

## **IRR Exposure Limits: An Industry Survey** (Financial Managers Society/McGuire Performance Solutions)

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### ***I. Introduction***

You hear the question in snatches of conversation at the annual FMS Forum and other professional conferences. You hear it again talking to examiners and regulatory staff, and you hear it often from board members. The question: what are the right IRR exposure limits for my institution and what are peer institutions using? It is a key issue but one with up to now little factual resolution.

This white paper provides definitive answers to questions relating to IRR exposure limits. Based on a broad survey of institutions, typical current IRR exposure limits and IRR exposures for banks and credit unions are presented. Important related information is also presented. With the insights in this report, financial managers are empowered to design IRR exposure limits that best match their institution's balance sheet and board preferences in light of peer practices.

The outline of this white paper is as follows. Immediately following are sections that provide a summary of basic concepts, general survey findings, and notes to the findings. A five-step solution for defining a correct set of IRR exposure limits is next. Behind that, a section providing a review of the survey methodology, general description of survey respondents, and a brief summary of written comments from the survey ends the report. Copies of the detailed survey findings at all reported levels are available as PDF files from the Financial Managers Society (FMS). Additionally, an interactive spreadsheet for calculating IRR limits is attached at the end of the White Paper.

### ***II. A quick review of IRR exposure limit concepts***

IRR exposure limits define the board's tolerance for interest rate related negative performance variability, as measured in defined tests. As a regulatory compliance input, IRR exposure limits are designed to protect the deposit/share insurance fund from potential loss across a wide range of hypothetical interest rate scenarios. As a business decision input, they define a framework against which to monitor current interest rate related balance sheet exposures and trends in exposure levels over time. In both applications, IRR exposure limits are a vital element of the asset-liability management (ALM) activities of all financial institutions.

IRR exposure limits are most commonly defined as the percent change in performance<sup>1</sup> (earnings or value) from Base Case, which is normally a no change in interest rates

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<sup>1</sup> The Office of Thrift Supervision (OTS) uses a variant of this approach for thrift institutions for regulatory monitoring purposes. For in-house ALM decision making, percent change limits are defined by many thrifts.

scenario. In earnings at risk analyses, limits are typically defined for changes in net interest income (NII), although net income (NI) limits are also commonly seen. In equity at risk analyses, IRR exposure limits are defined for changes in the net resolution residual<sup>2</sup> of the institution. Net resolution residual is defined as the current economic value of assets less the current economic cost of liabilities. It is a measure of the true net value residual in the balance sheet available to protect the deposit/share insurance fund.

All IRR exposure limits have two definitional dimensions. First, they must expand at least proportionately as IRR test scenarios diverge from Base Case IRR limits. For example, if the IRR exposure limit defined for a +/-100 bp rate shock is -10%, then the IRR exposure limit for a +/-200 bp needs to be at least double that, or -20%. But a second issue must also be addressed. The negative performance influences of embedded options, which increase as interest rates diverge farther from Base Case, must be accommodated in the design of IRR exposure limits. This is done by widening them non-linearly across the interest rate scenarios tested. Exhibit 1 illustrates the issues involved in basic IRR exposure limit definition.

When setting IRR exposure limits, keep in mind that they are based on extreme types of risk tests, not actual operating conditions. The key point is that hypothetical IRR exposures are depicted, not expected exposures. Thus be sure to define your institution's IRR exposure limits wide enough to accommodate extreme test outcomes. This is no time to be shy or too conservative!

In addition, recognize that IRR exposure limits are compared to the estimated exposures produced by an ALM model. For IRR limits to be a valuable reference point, the ALM model used must be a precise predictor of balance sheet IRR. This requires that the model's underlying data, category set up definitions, contractual inputs, behavior assumptions, and reporting are correct. If your ALM model has not been independently verified recently, consider having that done to ensure model accuracy. A final issue is that the IRR testing environment and balance sheet assumptions should be stable over time. This allows any given set of IRR exposure limits to better match the IRR tests employed and the balance sheet over time.

### ***III. Summary of survey findings and general recommendations***

Survey results reflect responses from a large number of participants and they are considered to be robust indicators of industry norms as of mid-2005. Exhibit 2 presents a summary of NII and EVE<sup>3</sup> IRR findings by charter for a +/-300 bp range of rate shock scenarios. Exhibit 3 presents rate ramp NII IRR limits for a +/-200 bp range of scenarios. Note that NII limits refer to a 12-month analysis horizon. Despite some limitations in the reported results, many important observations can be made based on the data.

#### **Rate shock earnings at risk IRR exposure limits**

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<sup>2</sup> Banking sector regulators refer to net resolution residual as economic value of equity (EVE), the OTS calls it net portfolio value (NPV), and for credit unions the term is net economic value (NEV).

<sup>3</sup> The equity at risk term for banks is used here for simplicity. Convert it to your institution's measure (NEV or NPV) if considered appropriate.

Average NII IRR exposure limits (upper set of data) in general appear reasonable. They look too large in the +/-100 bp scenarios, however, and they then do not expand enough in the higher interest rate scenarios. The reported<sup>4</sup> limits not only do not expand non-linearly with interest rates, they do not even progress proportionately.

There is a good deal of variation in NII IRR exposure limits by charter type. Commercial banks have the tightest limits (least percentage changes) and credit unions have (by far) the most expansive. FDIC savings banks are a bit higher than commercial banks while OTS thrifts are above that level again, but still well below credit unions. These patterns hold up across all scenarios.

Reported NII exposure limits are quite a bit larger than reported actual IRR exposures (center data area). NII IRR limits are in all cases more than double forecasted exposures; see the ratios presented in the lowest set of data. The very wide NII IRR limits reported for credit unions are in particular much greater than measured exposures, being four times as large in the +/-100 bp scenarios. But NII IRR exposure limits for commercial banks are also relatively large, at three times reported exposures in the +100 bp scenario, for example.

