR/ALM in communications from regulatory agencies, internal auditors or others;
- Model certification(s) provided by the model vendor;
- The conceptual soundness of the model, including documentation supporting model inputs and assumptions;
- Confirmation that the model has been appropriately implemented and is being used, and is functioning, as intended;
- The integrity of IRR/ALM inputs and assumptions;
- IRR/ALM model output reports and overall model performance;
- Back-testing and the validity of the modeling process and key inputs and significant assumptions;
- Sensitivity testing and inputs and assumptions that have a strong influence on model output;
- Customization of the vendor model, if any;
- Staff training and knowledge of the IRR/ALM model; and
- Compliance with internal policies and procedures relating to use of the IRR/ALM model.

6. What quality assurance processes do you use?
All fieldwork and reporting for our IRR/ALM procedures are performed by dedicated financial institution specialists. In addition, our Firm’s national presence ensures that we have experience with the national and regional economic and regulatory concerns impacting the financial institution. All testing and deliverables related to our IRR/ALM procedures are ultimately reviewed and signed by a partner or director specializing in this topic area.
7. Are industry standard and best practices defined in your deliverable?

Yes. Our reports not only identify areas of regulatory and policy non-compliance, but also include observations and recommendations based on industry standards and best practices.

F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?

The conceptual framework for our reports is taken from applicable regulatory guidance addressing interest rate risk, asset/liability management and model risk management. Our reports mirror the regulators' increasing focus on these areas in recent examination cycles.

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

Yes. We feel it is important to prioritize findings and best practice recommendations to ensure that our clients are aware of the significance of these items, as well as the internal and/or external costs of remediation and compliance.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?

Yes. We are always available to assist clients in understanding, addressing and responding to observations and recommendations included in our reports. However, we have to avoid making decisions on behalf of management or acting in a management capacity, as this could impair our independence.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits??

Yes. One of the primary components of our validation process is the evaluation of internal control and reporting structures surrounding the ALM/IRR process. This includes a comprehensive review of applicable policies and procedures to ensure that expected levels of monitoring and control are present. We also evaluate risk limits in comparison to both regulatory and industry best practices.

G. REGULATORY ACCEPTANCE

1. 1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?

Yes. Our reports have been reviewed by the OCC, the FDIC, the Federal Reserve and the NCUA, as well as various state regulatory agencies.

2. What has been the feedback examiners have provided on your reports?

Our reports have been positively received by the aforementioned regulatory agencies. They have acknowledged that our validation procedures and reports are consistent with the regulatory frameworks in place for interest rate risk, asset/liability management and model risk management.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?

We are always available to discuss our review process and the contents of our reports with any parties, with whom such discussion is deemed necessary by management, including boards of directors, audit committees, regulatory agencies, operating personnel and others. With this said, as the basis of our procedures and the format of our report are anchored in applicable regulatory guidance, regulatory challenges to our validation process and/or the contents of our reports are very infrequent.
A. GENERAL INFORMATION

1. Vendor contact information
   Jerry Boebel, CFA
   ProfitStars®
   800-356-9099
   jboebel@profitstars.com
   17110 Marcy Street, Suite 200
   Omaha, NE  68118
   Web: www.profitstars.com

2. Describe recent client base (charters, asset range, operating characteristics)
   Our recent client base includes natural person credit unions, state-chartered banks, national-chartered banks, and
   bank holding companies. Recent clients range in asset size from $40 million to $3 billion.

3. Number of risk assessment clients over the past three years
   340

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   PROFITstar® - All levels and all versions.

2. For each model named, how many comprehensive risk assessments have you conducted over the past
two years?
   PROFITstar - 240

3. Any relevant comments regarding your experience with particular models, or preferences?
   NA

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
(given the following somewhat arbitrary definitions, check all that apply)

- [ ] Model Certification: Assessment of a model’s fundamental ability to correctly address balance
  sheet data and produce accurate projections – the “model math”.
- [x] Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior
  assumptions and reports.
- [x] Model Validation: Confirmation of model forecasts compared to expected category behaviors given their
  contract terms and embedded options.
- [ ] Model Governance: Assessment of an institution’s model control environment, policy directives,
  and procedures.
D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.

The PROFITstar model is our own proprietary software. It is developed, sold, and supported by ProfitStars.

