Guide to Using NCUA's Interest Rate Risk (IRR) Examination Procedures Workbook

NCUA has developed this comprehensive guide to provide examiners and credit union staff detailed information about each step in the IRR review process.

(October 2016)

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Focus and Scope of IRR Examination

A review of a credit union's IRR exposure has long been part of NCUA's supervision. Results of this evaluation are reflected in the Liquidity/Asset-Liability Management (or "L") component of a credit union's CAMEL rating.

IRR is assessed as part of supervision of all federally insured credit unions, both in the Risk-Focused Examination (RFE) program and the Small Credit Union Examination Program (SCUEP). The scope of the IRR review is scaled to the credit union's asset size and, in some cases, the results of the NEV Supervisory Test.[1]

NCUA's process for evaluating IRR requires examiners to consider a number of quantitative and qualitative factors, including:

- Results of the NEV Supervisory Test and an assessment of the valuations assigned to accounts supporting NEV
- Income simulations performed by the credit union, including analysis of underlying assumptions, scenarios, and results of those simulations
- Stress testing performed by the credit union, including analysis of rate scenarios, and sensitivity testing
- IRR measurement systems, including the capability of the model, model validation, assumptions and inputs, controls, and changes to the model
- IRR management, such as board and asset/liability committee (ALCO) oversight, policies and procedures, policy limits, mitigation strategies, reporting, back-testing, forecasting, staff qualifications, and internal controls

IRR Risk Category Review Focus

The focus of the IRR review is to determine an overall rating for a credit union's interest rate risk. IRR is one of seven discreet supervisory risks that are systematically evaluated during an examination. The final IRR assessment is then evaluated in conjunction with the other supervisory risks, in what is termed the total analysis process, to conclude on the need for examination findings and/or to assign CAMEL component ratings. *Figure 1* below illustrates how the seven supervisory risk categories, including IRR, provide source input for examiners to reach overall conclusions about key risks in the institution.

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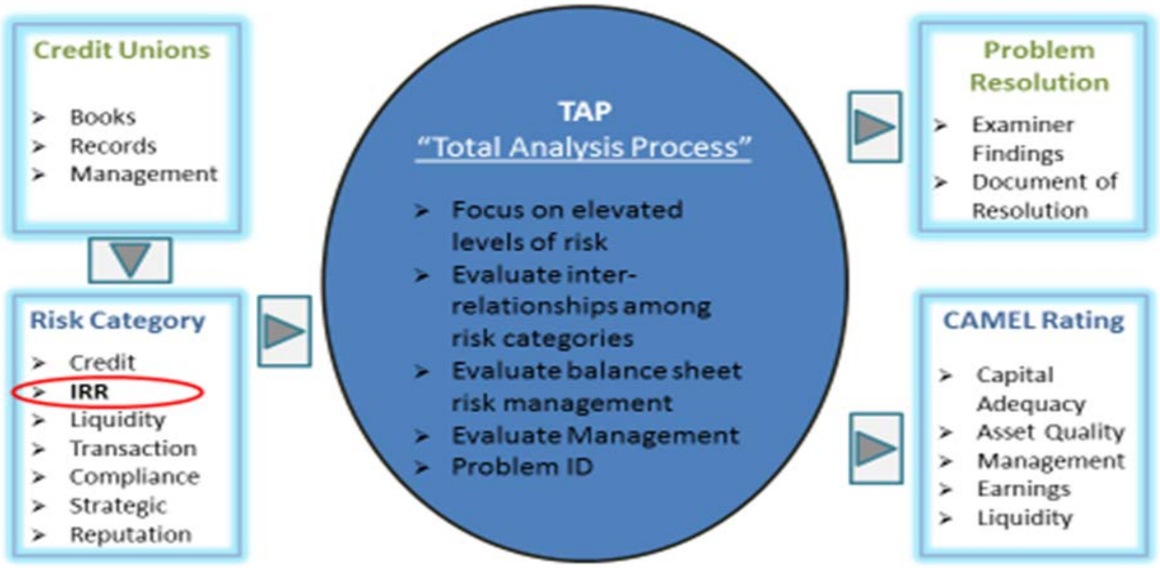
[1] Net economic value (NEV) is the present value of assets minus the present value of liabilities along with off-balance sheet items such as derivatives. It is a tool that can measure the changes in the economic value of net worth caused by changes in interest rates.