The data patterns suggest that +/-100 bp NII IRR exposure limits are too large and higher scenario limits are too tight. These observations are based on the fact that the largest ratios of exposure limits to measured exposures are in the +/-100 bp scenarios, while the ratios for higher scenarios generally are smaller. Were the average limits those posted by an MPS client bank, a recommendation to slightly tighten +/-100 bp NII IRR exposure limits and non-linearly expand those in higher scenarios would be issued. Were the client a credit union, the NII IRR exposure limits would also be questioned as to overall magnitude. Reductions in all scenarios are likely needed to bring them more in line with board preferences and regulatory scrutiny.

#### Rate shock equity at risk IRR exposure limits

Average EVE IRR exposure limits appear reasonable. But they are likely to be too tight in general and they do not expand enough across interest rate scenarios. They appear too tight because they are small multiples of their corresponding NII IRR exposure limits, despite the significantly greater potential for equity related value variations as interest rates change. The expansion of EVE IRR exposure limits across interest rate scenarios has the same problem as the NII IRR exposure limits, i.e. less than proportional increases by scenario and thus definitely not non-linear.

There is limited variation in EVE IRR exposure limits by bank charter type. Commercial banks have the tightest limits by a small degree, followed by FDIC savings banks and then OTS thrifts. Credit union limits are always much higher (which may be a reflection of the newness of this test in this sector). Patterns of relative limits vary somewhat across scenarios, but generally they hold up.

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<sup>4</sup> A portion of the odd limit behaviors seen may be due to institutions who set one limit for all interest rate scenarios. This would cause the +/-100 bp limits to be overstated and other limits to not expand sufficiently. There is not, however, widespread input of constant IRR exposure limits in the data.

The reported EVE IRR exposure limits are much larger than reported actual IRR exposures. Limits for banking sector charters are in most cases double forecasted exposures. Limits for credit unions are again up to four times reported exposures (in the +/-100 bp scenarios; ratios for other scenarios are somewhat less).

The data patterns suggest that +/-100 bp EVE IRR exposure limits are not large enough on an absolute basis and higher scenario limits do not expand sufficiently. The evidence is found in the noted small multiples of +/-100 bp EVE IRR exposure limits to corresponding NII IRR exposure limits and the shrinking of the exposure limit to actual exposure ratios in higher rate scenarios. Were the average limits those posted by an MPS client bank, a recommendation to expand all EVE IRR exposure limits and non-linearly increase limits in higher scenarios would be issued. Were the client a credit union, however, the EVE IRR exposure limits would be questioned as to magnitude. Reductions in all scenarios are likely needed here.

#### Rate ramp earnings at risk IRR exposure limits

While rate shock scenarios define an instantaneous and permanent change in interest rates, rate ramps change interest rates incrementally over time. Typically this is accomplished in a linear manner, e.g. one-twelfth of the overall interest rate change occurring in each of the 12 months in the analysis horizon. Other types of ramps, e.g. statistical based projections of individual interest rates given a specified change over time in a short term driver rate, can also be used.

Average rate ramp NII IRR exposure limits appear too large at +/-100 bp and they expand by small amounts in the +/-200 bp scenarios. The limits reported not only do not expand non-linearly with interest rates, they do not even progress proportionately. The same general patterns of variation in NII IRR exposure limits by charter type seen in the rate shock NII data are observed in the ramp limits. Commercial banks have the tightest (least percentage changes) limits and credit unions have (by far) the most expansive. FDIC savings banks are a bit higher than commercial banks while OTS thrifts are above that but still less than credit unions. Patterns hold up across all scenarios.

The reported NII exposure limits are again much larger than reported actual IRR exposures. NII IRR limits are in all cases more than double forecasted exposures. The very wide NII IRR limits reported for credit unions are in this case closest to reported actual exposures, a reversal of other experience. Ratios diminish somewhat in the +/-200 bp scenarios compared to those in the +/-100 bp scenarios, following the rate shock analysis patterning.

The data suggest that +/-100 bp rate ramp NII IRR exposure limits are too large, being in many instances almost the same as those for +/-100 bp rate shocks. This correspondence can not hold as the average interest rate change in a rate ramp is only one-half the overall change specified. In a +200 bp rate ramp, for example, interest rates will rise on average only +100 bp over the projected horizon. In a rate shock IRR test, on the other hand, by definition the entire specified change in interest rates is accomplished immediately. Because of the different degrees of interest rate change, as a rule of thumb rate ramp NII

IRR exposure limits should be approximately one-half those for corresponding rate shock tests.

With that perspective, the excessive nature of the rate ramp survey NII IRR exposure limits is clear. By this reckoning, higher scenario limits are also too wide. Were the average limits those posted by an MPS client bank, a recommendation to tighten +/-100 bp NII IRR exposure limits by about one-half and reconsider those in higher scenarios would be issued. Were the client a credit union, the rate ramp NII IRR exposure limits would be questioned even more intensely as to magnitude. The underlying ALM models for banks and (especially) credit unions call for attention also, because indicated exposures in the +100 bp ramp tests exceed exposures reported in the +100 bp rate shock tests. Given the relatively smaller interest rate variations in ramps, the results are not correct.

#### ***IV. A solution for setting the right IRR exposure limits***

A simple five-step process has proven successful in defining correct IRR exposure limits in many financial institutions. This process is outlined below, including survey results where relevant.

##### **Step 1. Understand basic concepts and educate the board**

IRR exposure limits are often misunderstood and this leads to erroneous specifications. See the discussion above of basic concepts as a starter. Be sure you and your board understand (a) what IRR exposure limits are (and are not) designed to do, (b) that hypothetical exposure levels are being defined and assessed, not actual expected risks, (c) that the “value” term in equity at risk measures relates to value in a regulatory resolution, not current market or stock value, and (d) that inaccurate ALM model forecasts of IRR render comparisons of “risk” to IRR exposure limits meaningless (or worse, misleading).