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

ProfitStars does not receive any payments from any security brokers.

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

We are the providers of the PROFITstar software.

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

Our process focuses on four model components:

• Data-related risks. (Are the data files from the core system accurate?)
• Contractual inputs. (Do the data inputs provide the correct level of granularity?)
• Category setup. (Are individual cash-flows aggregated or separated appropriately?)
• Behavioral assumptions. (Are prepayment speeds, decay speeds, and discount rate assumptions used appropriately?)

2. Do you take physical possession of the model for the assessment?

Yes

3. What specific model verification techniques do you use, and why?

• Manual review of model settings.
• Manual review for data-related risk.
• Manual review of contractual inputs on a representative sample size.

4. What specific model value/forecast validation techniques do you use and why?

• Back-test of projected net interest margin vs. actual results.
• Regression analysis on pricing assumptions.

5. What are your specific model verification and validation deliverables

For our validation reports, we include:

• Executive summary.
• Rate correlation analysis.
• Back-test of projected net interest margin vs. actual net interest margin results.

6. What quality assurance processes do you use?

Final reports are reviewed by department managers.
7. Are industry standard and best practices defined in your deliverable?
   Yes.

F. RISK ASSESSMENT REPORT DELIVERABLE
   1. What is the conceptual or theoretical reason each report element is included?
      Our report components are a direct response to regulatory requirements.

   2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
      Yes. All recommendations are categorized in the executive summary as HIGH priority, MODERATE priority, or LOW priority.

   3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
      Yes

   4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits??
      No

G. REGULATORY ACCEPTANCE
   1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
      Yes. Our reports have been reviewed by:
      - NCUA
      - OCC
      - FDIC
      - Multiple district Federal Reserve Banks
      - Multiple state DFIs

   2. What has been the feedback examiners have provided on your reports?
      Feedback provided by field examiners to our clients has been positive. Our independence has been questioned on one occasion in the past three years (more than 340 reports). Ultimately, our report was accepted by the regulator in this single instance.

   3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
      Yes, we would provide assistance to our clients if challenged. None of our reports have been challenged to date.
H. OPEN-ENDED COMMENTS

Your data inputs and assumptions should reflect the true behavior of the financial instruments on your balance sheet. Missing data, inaccurate inputs, or invalid assumptions can dilute the results of your risk measures, affect your institution’s earnings potential, or lead your organization in the wrong strategic direction – all of which could negatively impact your next examination. At the same time, regulatory guidelines also mention back-testing as a key component of any model validation process. A back-test report offers you another line of defense to ensure that your forecast assumptions are accurate, so you’re not caught off guard by net interest margin results that can sometimes change over time.

Now you can avoid critical modeling pitfalls by having us complete a Technical Model Validation and Back-Test Service on your PROFITstar model.

Model Validation product brochure:

Model Validation and Back-Testing Services product brochure:

Model Validation sample report for banks:

Model Validation sample report for credit unions:
http://www.profitstars.com/pdfs/ModelValidationSampleReportCreditUnion.pdf

Back-Testing sample report:
A. GENERAL INFORMATION

1. Vendor contact information
   R2Metrics, Inc
   6930 Cahaba Valley Road, Suite 201
   Birmingham, Alabama 35242
   analytics@r2metrics.com
   205.991.9415

2. Describe recent client base (charters, asset range, operating characteristics)
   Commercial banks and credit unions, $50 million to $2 billion in asset size

3. Number of risk assessment clients over the past three years
   >20, (excludes bond portfolio risk assessments which have been >50)

4. Other relevant client characteristics
   Many of these clients have been pushed by regulators to validate the accuracy of some aspect of their
   ALM/IRRM process

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   ZM Financial, IPS Sendero (both in house and outsourced), Saber, BancPath, Vining Sparks, Higgins Associates,
   Olson, Baker Group

2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   ZM Financial - 5
   IPS Sendero (both in house and outsourced) - 13
   Saber - 4
   BancPath - 1
   Vining Sparks - 3
   Higgins Associates - 2
   Olson - 1
   Baker Group - 2

3. Any relevant comments regarding your experience with particular models, or preferences?
   Key R2M personnel have been involved in assessing accuracy of financial modeling for over 17 years in various
   capacities including ALM, bond portfolios, and bond and interest rate swap transactions. Our goal in each case was
   to determine if the model results were accurate and could be relied upon by management for short and long term
   interest rate risk forecasts
C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED
(given the following somewhat arbitrary definitions, check all that apply)

___ x ___ Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.

___ x ___ Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.

___ x ___ Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.

___ x ___ Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

Other - see E1

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.