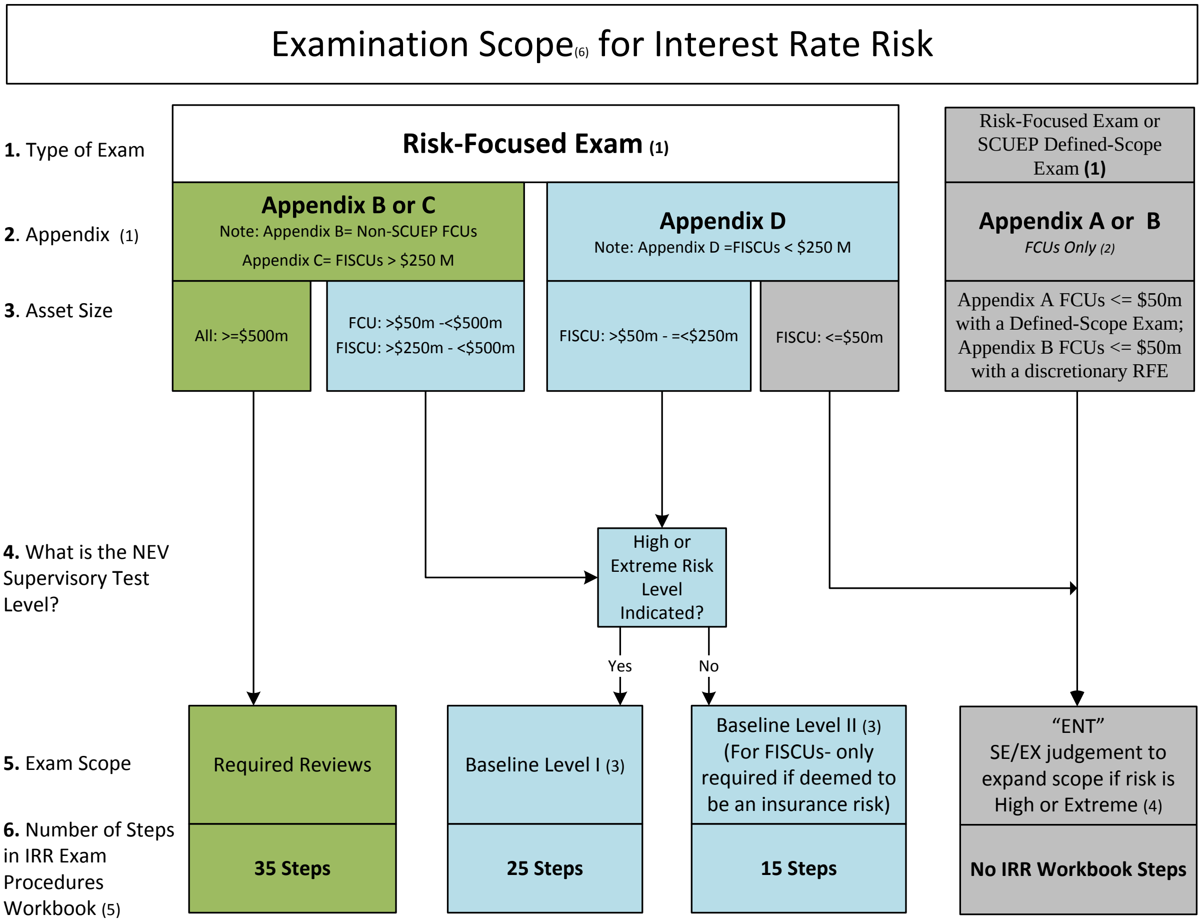
FIGURE 1. TOTAL ANALYSIS PROCESS INCORPORATING ALL RISKS


Credit Unions
Books
Records
Management
Risk Category
Credit
IRR
Liquidity
Transaction
Compliance
Strategic
Reputation
TAP
"Total Analysis Process"
Focus on elevated levels of risk
Evaluate inter-relationships among risk categories
Evaluate balance sheet risk management
Evaluate Management
Problem ID
Problem Resolution
Examiner Findings
Document of Resolution
CAMEL Rating
Capital Adequacy
Asset Quality
Management
Earnings
Liquidity

IRR Exam Scope

The exam scope of an IRR review uses a credit union's total asset size and the verified level of balance sheet risk as measured by the NEV Supervisory Test. Scope procedures are scaled up or down depending on the risk level result of the NEV Supervisory Test. The examination scope is outlined in the *Figure 2*, which is designed to help determine the appropriate examination scope.

FIGURE 2. EXAMINATION SCOPE FOR IRR


Examination Scope(6) for Interest Rate Risk
1. Type of Exam
2. Appendix (1)
3. Asset Size
4. What is the NEV Supervisory Test Level?
5. Exam Scope
6. Number of Steps in IRR Exam Procedures Workbook (5)
Risk-Focused Exam (1)
Risk-Focused Exam or SCUEP Defined-Scope Exam (1)
Appendix B or C
Note: Appendix B= Non-SCUEP FCUs
Appendix C= FISCUs > $250 M
Appendix D
Note: Appendix D =FISCUs < $250 M
Appendix A or B
FCUs Only (2)
All: >=$500m
FCU: >$50m -<$500m
FISCU: >$250m - <$500m
FISCU: >$50m - =<$250m
FISCU: <=$50m
Appendix A FCUs <= $50m with a Defined-Scope Exam; Appendix B FCUs <= $50m with a discretionary RFE
High or Extreme Risk Level Indicated?
Yes
No
Required Reviews
Baseline Level I (3)