Exhibit 4 provides insights into how much work there is to do here. While a majority of responses in every charter ranked board understanding of IRR exposure limits as Satisfactory or above, large percentages also let it be known that improvements are necessary (e.g. rankings of Fair or Poor). Building a strong foundation of understanding is crucial, so work on this hard.

##### **Step 2. Design the right IRR test environment for your institution**

Regulatory mandates relating to IRR analysis are quite wide, allowing institutions (in general) to choose the methodology best for their unique situation. Use of rate shock scenarios for equity at risk IRR analysis is universal as a rate shock type of test is required to assess current balance sheet value sensitivity to interest rate changes. For earnings at risk IRR analyses, rate shocks are the currently dominant approach. But a strong case can be made for rate ramps. This is because they incorporate time into the analysis, a dimension which also characterizes the IRR measure (NII or NI).

Better than traditional linear rate ramps are statistically based projections of individual interest rate changes that derive from defined changes over time in a short term driver rate (e.g. a Fed target rate). This type of ramp incorporates both time and basis risk (the unique pace of each individual interest rate) into earnings at risk analyses. Because

projections are derived from analyses of long time series of interest rates, projections evolve as interest rate environment change. This provides a more stable test environment than do forecasts of interest rates, which may change significantly in a short period. The statistical basis for the projections also allows creation of specialized rate tests such as yield curve shape changes (including inversions).

Whatever the IRR scenarios chosen, tailor your IRR exposure limits to them. Be especially careful of rate ramp limits due to the smaller changes in interest rates on average over the period specified.

Finally, for earnings at risk analyses review the balance sheet growth assumptions being used in the ALM model that is analyzing IRR. A static (no growth or changes in mix or maturities) is the most precise way to assess embedded NII IRR because the influence of only interest rate changes, not variations balance sheet size or composition, is tested. This approach also has the advantage of being consistently tied to your originally defined set of NII IRR exposure limits, as no underlying balance sheet growth or change assumptions are varying from analysis to analysis.

If you choose to assess NII IRR using a dynamic balance sheet (for example one depicting your current business plan), be sure to adjust your NII IRR exposure limits accordingly. Projected growth in the balance sheet will produce larger Base Case NII outcomes than otherwise. This (by definition) decreases all percentage change measures of NII/NI, an indication of less exposure. Tighten your NII IRR limits accordingly. Further, as balance sheet growth and change targets vary review your NII IRR limits regularly to ensure that they are consistent with current model inputs.

### **Step 3. Verify the ALM model producing your IRR estimates is accurate**

An imprecise ALM model will produce inaccurate measures of IRR. If comparisons of such model data to IRR exposure limits cause erroneous business decisions, then what regulators call “model risk” results. There is no room for model risk in assessing IRR, so the ALM model producing your IRR estimates needs to be verified. This should be done (a) at an overall level in-house every time the model is run and (b) in detail periodically by an independent party. The fundamental capability of the model to capture repricing and maturity positions and its ability to forecast correct option behaviors are vital to accurate IRR analyses.

The survey data give pause to confidence in typical ALM model IRR forecasts, however. In almost all reported actual IRR exposure data, the magnitude of IRR does not expand disproportionately as higher rate scenarios are analyzed. But the effects of embedded options produce such behaviors, and we know that options are widely found in bank and credit union balance sheets. The conclusion must be that option effects are not being modeled correctly<sup>5</sup> in many ALM models, across all charters. This understates true IRR exposures, resulting in model risk.

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<sup>5</sup> This is also a finding in the large number of recent detailed MPS verifications of client ALM models. The options mis-modeled are mainly calls and conversions in wholesale products, but many other option inputs are also often weak.

Other areas of concern in ALM models are the behavior inputs employed for loan prepayments and core deposits. Exhibit 5 summarizes the survey responses here. The results are clear in showing that large percentages of respondents use internally developed or regulatory inputs. The accuracy of internal estimates of complex loan prepayment and core deposit behaviors (supply, repricing, and run off/duration) is open to question, although they do have the advantage of being institution specific. Regulatory inputs may be adequate at a basic level, but they are generic and biased by their regulatory intent. It is best if these key drivers of your IRR positions are as institution specific and quantified as possible, so that estimates from your ALM model are accurate and precise.

#### **Step 4. Define the right set of IRR exposure limits for your institution**

The stage is now set to define the right set of IRR exposure limits, i.e. based on an understanding of basic concepts, a clearly specified IRR test environment, and a verified ALM model. The good news is that you are ready to go. The bad news is that IRR limits are unique to each institution's balance sheet, so rules of thumb rather than precise formulas apply (at least in part). Plus, IRR limits are eventually dependent on board risk tolerances.

The +/-100 bp scenario exposures (or those for whatever first scenarios you define) are the starting point for setting IRR exposure limits. This is because all other IRR limits will be built on them. Set these limits based on recent measures of your institution's IRR in these scenarios (if available) or use the benchmarks defined in the survey for institutions in your charter. Once the +/-100 bp IRR exposure limits are defined, limits in more extreme scenarios need to increase more than proportionately. If the +/-100 bp IRR exposure limit is -10%, for example, then the +/-200 bp limit needs to be more than -20%, to account for the negative performance effects of embedded options.

Examples based on the survey data are valuable as reference; see Exhibit 6 for details. The reported average NII exposure in the +100 bp rate shock scenario for commercial banks is -3.33% (a -4.10% NII exposure is listed in the -100 bp scenario). A +/-100 bp NII IRR exposure limit of -5.00% is a conservative solution here, as it limits exposure to within (assumed) board tolerances while at the same time allowing room between recent actual exposures<sup>6</sup> and the limit.