   No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

   Yes, we license our software, primarily BondRisk and SwapRisk and through related programs, to 14 different bond dealers and 2 ALM providers. Through the licensees, our calculation engines are used by over 600 different community banks on a monthly basis.

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

   Yes, BankRisk, it is the model we use to perform the comparative analysis mentioned above.

E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   We provide reviews of all pertinent assumptions, data accuracy, back testing and modeling soundness. Once the 4 areas mentioned above have been reviewed, our primary focus is providing a comparative sensitivity analysis by running our BankRisk model in parallel with the primary ALM model and trapping out all modeling discrepancies by individual balance sheet category and by assets and liabilities in total. If, in the review stage, certain important assumptions are perceived by R2M personnel to be inappropriate, we may question management on how they arrived at these assumptions, and often the consensus is that they need changing.

   Once changes are made and both models are rerun, we will compare the yield and cost sensitivity of individual asset and liability categories over 1 month, 6 month, 1 yr, 2 yr, and 5 year time horizons. Where significant discrepancies exist, R2M personnel will work with management and personnel at the primary ALM vendor to ascertain which model is correct, and then that model will be rerun. We do this until all substantial modeling discrepancies have been eliminated.

   We then go through the same thing for EVE calculations. Usually the process of fixing the yield and cost sensitivity issues will bring the EVE calculations substantially into line, but the possibility exists that some modeling calculation issues may impact EVE, but not expected yields and costs. We always find significant modeling errors on initial comparisons, and even where R2M has been retained to assess accuracy on an ongoing basis, there is often not
consistency in the primary ALM model due to changes in personnel at either the financial institution or the ALM provider, changes in market rates which impact refinancing probability, betas, etc.

It is our conclusion from this process that even with conceptually sound models, it is all but impossible even for the most knowledgeable and experienced consultants to “eyeball” an IRRM analysis and know whether, for instance, fixed commercial loans would be up in yield by 40, 60, or 80 basis points at up 2% shock scenarios over a 2 year time period, whether a step up agency will be called in 6 months or two years, and how significant early redemption risk is in the CD portfolio, but this type of analysis on all categories is critical to achieve accurate model results.

2. Do you take physical possession of the model for the assessment?
   No, just the results

3. What specific model verification techniques do you use, and why?
   Based on the results in E1 above, we may ask for principal cashflows for individual categories in all shock scenarios, early redemption methodologies on cd’s, option and prepayment modeling in the case of bonds, and structured convertible, puttable, expandable FHLB advances, structured repos, etc, as well as cap/floor modeling on loans

4. What specific model value/forecast validation techniques do you use and why?
   See E1, above

5. What are your specific model verification and validation deliverables
   We deliver up to a 10 page comparative analysis which highlights model discrepancies, as well as an opinion letter, and if applicable, how the differences were resolved.

6. What quality assurance processes do you use?
   See E1, above

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

F. RISK ASSESSMENT REPORT DELIVERABLE
1. What is the conceptual or theoretical reason each report element is included?
   Improve the accuracy of the primary ALM and increase the confidence level of management and the board when considering short and long term risk management decisions

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
   Yes, bond portfolio option and prepayment related methodology, refine (or even implement in some cases) more robust premium amortization routines for bonds, correct principal cashflow schedules on loans, incorporate periodic cap and floors loan and bond modeling, correct unlikely betas and decay rates for certain deposits, as well as betas for certain loan types, incorporate or amend early redemption penalties for CD’s, correct bank owned life insurance dividend yield expectations, etc.
3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?

Definitely, often they will rerun their primary model at least once and then ask us to do another comparative analysis.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits?

Yes, as appropriate, and this is often the result of reviewing modeling.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?

Yes, various state banking agencies, FDIC, OCC, NCUA, Federal Reserve.

2. What has been the feedback examiners have provided on your reports?

Not a great deal of feedback but generally positive.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?

Yes, we would provide such things as individual item modeling, cashflows on an individual item of category basis, yield forecasting as needed, all calculations, all historical data and backtesting, Model Validation certificate.