Baseline Level II (3) (For FISCUs- only required if deemed to be an insurance risk)
"ENT" SE/EX judgement to expand scope if risk is High or Extreme (4)
35 Steps
25 Steps
15 Steps
No IRR Workbook Steps

(1) NCUA Instruction 5000.20 Rev. 7 determines if the credit union will receive a risk-focused exam or SCUEP defined scope exam, and the appropriate Appendix.

(2) Field staff will assess and rate the IRR Category based upon the ENT risk level.

(3) Field staff may opt out of individual review steps in the IRR Workbook with adequate justification, but may not opt out completing the workbook section scores including the NEV Supervisory Test or the Overall IRR Rating.

(4) NCUA Instruction 5000.20 Rev 7 discusses seeking SE approval for expanding the scope for SCUEP exams. The depth of review is determined by the level of risk and the amount of time authorized by the SE.

(5) The IRR Exam Procedures workbook is an Available Template File in AIRES. Number of steps determined as of October 2016 workbook and maybe subject to changes.

(6) Examination Steps for Required and Baseline will be re-assessed subsequent to at least one exam cycle after the Implementation date.

Determining the Scope of the IRR Review

Examiners will make the following determinations when setting the appropriate scope of the IRR review.

1. Type of Exam

Examiners will determine which type of examination to conduct: risk-focused examination (RFE) or defined scope examination (such as SCUEP). NCUA Instruction 5000.20 sets forth the criteria used to determine if a credit union will receive an RFE or SCUEP exam. Each NCUA Regional Office has discretion in selecting a RFE or SCUEP exam for credit unions with total assets between $30 and $50 million.