Beyond the +/-100 bp scenarios, NII IRR exposure limits need to expand by increasingly larger degrees. For +/-200 bp limits, a 110% factor is suggested relative to +/-100 bp scenario limits, a 125% factor relative to (twice) the +/-100 bp limits is suggested for +/-300 bp results, and so on. A spreadsheet to calculate custom IRR exposure limits in this manner is available upon request.

A set of EVE IRR exposure limits can be defined in the same way. Given the reported equity at risk exposures in the +/-100 bp rate shock scenarios, an EVE IRR limit of -7.50% is conservatively<sup>7</sup> reasonable. EVE IRR exposure limit expansion factors will need to be

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<sup>6</sup> Note that a -7.50% limit could also be justified in this case, to allow more distance between the limit and recent actual exposures in the +/-100 bp scenario. Beware of making IRR exposure limits too tight!

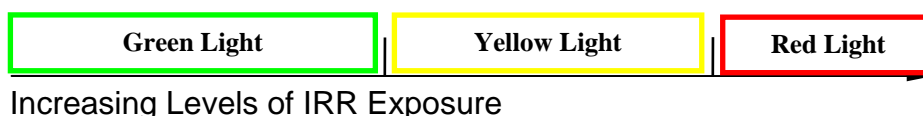
<sup>7</sup> If a 7.50% NII IRR exposure limit is used, increase the EVE limit also. A 10.00% EVE limit can easily be supported.

larger in this case, as the entire balance sheet is now contributing to IRR. Factors of 120% and 135% are suggested to define +/-200 bp and +/-300 bp limits, respectively.

Sample IRR exposure limits are defined in Exhibit 6 for other charter types also. Note that listed limits for all charter types are conservative examples only, based on rough interpretations of the survey data. Adjust the example data to match your institution's specific situation. Finally, note also that NII IRR exposure limits are dependent on board approval. Your definitions and board risk preferences will have to align in the final data.

An advanced specification of IRR exposure limits that adds to their communication content is obtained by defining red/yellow/green light IRR exposure zone limits. IRR exposure zone limits are an enhanced approach for monitoring IRR compliance and they can replace or supplement standard IRR exposure limit designations.

Red/yellow/green light IRR exposure zone limits define three exposure ranges in each scenario:



The “green light zone” is defined as the range of potential IRR exposures that the Board believes to be normal and acceptable operating behavior for NII and EVE IRR. When the institution is shown by its specified IRR analysis tests to be in the green light zone, normal IRR analysis activities and board reporting requirements are in effect.

The lower bound of the “red light zone” is the institution’s absolute IRR exposure compliance limit (i.e. it is the same as a traditionally defined IRR exposure limit). Should the institution find itself in the red light zone, based on its specified IRR analysis tests, a comprehensive program of responses to address the excessive (out of compliance) IRR must be provided by ALCO to the board no later than its next meeting.

The “yellow light zone” is a range of IRR exposures falling below the institution’s maximum allowable IRR exposure (the red light zone) but above normally acceptable IRR levels (the green light zone). The board specifically empowers management to temporarily place the institution’s IRR position into the yellow light zone when (a) such a positioning is the result of actions which provide a clearly advantaged performance position and (b) these actions are accompanied by documented programs to bring the IRR exposure of the institution back into the green light zone in a specified period of time. While in the yellow light zone, as indicated by the institution’s specified IRR analysis tests, the board should be updated frequently (i.e. at least monthly) on progress made towards moving back into the green light zone. A set time frame for regaining green light zone status could be defined if deemed necessary.

Examples of red/yellow/green light zone IRR exposure limits are provided for each charter (based on survey data), in Exhibit 7. Again, recognize that listed limits are conservative examples only, based on rough interpretations of the survey data. Adjust the example data to match your situation.

The key advantage of IRR exposure zone type limits is that they simultaneously define maximum, allowable, and normal exposures for IRR. They also establish an early warning mechanism for IRR exposure moving outside the green light zone, prior to it becoming excessive (red light zone). Thus red/yellow/green light IRR exposure zone limits are a large step forward in the communicating and monitoring NII and EVE IRR. They require, however, added definitional inputs from the Board and place somewhat greater reporting requirements on ALCO. They may also require a short period of fine tuning after initial adoption.

### **Step 5. Monitor and adjust IRR exposure limits over time**

The final step is to ensure that the control environment surrounding IRR exposure limits is properly established. Define in your ALCO policy how frequently limits need to be reviewed and how often they can be adjusted. Also specify that trends in exposures versus limits will be tracked over time to identify drift that may require limit adjustments or redefinitions.

Survey respondents report a very active program of reviewing limits; Exhibit 8 presents the results by charter type. The majority of institutions review IRR exposure limits quarterly. Annual review is the next most frequent choice. Credit unions reported the greatest frequency of review periods other than quarterly or annually. About one-quarter of these indicate semi-annual reviews.

While review of IRR exposure limits should be frequent, changes to limits will likely be rare. Adjust them when large balance sheet changes occur (e.g. a major new strategy or acquisition) and when analysis of trends indicated enough drift in estimated IRR exposures to require action. When implementing new or revised IRR exposure limits, it is a good idea to state in the Board minutes that for a period of time IRR exposure limits may be adjusted frequently, to fine tune them.

### ***V. Review of the survey methodology and respondents, and summary of written survey comments***

The survey form was made available via email to 4,238 financial institutions on May 20, 2005. A second emailing to 1,939 institutions was conducted on June 23, 2005. Data presented in this report are a compilation of responses as of June 30, 2005.

A total of 233 responses was received. Commercial banks are 48% of the total, credit unions 17%, OTS thrifts 19%, and FDIC savings banks are 17%. Overall, a very strong geographic distribution of responses was obtained, with 43 states represented (plus several other areas).

Exhibit 9 depicts the asset size distribution of the respondents. In each charter, the assets sizes seen in the survey are roughly representative of underlying asset size distributions.