H. OPEN-ENDED COMMENTS

On more than a dozen occasions over the last 6 months we have reviewed models that have been given the “all clear” by external auditors and independent consultants only a year earlier, only to find numerous categories mis-modeled and estimates of short and long term risk substantially different from what corrected numbers revealed.

A comparative analysis of yield and cost sensitivity and market value changes is a blend of quantitative and qualitative factors and ultimately requires a significant understanding of all items typically found in a bank or credit union balance sheet. We have never run a comparative analysis, especially the first time, where we did not find substantial modeling issues.

Often errors reflect a lack of understanding in the assumption setting process, but data accuracy and model conceptual soundness have also been found to contribute to inaccurate results. There are so many dials and so many ways that modeling can lose accuracy that we feel all financial institutions will benefit from a second opinion and a comparative analysis periodically.

In the past, we have been hired to ascertain why net interest margin declines have occurred when management/board expected a different outcome. Occasionally, there has been reluctance from the primary model vendor to provide the simple information needed to compare results, and thereby avoid scrutiny of its results. However, once the assumptions have been fully reviewed and the comparative analysis has been performed, bank or credit union managements and boards can have substantially more confidence in addressing perceived short and long term interest rate risk.
A. GENERAL INFORMATION

1. Vendor contact information
   Hugh Blaxall, President
   215.822.9097
   HBlaxall@VelliganBlaxall.com

   Brian A. Velligan, CEO
   610.526.1869
   BVelligan@VelliganBlaxall.com

   Velligan-Blaxall Consultants, LLC
   113 Rodney Circle
   Bryn Mawr, PA 19010
   www.VelliganBlaxall.com

2. Describe recent client base (charters, asset range, operating characteristics)
   VBC, LLC has a national reach and works with Banks and Credit Unions ranging from de-novos to institutions with multi-billion dollars in total assets. We have also consulted with institutions chartered abroad. We work with a large variety of institutions with different charters and ranging from strong earnings and low risk to others under financial stress or regulatory scrutiny.

3. Number of risk assessment clients over the past three years
   We have worked with over 100 institutions. We pride ourselves in our long term relationships and breadth of services provided.

4. Other relevant client characteristics
   For institutions that are looking to outsource their financial risk management our services are very attractive. These clients are looking to benefit from our wide experience and broad perspective as we bring an outside perspective and simultaneously help them manage their costs by avoiding hiring expensive experts on as full-time staff.

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT

1. Model name(s), level(s) and version(s)
   Fiserv  ALM 3.4
   Fiserv  Vantage Risk and Budgeting Manager V2.2
   ZMFS onlineALM 4.00
   ProfitStar V2011a.79
   Bancware Convergence ALM 4.7
   Risk Analytics ALM V5.6
   PALMS
   Financial Compass V8.3.30
2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?

(a) Fiserv ALM - 5
(b) Fiserv Vantage – 2
(c) ProfitStar – 5
(d) Bancware Covvergence – 3
(e) Risk Analytics ALM – 3
(f) PALMS – 2
(g) Financial Compass (Plansmith) – 1
(h) Proprietary models - 5

3. Any relevant comments regarding your experience with particular models, or preferences

Most financial institutions we have worked with seem to select models relevant to their balance sheet composition and complexity more so than asset size. Others have “acquired” a model license through an acquisition and chosen to continue that contract.

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED

(given the following somewhat arbitrary definitions, check all that apply)

- Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
- Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
- Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
- Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE

1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.

   No

2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.

   No

3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?.

   We offer outsourced ALM modeling using either:
   Fiserv ALM 3.4
   ZMFS onlineALM 4.00
E. RISK ASSESSMENT PROCESS

1. How would you describe your model risk assessment process?

   Our risk assessment process consists of three components, defined as “MAP” audit:
   
   (a) Model Review (M) – this stage of the process is designed to obtain a comprehensive understanding of the entity and the model results/reports. Verify sample data sets, model setup, review and assess stress test scenarios. Assess compliance with internal policies, regulatory guidance and industry best practices.
   
   (b) Assumptions Review (A) – during this stage we review and assess the operating environment, key assumptions employed in modeling, sources, validity, documentation and approval process.
   
   (c) Process Review (P) – the final component of our MAP process reviews Board approved policies, Governance structure, internal control measures, procedures, skill level and training.