2. Applicable Instruction Appendix

NCUA Instruction 5000.20 includes a series of appendices that outline the required, baseline, and optional review areas for the different types and sizes of credit unions. For SCUEP defined-scope examinations, all identified review areas are required. Based on the type of credit union being examined, examiners will refer to the appropriate appendix to determine what review areas are required to be performed.

3. Credit Union's Asset Size (for RFEs only)

The credit union's asset size (usually determined by the last Call Report) will be used to determine this scope step.

4. NEV Supervisory Test Risk Level

The results of the NEV Supervisory Test are another important factor in determining the scope of the IRR review. If the credit union's total assets range between $50 million and $500 million and the result of the NEV Supervisory Test result is high or extreme, examiners will complete more review steps than if the NEV Supervisory Test result rating is moderate or low.

5. Exam Scope

Based on the outcomes of the four previous scope determinations, examiners will identify the appropriate IRR exam scope. Credit unions with total assets of $500 million or more will be subject to *all* procedures in the *IRR Exam Procedures Workbook* (35 steps for the first exam cycle after implementation). Examiners performing an RFE of a credit union with assets less than $500 million will perform either Baseline Level I (25 steps) or Baseline Level II (15 steps). Examiners can refer to the *IRR Exam Procedures Workbook* for detailed guidance for completing Baseline I and II review steps.

6. Number of Steps to Complete

Once the appropriate exam scope has been identified, examiners perform the required number of review steps. This will be re-assessed after at least one exam cycle has been completed.

- For credit unions with total assets of $500 million or more, the examiner will complete the full 35 steps.
- For all other RFEs, the results of the NEV Supervisory Test will determine whether the examiner completes 25 steps (Baseline Level 1), 15 steps (Baseline Level II), or no steps.
- For SCUEP exams or credit unions with total assets of $50 million or less, examiners have discretion regarding whether to perform review steps, subject to supervisor approval, and can rely solely upon the Estimated NEV Tool (ENT) to assign the IRR rating. Where IRR is determined to be a high or extreme based on the ENT results, the examiner should seek concurrence from their supervisor (as outlined in NCUA Instruction 5000.20) to expand the scope. The number of steps completed should be appropriate to the level of risk identified and the time allotted for review.

Organization of the IRR Examination Workbook

The *IRR Examination Workbook* is organized into nine sections. Each section appears on a separate tab in the workbook.

- Tab A: *Market Risk* (includes instructions for Tab G)
- Tab B: *Earnings at Risk*
- Tab C: *Stress Testing*
- Tab D: *Measurement Systems*
- Tab E: *Risk Management*
- Tab F: *Overall IRR Rating*
- Tab G: *NEV Supervisory Test* (See comments in Tab A section)
- Tab H: *Category Matrix* (See comments in Tab A section)
- Tab I: *Examiner Worksheet* (See comments in Tab A section)

Tabs A through E include review steps that are designed to help the examiner evaluate the major components of a credit union's IRR management program in a systematic way. These five sections focus on the key aspects of the credit union's IRR exposure, measurements, and management. Completing the steps in each tab results in an individual section score; these components are then evaluated collectively to make an overall IRR rating of low, moderate, or high. This overall risk rating is documented in Tab F: *Overall IRR Rating*, which uses the "Market Risk" rating as a floor for the final rating. Tabs G and H are further described and incorporated into the Tab A section below. Tab I is an available worksheet for examiners to aggregate data or calculations to support the NEV Supervisory Test.

The content included in this guide describes the general focus and approach to be used by examiners when performing the steps in tabs A through F. This content includes detailed explanation of relevant factors. It serves as a guide for the examiner through major considerations that will influence how the tabs are rated and how the overall IRR rating should be made.

Tab A: *Market Risk*

The *Market Risk* tab serves as the primary quantitative assessment of a credit union's level of market risk exposure and utilizes the NEV Supervisory Test as the quantification measure. The NEV Supervisory Test provides a basis for the degree to which changes in market interest rates can adversely affect a credit union's economic value.