Many different ALM models are represented. Proportions generally reflect industry wide installed bases by charter. The data also confirm the use of out-source ALM/IRR modeling solutions by a relatively large number of institutions.

Since IRR is related to balance composition, two questions were asked relating to holdings of longer initial term ARMs or longer maturity FRMs. Exhibit 10 presents the findings. The distributions generally follow expected patterns by charter.

The responses to the free form write-in questions included in the survey are interesting in that they bring to light in a richer fashion the current state of IRR exposure limits and their implementations. Summaries to those responses are as follows, but they make valuable reading in their entirety.

### **Comment on your board's general understanding of IRR exposure limits**

The general feeling is that progress has been made in board understanding but that much work remains to do. Frustration with conservative attitudes toward what are in fact hypothetical IRR test results and a lack of understanding how IRR effects institution performance are noted in particular. Many of the responses note that Board training has been done or is about to get under way.

### **What is your biggest frustration regarding IRR exposure limits?**

A wide range of issues were noted. Conservative limits as a constraint on performance and poor assumptions (mainly for core deposit behaviors) often were mentioned. Rate shocks are recognized as lacking as a test for earnings at risk IRR analyses but switching to rate ramps is often blocked by examiners not well versed in their advantages. Equity at risk analysis as a measurement of IRR (or of anything relevant) comes up many times, reflecting a common frustration. The notion of being able to boil down interest rate related performance exposure into a single metric (such as percent change in NII or EVE from Base Case) was questioned by many respondents.

### **What would you want examiners to understand most about your IRR exposure limits?**

The biggest concern is that examiners want the institution to be managed to its IRR exposure limits, especially in regards to equity at risk IRR, without a full understanding of what that implies for performance. Not recognizing that the board's mandated IRR limits are too conservative or the extreme nature of the IRR test environment are further issues. Difficulties with obtaining accurate measures of core deposit behavior assumptions, and what the criteria are for adequate core deposit behavior measurement methodologies, are also frequent concerns. There is widely noted frustration that examiners generally don't dig deeper into the balance sheet before criticizing management on the institution's IRR position. It is a lot more complex than a single number!

## VI. Final Notes

Copies of the detailed IRR survey responses by charter level are available upon request by contacting FMS. Additionally, a simple, interactive spreadsheet that calculates IRR exposure limits using your own institution's specific inputs is attached at the end of this White Paper.

### This spreadsheet requires Excel to run Macros

You may need to lower your security settings to Medium and Enable Macros.

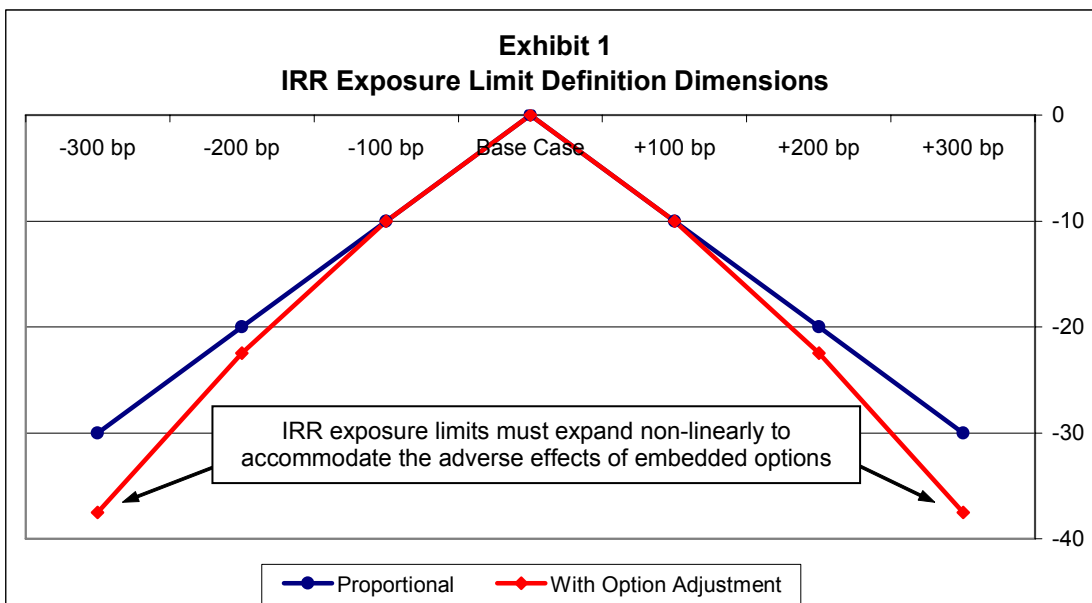
1. Open Microsoft Excel
2. From the **Tools** menu choose **Macros > Security...**
3. In the Security window choose **Medium** and click **OK**
4. Open the spreadsheet (if the spreadsheet is already open, you must close the file and reopen it.)
5. Click **Enable Macros**

### Spreadsheet Directions

[Download IRR Exposure Limit Spreadsheet](#)

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## Exhibits 1- 10



**Exhibit 2**  
**IRR Exposure Limits and Actual IRR Exposures: Rate Shocks**

**Average Reported IRR Limits**

	Commercial Banks		Credit Unions		OTS Thrifts		FDIC Savings Banks	
	NII	EVE	NII	NEV	NII	NPV	NII	EVE
+300 BP:	-18.06%	-26.82%	-29.58%	-36.31%	-26.78%	-25.54%	-20.93%	-24.67%
+200 BP:	-14.20%	-21.10%	-27.67%	-29.80%	-21.80%	-20.79%	-15.00%	-22.25%
+100 BP:	-9.94%	-14.43%	-25.41%	-25.20%	-14.27%	-16.00%	-10.64%	-15.07%
-100 BP:	-10.19%	-14.37%	-25.18%	-25.20%	-13.07%	-14.94%	-10.64%	-15.07%
-200 BP:	-14.39%	-20.78%	-27.82%	-29.34%	-19.09%	-18.78%	-14.50%	-22.66%
-300 BP:	-18.32%	-27.43%	-30.11%	-35.38%	-25.72%	-22.00%	-23.14%	-27.81%