2. Do you take physical possession of the model for the assessment?

   Not usually.

3. What specific model verification techniques do you use, and why?

   Review model maintenance reports, frequency, authorization of account setup/definitions. Verify output and model calculations (samples based on materiality).

   Objective is to establish consistency of methodology from one period to the other, stability of models, adequacy of control and documented procedures over models.

4. What specific model value/forecast validation techniques do you use and why?

   Benchmark against market data (of liquid instruments or any publicly available data that are relevant and measurable).

   Benchmark forecasts with Client internal actual results. Review loan/CD/Investment activity or originations to assess reasonableness and relevance of input assumptions and output results.

5. What are your specific model verification and validation deliverables

   Include relevant exhibits with final report and executive summary. If a particular internal policy or regulatory requirement is not complied with, relevant and applicable documentation with recommendations will be included in an exhibit.

6. What quality assurance processes do you use?

   In a word, experience. All of our associates have at least ten and some have over twenty years’ of real world experience with ALCO. The partners and most of our associates have been involved with ALCO for over fifteen years. We employ agreed upon procedures with each Client to ensure data integrity. Also to protect confidentiality, a secure website is available for Client data uploads, accessible only to authorized users. Data provided to our company will only be available to employees who work directly with the Client on a specific validation. Questions, answers, and test material are documented and maintained for reference.

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

   Yes, as well as regulatory expectations as outlined in issued guidance.
F. RISK ASSESSMENT REPORT DELIVERABLE

1. What is the conceptual or theoretical reason each report element is included?
   Compliance, industry best practices, relevance to the institution, materiality, effectiveness of measures employed, subjectivity and limitations of models.

2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
   Yes. These would include alternative stress tests scenarios, including non-maturity deposit decay and repricing betas as well as prepayment speed stress tests. These are scenarios prescribed by the regulators.

3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
   Generally, yes, but it depends on the scope of the initial engagement. We are happy to help as long as the help does not produce a conflict.

4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits??
   Yes. The entire team started our careers working for financial institutions; specific duties included implementing, maintaining, and managing the ALCO process.

G. REGULATORY ACCEPTANCE

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
   NCUA, FDIC, FHFA, FRB, OCC.

2. What has been the feedback examiners have provided on your reports?
   In any contact we have received directly, their comments have been entirely positive. Their comments to our clients have also been very favorable.

3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?
   Although the Partners have been providing this service at two firms for nearly fifteen years, we have never experienced a regulatory challenge. We have assisted clients with answering questions from regulators and found that the regulators were satisfied with our explanations. We have communicated directly with regulators via a conference call or discussed regulator questions with our clients so the client can provide the feedback to the regulator.

H. OPEN-ENDED COMMENTS

Our mission is to deliver the highest level of personalized service. We provide the best quality insights and analysis to position you for the future. Our aim is to be a long-term extension of your internal team and integral to your success.
Sample In-House ALM Model Request for Proposal

Below is an example of a request for an in-house 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>
<br>
<Institution Name>
<br>
<Institution City, State, Zip>
<br>
<Date>
<br>

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. Ability to model and forecast uniquely by interest rate scenario the category-level balance sheet re-pricing and maturity characteristics, pricing, re-pricing, 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. Ability to measure net interest income (NII), net income (NI) and <economic value of equity (EVE)/net economic value (NEV)> IRR at high precision levels in rate shock, rate ramp and custom rate ramp scenarios.
5. Ability to produce multiscenario business plan strategy analyses using realistic rate forecasts for most likely, rising and declining interest rate projections.
6. Ability to readily produce standard and custom reports from model outputs, with the ability to directly export model reports to standard spreadsheet software.
7. Ability 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> Ability to simultaneously produce budgeting forecasts with business plan analyses.
10. <if applicable> Ability to interact with or produce forecasts relevant to profitability analysis and funds transfer pricing (FTP) applications.

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 and 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>
<br>
<Institution Name>
<br>
<Street Address>
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 re-pricing 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 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-at-risk<and equity at-risk> IRR <quarterly or monthly>.
• Rate shocks, linear rate ramps and non-linear basis risk and yield curve shape changes are required as IRR tests.
• IRR analyses must be capable of producing high-precision forecasts with optimal commitment of time and staff resources.
• <Institution> desires model functionality that can produce back tests of model forecast outcomes and behavior assumptions compared to actual subsequent values.
• <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 ability to readily construct future business plans.
• <if applicable> The ability 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 ability 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.