The NEV Supervisory Test uses asset and liability values from the credit union's NEV report to generate results for review. The reliability of the NEV Supervisory Test results is a function of how reliable the model inputs are, so examiners must assess the credit union's valuation process before accepting the data. Credit unions should use and document appropriate assumptions, based on available data (for example, using observed market values where possible), when valuing individual or groups of assets and liabilities.

With one exception, the NEV Supervisory Test utilizes the credit union's values for assets and liabilities. It uses prescribed, standardized valuations for non-maturity shares (NMS) in both the "base" and "shock" scenarios, which are built into the model.

Why Use NEV to Measure IRR?

The NEV Supervisory Test uses NEV as the analytical measure for evaluating the quantitative level of IRR in a credit union's balance sheet. NEV scenario analysis measures the effect of changing interest rates on the economic value of net worth by capturing the net valuation changes for all interest bearing assets and liabilities as measured for base case and shocked scenarios. As NEV is a present value calculation, it is a single point-in-time measure of a static balance sheet. It includes all cash flows, meaning it incorporates every payment for the entire life of each asset and liability. This makes NEV useful in capturing long-term risk of outlying cash flows, especially those with embedded options, in a way that most earnings-at-risk measures do not.

The review steps included in Tab A are designed to help examiners a) gauge the inherent degree of market risk present on the credit union's balance sheet and b) understand the sources of balance sheet risk exhibited in the NEV Supervisory Test results. Examiners will review the credit union's valuations for assets and liabilities for reasonableness and supportability, and will seek to identify and understand elements of the balance sheet that contribute to the overall IRR position.

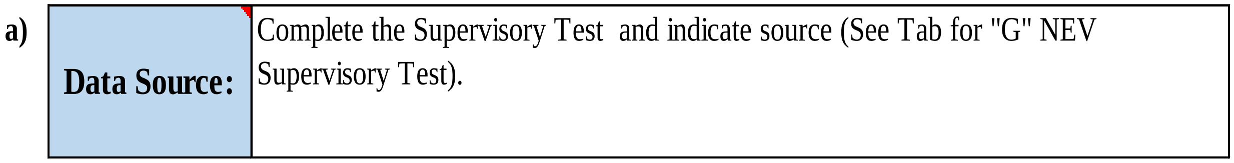
By completing the review steps in Tab A, the examiner will verify the credit union's NEV evaluation and conclude on the reasonableness and supportability of the material asset and liability valuations. The *Market Risk* tab is broken into two sections containing ten total review steps.

- Section I: NEV Supervisory Test Results
- Section II: Verification of NEV Supervisory Test Results
- Scoring Guidelines

Section I: NEV Supervisory Test Results

- Step A: *Data Source*
- Step B: *NEV Test Results*
- Step C: *NEV Sensitivity Results*
- Step D: *Final NEV Supervisory Test Level*

Step A: *Data Source*



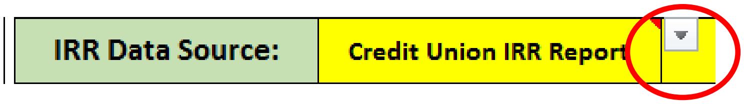
a)

Data Source:	Complete the Supervisory Test and indicate source (See Tab for "G" NEV Supervisory Test).

The examiner must determine the source of data for the NEV Supervisory Test before beginning the IRR review. It must be completed to establish a review scope for credit unions with total assets between $50 million and $500 million.

There are two options for the data source:

1. Credit Union IRR Report[2]
2. Estimated NEV Tool (ENT)



IRR Data Source:	**Credit Union IRR Report**

NOTE: If, at any time, the examiner switches the data source from IRR Report to the ENT tool (for example, because they conclude that data available from the credit union’s IRR Report has material deficiencies and is unreliable), the examiner must go back to Tab A and change the dropdown selection to “Estimated NEV Tool” dropdown. The examiner will receive a warning that the previous input (sourced from the credit union's IRR report) will be deleted (lost) and replaced with the ENT data.