**Average Reported Actual IRR Exposures**

	Commercial Banks		Credit Unions		OTS Thrifts		FDIC Savings Banks	
	NII	EVE	NII	NEV	NII	NPV	NII	EVE
+300 BP:	-7.50%	-14.46%	-14.71%	-17.71%	-12.38%	-16.67%	-11.25%	-17.08%
+200 BP:	-6.30%	-11.36%	-9.89%	-9.35%	-8.85%	-12.31%	-7.41%	-13.50%
+100 BP:	-3.33%	-6.16%	-6.25%	-6.02%	-6.46%	-8.06%	-4.79%	-7.17%
-100 BP:	-4.10%	-5.65%	-6.35%	-5.28%	-5.98%	-6.57%	-5.90%	-5.83%
-200 BP:	-9.13%	-10.00%	-11.40%	-8.75%	-7.50%	-8.54%	-8.70%	-6.79%
-300 BP:	-11.88%	-14.80%	-13.50%	-14.05%	-11.61%	-9.08%	-14.29%	-8.75%

**Ratio: IRR Limits / Actual IRR Exposures**

	Commercial Banks		Credit Unions		OTS Thrifts		FDIC Savings Banks	
	NII	EVE	NII	NEV	NII	NPV	NII	EVE
+300 BP:	2.41	1.85	2.01	2.05	2.16	1.53	1.86	1.44
+200 BP:	2.26	1.86	2.80	3.19	2.46	1.69	2.02	1.65
+100 BP:	2.98	2.34	4.07	4.19	2.21	1.99	2.22	2.10
-100 BP:	2.48	2.54	3.96	4.78	2.19	2.27	1.80	2.58
-200 BP:	1.58	2.08	2.44	3.35	2.55	2.20	1.67	3.34
-300 BP:	1.54	1.85	2.23	2.52	2.22	2.42	1.62	3.18

**Average Number of Responses: Limits**

	Commercial Banks		Credit Unions		OTS Thrifts		FDIC Savings Banks	
	NII	EVE	NII	NEV	NII	NPV	NII	EVE
	60	58	25	25	21	25	24	14

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 3**  
**IRR Exposure Limits and Actual IRR Exposures: Rate Ramps**

**Average Reported IRR Limits**

	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
	NII	NII	NII	NII
+200 BP:	-11.63%	-21.88%	-18.05%	-14.21%
+100 BP:	-9.50%	-19.55%	-13.07%	-10.93%
-100 BP:	-9.34%	-19.05%	-12.63%	-12.00%
-200 BP:	-12.00%	-22.09%	-18.44%	-14.81%

**Average Reported Actual IRR Exposures**

	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
	NII	NII	NII	NII
+200 BP:	-4.72%	-12.88%	-5.50%	-4.85%
+100 BP:	-3.71%	-10.25%	-4.64%	-3.13%
-100 BP:	-3.44%	-9.75%	-4.17%	-3.13%
-200 BP:	-6.07%	-13.75%	-6.25%	-4.83%

**Ratio: IRR Limits / Actual IRR Exposures**

	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
	NII	NII	NII	NII
+200 BP:	2.46	1.70	3.28	2.93
+100 BP:	2.56	1.91	2.82	3.50
-100 BP:	2.72	1.95	3.03	3.84
-200 BP:	1.98	1.61	2.95	3.06

**Average Number of Responses: Limits**

	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
	NII	NII	NII	NII
	35	11	9	15

Source: MPS analysis of FMS IRR Exposure Limits Survey data

Exhibit 4  
Board's Level of Understanding: IRR Exposure Limits

	Charter Type			
	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
Poor	5%	10%	5%	7%
Fair	37%	40%	28%	34%
Satisfactory	48%	45%	48%	50%
Excellent	9%	5%	20%	9%

Source: MPS analysis of FMS IRR Exposure Limits Survey data

Exhibit 5  
Source of ALM Model Loan Prepayment and Core Deposit Behavior Inputs

	Loan Prepayments		
	Internal	Regulator	External Provider
Commercial Banks	27%	15%	58%
Credit Unions	59%	12%	29%
OTS Thrifts	39%	34%	27%
FDIC Savings Banks	39%	15%	46%

	Core Deposit Behavior Inputs		
	Internal	Regulator	External Provider
Commercial Banks	44%	15%	41%
Credit Unions	69%	12%	19%
OTS Thrifts	45%	39%	16%
FDIC Savings Banks	83%	5%	12%

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 6**  
**Example IRR Exposure Limits: Traditional Definitions**

**Commercial Banks**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		EVE Rate Shock	
	Limit	Factor	Limit	Factor	Limit	Factor
+300 BP:	-18.75%	1.25			-30.38%	1.35
+200 BP:	-11.00%	1.10	-5.50%	1.10	-18.00%	1.20
+100 BP:	-5.00%		-2.50%		-7.50%	
-100 BP:	-5.00%		-2.50%		-7.50%	
-200 BP:	-11.00%	1.10	-5.50%	1.10	-18.00%	1.20
-300 BP:	-18.75%	1.25			-30.38%	1.35

**Credit Unions**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		NEV Rate Shock	
	Limit	Factor	Limit	Factor	Limit	Factor
+300 BP:	-28.13%	1.25			-38.48%	1.35
+200 BP:	-16.50%	1.10	-7.15%	1.10	-22.80%	1.20
+100 BP:	-7.50%		-3.25%		-9.50%	
-100 BP:	-7.50%		-3.25%		-9.50%	
-200 BP:	-16.50%	1.10	-7.15%	1.10	-22.80%	1.20
-300 BP:	-28.13%	1.25			-38.48%	1.35