A key factor in the decision will be the “all-in” model cost, including optional components and ongoing indirect costs. Vendor financial condition, level of ongoing user support, and cost of annual maintenance are also significant inputs. The ALM model proposal should include information relating to these issues.
Sample Outsourced IRR Analysis Request for Proposal

Below is an example of a request for proposal relating to engaging an outsource IRR analysis provider. Replace the information enclosed in <angle brackets> with your institution’s specific information to customize the form to your needs.

<IRR Analysis Outsource Solution Provider>
<Institution Name>
<Institution City, State, Zip>
<Date>

Executive Summary
<Institution name> requests that selected providers of outsource IRR analysis services deliver information describing a specific solution that meets the following balance sheet management and risk assessment needs:

1. Efficient process for initial specification of our institution’s outsourced IRR analysis/ ALM model.
2. Efficient processes for completing all phases of each period’s IRR analysis.
3. Fully, or nearly fully, automated data extract and download into the ALM model.
4. Ability to model and forecast uniquely by interest rate scenario the category-level balance sheet re-pricing and maturity characteristics, pricing, re-pricing, rate limit relationships, option-related interest rate dependencies, core deposit behaviors and all other unique performance and risk attributes of our institution’s balance sheet.
5. Precise analyses of net interest income (NII), net income (NI) and <economic value of equity (EVE)/net economic value (NEV)> IRR in standard rate shocks and custom rate scenarios including basis risk and yield curve shape change tests.
6. Ability to readily produce reports that effectively communicate IRR positions to technically oriented (e.g. ALCO) and non-technically oriented audiences (e.g. Board).
7. <add to list as desired>

Data processing for <institution> is provided by <specify firm or in-house department>. Management anticipates working closely with the data servicer and the outsourced IRR analysis provider in coordinating model data related installation activities.

Submit information materials relating to the outsourced IRR analysis solution deemed to meet 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>
>Institution Name>
>Institution City, State, Zip>
>Institution City, State, Zip>
>Phone and Fax Numbers>
>E-mail Address>

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 of balance sheet data suggest a wide mismatch between asset and liability re-pricing in the short term. Qualitative reviews of balance sheet data indicate significant maturity mismatch. Different driver rates, pricing behaviors and rate limits for individual asset and liability categories are material factors. A degree of optionality is embedded in the balance sheet. Core deposits are a significant percentage of overall funding. The institution needs to be able to quantify the performance implications of any unique items for IRR and business plan performance.

Management Issues Regarding the Outsourced IRR Analysis Solution
Institution wishes to assess earnings-at-risk and equity at-risk IRR on a quarterly or monthly basis to meet regulatory compliance mandates. Standard rate shock IRR tests are required on a basis and reporting that effectively meets the varied needs of multiple institution audiences. Assessments of rate tests addressing basis risk and yield curve shape changes are required on a periodic basis. IRR analyses must be capable of producing high-precision forecasts with limited commitments of institution time and staff resources.

IRR Outsource Provider Choice Criteria
Providers should propose outsource IRR analysis solutions that directly address current institution needs and goals. Provider demonstrations should speak directly to how their service will address each specific aspect of IRR present in the institution's balance sheet. The vendor is expected to provide convincing evidence on how their outsource service provides solutions to specific regulatory-related IRR needs of the institution.

All-in cost of the proposed outsource IRR analysis solution, including initial ALM model set up, resource mandates, and ongoing direct and indirect costs are key factors in the decision. Deliverable quality, vendor reputation, and other issues will also be reviewed.
In-house model vendors were asked to respond to the following questionnaire regarding their model. In addition, they were given an opportunity to offer an “open-ended” description of their model as they saw fit.

A. GENERAL INFORMATION
1. Vendor contact information
2. Describe current client base (charters, asset range, operating characteristics)
3. Number of in-house clients
4. Relevant client characteristics

B. MODEL USER SUPPORT PROGRAM
1. Toll-free, phone-based user support (enter “yes” or “no”)
2. Hours during which phone support function operates
3. Number of support staff available
4. Location(s) of the phone support function:
5. Web-based user support (enter “yes” or “no”)
6. Other support characteristics as deemed relevant

C. MODEL INFORMATION
1. Model name
2. Level and version
3. Last update
4. Operating system(s) and other required software
5. Is a vendor-supplied outsource service using the same model available?
6. What other vendor-provided financial management products interface with the model?
7. What is included in the vendor-provided model installation?
8. Do you offer support beyond initial model installation, i.e., consulting or extended implementation assistance?