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[2] Also referred to as the ALM model reports or ALM report.

Source: Credit Union IRR Report

A credit union's IRR report data should be the same source the credit union uses for reporting its compliance with IRR limits. Examiners will input the asset and liability values for the book, base,[3] and +300 basis points (bps) in thousands, as indicated in the yellow cells of Tab G: NEV Supervisory Test. (See *Figure 3*.)

Examiners will input the reported effective duration[4] (+300 bps) for total assets and liabilities and the credit union's net worth ratio in the required highlighted cells. The effective duration calculations do not impact the results of the NEV Supervisory Test and are for information purposes only. However, examiners should familiarize themselves with the duration measures, compare the model input to the estimated calculation, and consider if it appears reasonable. (**NOTE:** If the credit union's IRR model report does not include effective durations, leave the fields blank.)

Tab H: *Asset and Liability Category Matrix* provides additional guidance on how to group asset and liability accounts.

Examiners will compare total assets and total liabilities for book, base, and shocked NEV values in the NEV Supervisory Test table against a) the credit union's IRR model report or b) the Estimated NEV Tool sourced from the Exam.xls sheet for book balances to ensure all data has been captured accurately in the template. **The reliability of the NEV Supervisory Test is dependent on accurate transcription of the data.**

The critical reconciliation points in the NEV Supervisory Test template that must be checked for book, base, and shocked data are as follows:[5]

1. Total assets
2. Total non-maturity share accounts
   (The sum of the three respective categories as grouped using Tab H: Category Matrix; see *Figure 4*.)
3. Total liabilities
4. Book ratio
   (A calculation of assets minus liabilities. Generally, the Book NEV Ratio should not be

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[3] The base case is the starting point from which shock scenarios are compared to for NEV Sensitivity.
[4] Further discussion on Duration can be found in the IRR chapter of the Examiners Guide.
[5] These six items are also cross referenced in *Figure 3*.

significantly different from the Net Worth Ratio, as reported on the credit union's Call Report or Financial Performance Report (FPR).)