**OTS Thrifts**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		NPV Rate Shock	
	Limit	Factor	Limit	Factor	Limit	Factor
+300 BP:	-28.13%	1.25			-50.63%	1.35
+200 BP:	-16.50%	1.10	-7.15%	1.10	-30.00%	1.20
+100 BP:	-7.50%		-3.25%		-12.50%	
-100 BP:	-7.50%		-3.25%		-12.50%	
-200 BP:	-16.50%	1.10	-7.15%	1.10	-30.00%	1.20
-300 BP:	-28.13%	1.25			-50.63%	1.35

**FDIC Savings Banks**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		EVE Rate Shock	
	Limit	Factor	Limit	Factor	Limit	Factor
+300 BP:	-22.50%	1.25			-34.43%	1.35
+200 BP:	-13.20%	1.10	-6.60%	1.10	-20.40%	1.20
+100 BP:	-6.00%		-3.00%		-8.50%	
-100 BP:	-6.00%		-3.00%		-8.50%	
-200 BP:	-13.20%	1.10	-6.60%	1.10	-20.40%	1.20
-300 BP:	-22.50%	1.25			-34.43%	1.35

Notes: Example limits key off of +/-100 bp rate shock scenario IRR exposures, as reported in the survey. Tailor inputs to your institution.

Rate ramp limits defined relative to rate shock limits, Use caution as reported rate ramp exposures are often greater than limits.

Factors multiply 2 or 3 times the +/-100 bp scenario limit to obtain scaled +/-200 bp and +/-300 bp limits, respectively.

Round limits as desired to obtain final inputs for Board approval.

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 7**  
**Example IRR Exposure Limits: Red, Yellow, Green Light Zone Definitions**

**Commercial Banks**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		EVE Rate Shock	
	Yellow Zone	Red Zone	Yellow Zone	Red Zone	Yellow Zone	Red Zone
+300 BP:	-15.94%	-18.75%	0.00%		-25.82%	-30.38%
+200 BP:	-9.35%	-11.00%	-4.68%	-5.50%	-15.30%	-18.00%
+100 BP:	-4.25%	-5.00%	-2.13%	-2.50%	-6.38%	-7.50%
-100 BP:	-4.25%	-5.00%	-2.13%	-2.50%	-6.38%	-7.50%
-200 BP:	-9.35%	-11.00%	-4.68%	-5.50%	-15.30%	-18.00%
-300 BP:	-15.94%	-18.75%			-25.82%	-30.38%

**Credit Unions**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		NEV Rate Shock	
	Yellow Zone	Red Zone	Yellow Zone	Red Zone	Yellow Zone	Red Zone
+300 BP:	-23.91%	-28.13%			-32.70%	-38.48%
+200 BP:	-14.03%	-16.50%	-6.08%	-7.15%	-19.38%	-22.80%
+100 BP:	-6.38%	-7.50%	-2.76%	-3.25%	-8.08%	-9.50%
-100 BP:	-6.38%	-7.50%	-2.76%	-3.25%	-8.08%	-9.50%
-200 BP:	-14.03%	-16.50%	-6.08%	-7.15%	-19.38%	-22.80%
-300 BP:	-23.91%	-28.13%			-32.70%	-38.48%

**OTS Thrifts**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		NPV Rate Shock	
	Yellow Zone	Red Zone	Yellow Zone	Red Zone	Yellow Zone	Red Zone
+300 BP:	-23.91%	-28.13%			-43.03%	-50.63%
+200 BP:	-14.03%	-16.50%	-6.08%	-7.15%	-25.50%	-30.00%
+100 BP:	-6.38%	-7.50%	-2.76%	-3.25%	-10.63%	-12.50%
-100 BP:	-6.38%	-7.50%	-2.76%	-3.25%	-10.63%	-12.50%
-200 BP:	-14.03%	-16.50%	-6.08%	-7.15%	-25.50%	-30.00%
-300 BP:	-23.91%	-28.13%			-43.03%	-50.63%

**FDIC Savings Banks**

Interest Rate Risk Test Scenario	NII Rate Shock		NII Rate Ramp		EVE Rate Shock	
	Yellow Zone	Red Zone	Yellow Zone	Red Zone	Yellow Zone	Red Zone
+300 BP:	-19.13%	-22.50%			-29.26%	-34.43%
+200 BP:	-11.22%	-13.20%	-5.61%	-6.60%	-17.34%	-20.40%
+100 BP:	-5.10%	-6.00%	-2.55%	-3.00%	-7.23%	-8.50%
-100 BP:	-5.10%	-6.00%	-2.55%	-3.00%	-7.23%	-8.50%
-200 BP:	-11.22%	-13.20%	-5.61%	-6.60%	-17.34%	-20.40%
-300 BP:	-19.13%	-22.50%			-29.26%	-34.43%

Notes: Yellow zone limit is set at 85% of red light zone. Vary the percentage to fit your institution's early warning preference.

Green light zone is from zero to yellow light zone limit.

Rate ramp limits defined relative to rate shock limits. Use caution as reported rate ramp exposures are often greater than limits.

Round limits as desired to obtain final inputs for Board approval.