D. DATA EXTRACT AND INTAKE
1. Briefly describe the model’s intake processes for balance sheet data (e.g., general ledger, maturity, re-pricing information) from my existing data processor(s)
2. Briefly describe the model’s process for setting up category-level definitions (e.g., fixed vs. variable, amortization, etc.)
E. CHART OF ACCOUNTS

1. Identify any special features and/or limitations of the model’s ability to model the balance sheet behaviors listed below
   - Re-pricing and maturing balances for categories without embedded options
   - Interest rate adjusted re-pricing and maturing balances for categories that have continuous and call/put embedded options
   - Re-pricing and maturing balances for unique categories (e.g., hybrid ARMs, teaser products, step-up/callable CDs)
   - Re-pricing and maturing balances for indeterminate behavior categories (e.g., core deposits, lines of credit, credit card outstandings)

2. Are there any limitations on automated control of pricing, re-pricing, caps/floors and teaser rates?

3. Can the model effectively amortize discounts/premiums?

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

F. PRICING, RE-PRICING, OPTION-RELATED CAPABILITIES, INTEREST RATE SCENARIOS AND MISCELLANEOUS

1. How are contractual inputs (e.g., pricing spreads, re-pricing limits) entered?

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

3. How are pricing and re-pricing relationships defined and updated?

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

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

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

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

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

9. Can the model produce back tests of prior forecast and behavior assumptions?

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

11. Does the model have stochastic forecasting capability? If so, describe it.

12. Can custom (institution-specific) behavior equations for prepayment and core deposit behaviors be embedded in the model to drive cash flow behavior?
Outsourced model vendors were asked to respond to the following questionnaire regarding their services. In addition, they were given an opportunity to offer an “open-ended” description of their services as they saw fit.

A. GENERAL INFORMATION
   1. Vendor contact information
   2. Describe current outsource client base (charters, asset range, operating characteristics)
   3. Number of outsource clients
   4. Other relevant client characteristics

B. OUTSOURCE SUPPORT PROGRAM
   1. Toll-free, phone-based user support (enter “yes” or “no”)
   2. Hours during which phone support function operates
   3. Number of support staff available
   4. Location(s) of the phone support function
   5. Web-based user support (enter “yes” or “no”)
   6. Other support characteristics as deemed relevant

C. MODEL(S) USED IN OUTSOURCE ENGAGEMENT
   1. Model name
   2. Level and version
   3. Last update
   4. Do you also offer the model as an in-house solution?
   5. What other vendor-provided financial management products interface with the model?

D. MECHANICS OF OUTSOURCE RELATIONSHIP
   1. How are balance sheet data, inputs, and assumptions transferred to you?
   2. At what point and by whom is the “run-ready” IRR model approved?
   3. How fast are IRR analyses provided after the final data is approved?
   4. How are completed IRR reports sent back to my institution?
   5. Describe your typical IRR client report.
   6. Who is responsible for IRR position quality assurance?
   7. If needed, how are reruns of a period’s report handled?
   8. Are there written guidelines for service users and provider staff?
   9. How are disputes remediated?
E. SELECTED ELEMENTS OF YOUR OUTSOURCE MODEL