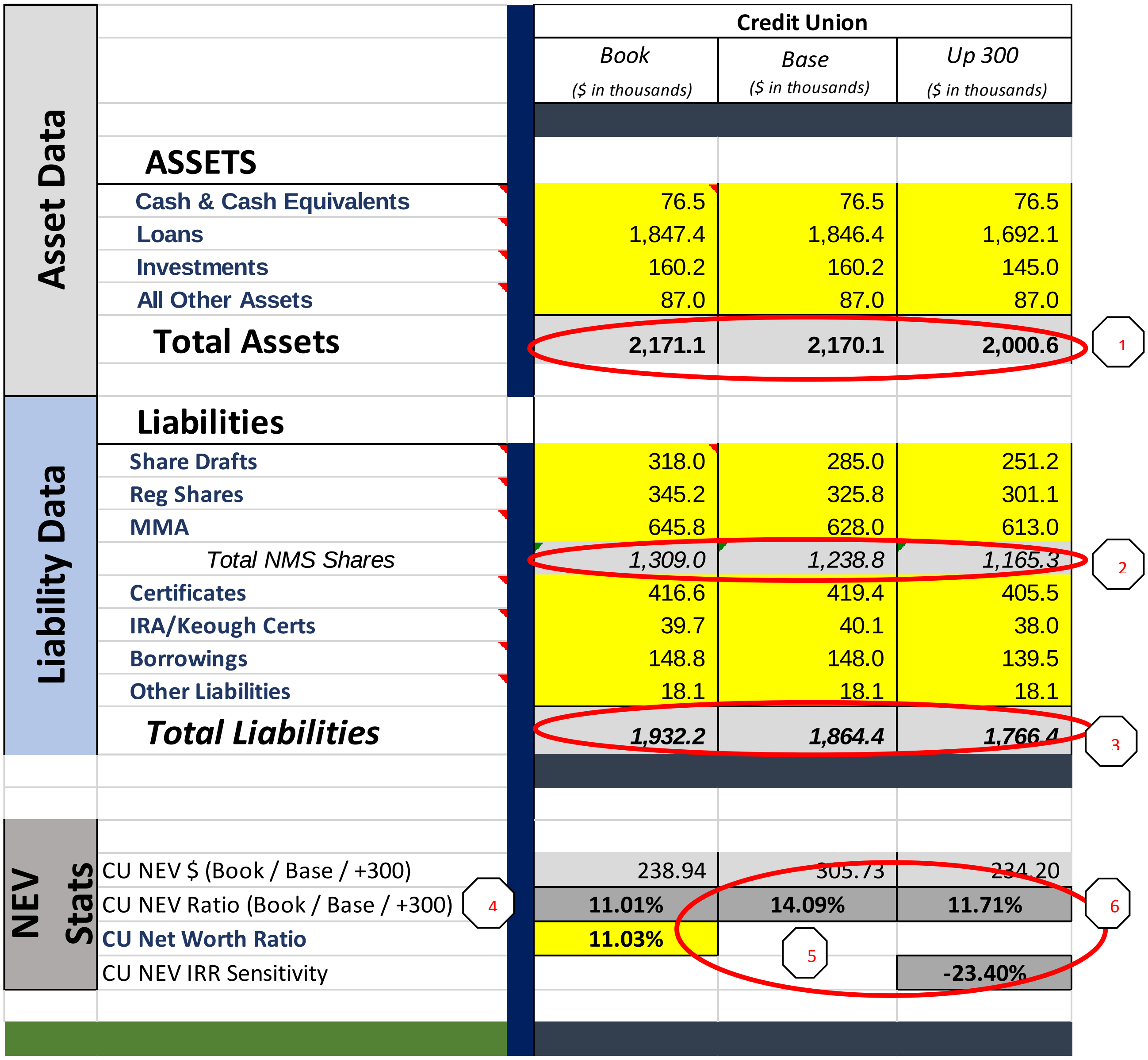
5. Base NEV and shocked NEV ratios
   (Differences of a few of basis points are reasonable if there are only small differences in the data input.)

6. NEV ratio sensitivity to a shock

If the data from the credit union's IRR report needs to be manually subtotaled for input in the NEV Supervisory Test template in Tab G, examiners should use Tab I: *Examiner Worksheet* to support the template inputs.