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 8**  
**Frequency of IRR Exposure Limit Review**

	Loan Prepayments		
	Quarterly	Annually	Other
Commercial Banks	61%	30%	9%
Credit Unions	56%	22%	22%
OTS Thrifts	64%	30%	6%
FDIC Savings Banks	78%	20%	2%

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 9**  
**Asset Size Distributions of Survey Respondents**

Asset Size	Charter Type			
	Commercial Banks	Credit Unions	OTS Thrifts	FDIC Savings Banks
< \$250 million	25%	42%	43%	15%
> \$250 mil - \$500 mil	26%	15%	14%	27%
> \$500 mil - \$1 bil	26%	17%	20%	29%
> \$1 bil - \$5 bil	19%	24%	14%	24%
> \$5 bil - \$10 bil	3%	2%	7%	5%
> \$10 billion	1%	0%	2%	0%

Source: MPS analysis of FMS IRR Exposure Limits Survey data

**Exhibit 10**  
**Percent of Assets in Longer Initial Term or Longer Maturity Mortgage Loans**

	Percent off Assets in ARM's with Initial Term >1 Year			
	0 - 10%	> 10% - 20%	>20% - 30%	> 30%
Commercial Banks	72%	19%	3%	7%
Credit Unions	71%	17%	10%	2%
OTS Thrifts	43%	16%	11%	30%
FDIC Savings Banks	51%	24%	15%	10%

	Percent off Assets in 15 or 30 Year FRM's			
	0 - 10%	> 10% - 20%	>20% - 30%	> 30%
Commercial Banks	75%	19%	4%	2%
Credit Unions	34%	37%	22%	7%
OTS Thrifts	23%	18%	14%	45%
FDIC Savings Banks	17%	32%	24%	27%

Source: MPS analysis of FMS IRR Exposure Limits Survey data

## Interactive Spreadsheet Instructions

Information garnered in a recent FMS survey of the IRR exposure limits used by banks, thrifts, and credit unions indicated that upgrades to current practices are needed in certain areas. The most important of these is defining the right limits to set for each IRR test interest rate scenario.

IRR exposure limits need to expand as interest rate scenarios move farther away from Base Case. But the expansion should be more than proportional because embedded options tend to increase IRR exposures in more extreme scenarios. The right set of limits is thus non-linear, expanding outwards faster than the expansion of the interest rate scenarios.

Setting non-linear IRR exposure limits is a lot easier if a tool that creates the right set of limits is available. That solution is now at hand, in the accompanying spreadsheet. To create a set of properly defined IRR exposure limits for your institution, just follow the simple steps below.

1. Open the spreadsheet file. Click to “Enable Macros” at the Excel generated notice box and click to accept the software agreement. Optionally, save the file.
2. To see an example of how the spreadsheet works, click on the “Sample Values” button at the top of the spreadsheet. The data in red, surrounded by the gray boxes, are required inputs. All other values automatically calculate.

The key starter input in the spreadsheet is the +100 bp limit value, located in the upper portion of the spreadsheet. In the example, it is -5.00% in the NII rate shock, -2.50% in the rate ramp, and -7.50% in the equity at risk rate shock. These are considered to be reasonable values, based on the industry survey results. Once the +100 bp limit value is input, limits in other scenarios are created as multiples of it.

The “Factor” input values define the non-linear expansion of IRR limits as scenarios become more extreme. The example Factor values input for each rate test are considered reasonable in how much they dis-proportionately expand the IRR limits.

The center area of the spreadsheet converts the simple IRR exposure limits above into “red light, yellow light, green light” zone limits. This enhancement defines zones where IRR is acceptable (green), of concern (yellow), and out of compliance (red). The upper bound of the green light zone is at the lower boundary of the yellow zone. The yellow zone lower bound is defined as a percentage of the IRR exposure limit defined above. In the example, the percent value for the yellow zone lower bound is 85.00%, which is considered reasonable.

The graphic at the bottom of the spreadsheet illustrates the example IRR exposure limits. Click on the buttons above the graph to change the chart to show the desired rate test.

3. After you are done reviewing the example data, click on the “Clear Wksht” button at the top of the spreadsheet.

4. To create your own set of institution specific IRR exposure limits follow these steps:
  - A. If you do not wish to set IRR limits for the +/-400 scenarios, click on the “Hide +/-400 bp” button at the top of the spreadsheet. To restore the +/-400 bp input areas, click on the same button, which will be now labeled “Show +/-400 bp.”
  - B. Enter a +100 bp limit value for each applicable IRR test (red data in gray boxes only). See the FMS IRR Exposure Limits white paper for insights into how to set the right value.
  - C. Enter Factor values as appropriate (red data in gray boxes only). A larger factor value expands the limits by a greater degree and vice versa. A factor of 1.00 defines a linear change in limit. Note that Factors for equity at risk IRR limits are normally larger than for NII limits because option effects are stronger in equity at risk IRR analyses.
  - D. If red light, yellow light, green light zone limits are desired, enter a yellow zone boundary in the gray boxes below the zone limit data (red data). The yellow zone is usually defined between 67% to 90% of the red zone. A lower percentage is a more conservative input, as the yellow zone is reached at a lower level of IRR.
5. Click on the “Print Page” button at the top of the page to create a record of you IRR exposure inputs. Save the file if desired.

As desired, round the calculated IRR exposure limits to whole numbers or whatever scale is desired. Present the IRR exposure limits to ALCO and the Board for formal approval.

If the limits created are new or significantly different from prior limits, include a statement that adjustments can be made over the course of the next year to fine tune them based on experience. Review IRR exposure limits at least annually to ensure that they continue to reflect Board interest rate risk preferences.

To access the McGuire Performance Solutions (MPS) or Financial Managers Society (FMS) web sites, click on the logos at the top of the spreadsheet. If you have not obtained a copy of it already, download the FMS IRR Exposure Limits white paper and the survey results for your charter type.

Additional information on the MPS ALM Model Verification Service, from which benchmark design elements for this spreadsheet were obtained, click on the “More Info” icon at the bottom of the spreadsheet. To contact MPS, email or call based on the contact information listed.

**This spreadsheet requires Excel to run Macros**

You may need to lower your security settings to Medium and Enable Macros.

1. Open Microsoft Excel
2. From the **Tools** menu choose **Macros > Security...**
3. In the Security window choose **Medium** and click **OK**
4. Open the spreadsheet (if the spreadsheet is already open, you must close the file and reopen it.)
5. Click **Enable Macros**

[Download IRR Exposure Limit Spreadsheet](#)