1. How are maturity and re-pricing information input into your model from my institution's underlying systems?
2. Do your data capabilities include the ability to assign specific rates, caps and floors, etc., to all re-pricing balances?
3. How is pricing assigned for existing balances, and how are new balances entering future balance sheets defined? How extensive is any manual data input and adjustments?
4. How are maturity points across various categories downloaded? How easy is it to assign amortization, option-related behaviors, decay, etc., to all balances? Again, how extensive is any manual data input and adjustments?
5. How does your model handle a specific asset or liability category's driver rate, beta relationship, and any re-pricing lag when re-pricing for a given general interest rate change?
6. How are categories with administered re-pricing, such as core deposits, treated?
7. Can temporary teaser rates be properly defined for IRR purposes?
8. How does your model handle embedded options on both sides of the balance sheet? Does it have the ability to accept category level, quantified behavior inputs for all relevant loan and deposit categories (i.e. 1-4 family mortgages, mortgage-backed securities [MBS's], and other mortgage related categories; consumer and commercial loans; decay [runoff] from core deposit balances, and CD early withdrawals)? Does it accommodate institution-provided behavior assumptions relative to interest rates and options that are non-contractual in nature…e.g. core deposit decay rates? How?
9. How are re-pricing limits (e.g. caps and floors) on existing balances from system downloads handled? How are new volume re-pricing limits input?
10. What are your capabilities with switch option IRR behaviors that change at a specific time and interest rate level for unique financial instruments, such as calls or puts on holdings? On the funding side, what are your capabilities with convertible FHLB advances, and CDs that include embedded options, such as "bump up" features?
11. How are cash flows obtained and modeled for instruments such as collateralized mortgage obligations (CMO's) and other investments?
12. What is your model's IRR analytical capacity for handling off-balance sheet positions that may require the intake of specific cash flows or specialized advanced modeling?
13. What IRR test scenarios are available in your model (e.g. regulatory oriented rate shocks and linear rate ramps)? Are non-linear rate tests that assess basis risk and specific yield curve shape changes available? What is the source of these scenarios, and can externally supplied non-linear IRR tests be entered?
14. In equity-at-risk tests, what is your methodology for calculating present values, including how discount rates are established?
15. Does your model include any type of stochastic valuation applications?
FMS Questions for Risk Assessment Vendors

Risk assessment vendors were asked to respond to the following questionnaire regarding their services. In addition, they were given an opportunity to offer an “open-ended” description of their services as they saw fit.

A. GENERAL INFORMATION
   1. Vendor contact information
   2. Describe recent client base (charters, asset range, operating characteristics)
   3. Number of risk assessment clients over the past three years
   4. Other relevant client characteristics

B. MODEL(S) ON WHICH YOU HAVE PERFORMED ANY TYPE OF RISK ASSESSMENT
   1. Model name(s), level(s) and version(s)
   2. For each model named, how many comprehensive risk assessments have you conducted over the past two years?
   3. Any relevant comments regarding your experience with particular models, or preferences

C. TYPES OF RISK ASSESSMENT YOU HAVE PERFORMED (given the following somewhat arbitrary definitions, check all that apply)
   ______  Model Certification: Assessment of a model’s fundamental ability to correctly address balance sheet data and produce accurate projections – the “model math”.
   ______  Model Verification: A detailed assessment of model data, setup attributes, contractual inputs, behavior assumptions and reports.
   ______  Model Validation: Confirmation of model forecasts compared to expected category behaviors given their contract terms and embedded options.
   ______  Model Governance: Assessment of an institution’s model control environment, policy directives, and procedures.

D. INDEPENDENCE
   1. Are you connected in any way with, or do you receive any payments from the ALM vendor(s) whose model(s) you assess? If so, please explain.
   2. Are you connected in any way with, or do you receive any payments from any securities brokers? If so, please explain.
   3. Do you offer a proprietary in-house or outsourced ALM model? If so, what is its name?

E. RISK ASSESSMENT PROCESS
   1. How would you describe your model risk assessment process?
   2. Do you take physical possession of the model for the assessment
   3. What specific model verification techniques do you use, and why?
   4. What specific model value/forecast validation techniques do you use and why?
   5. What are your specific model verification and validation deliverables?
6. What quality assurance processes do you use?
7. Are industry standard and best practices defined in your deliverable?

**F. RISK ASSESSMENT REPORT DELIVERABLE**

1. What is the conceptual or theoretical reason for each report element?
2. Does the report include prioritized recommendations for model enhancements and refinements? If yes, what are some recent examples?
3. Do you assist the client in implementing any model enhancements or refinements recommended by your report?
4. Can you help the client enhance its model control environment and ALCO process, including the defining or fine-tuning of IRR exposure limits?

**G. REGULATORY ACCEPTANCE**

1. Have examiners in the field reviewed your model risk assessment report? If yes, which agencies?
2. What has been the feedback examiners have provided on your reports?
3. Do you offer assistance to your clients if regulators challenge your report? Specifically, what types of support do you provide?