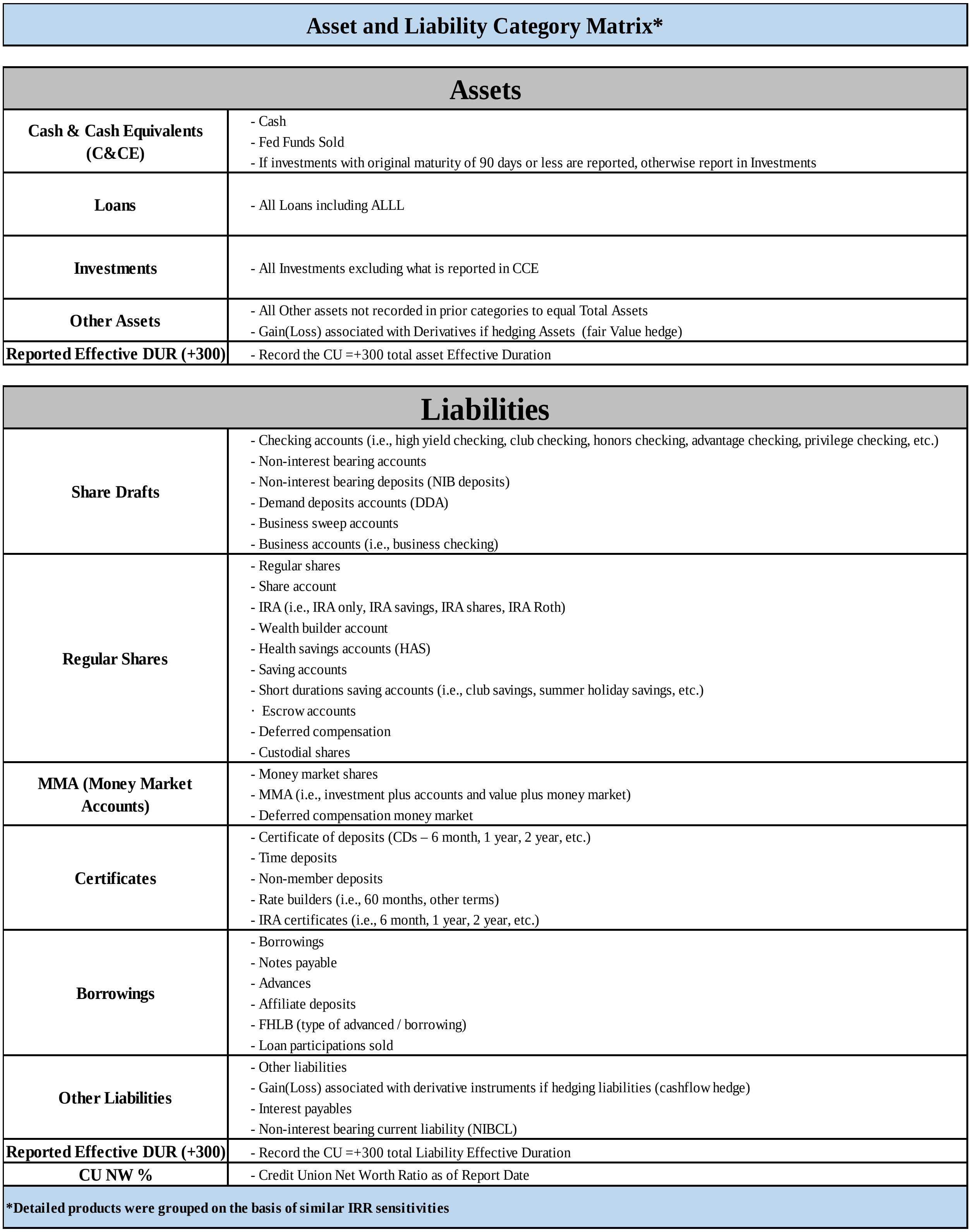
Important: Examiners should verify that they are using values from an instantaneous, parallel, and sustained +300 bps shock scenario and not, for example, values from a ramped or alternative yield curve scenario. Using other scenarios will yield incomparable results that do not correspond to NCUA's specified risk classifications for NEV.

FIGURE 3. ASSET, LIABILITY, AND NEV INPUTS (FROM TAB G: NEV SUPERVISORY TEST)



		Credit Union		
		Book ($ in thousands)	Base ($ in thousands)	Up 300 ($ in thousands)
Asset Data	**ASSETS**			
	Cash & Cash Equivalents	76.5	76.5	76.5
	Loans	1,847.4	1,846.4	1,692.1
	Investments	160.2	160.2	145.0
	All Other Assets	87.0	87.0	87.0
	Total Assets	**2,171.1**	**2,170.1**	**2,000.6**
Liability Data	**Liabilities**			
	Share Drafts	318.0	285.0	251.2
	Reg Shares	345.2	325.8	301.1
	MMA	645.8	628.0	613.0
	Total NMS Shares	*1,309.0*	*1,238.8*	*1,165.3*
	Certificates	416.6	419.4	405.5
	IRA/Keough Certs	39.7	40.1	38.0
	Borrowings	148.8	148.0	139.5
	Other Liabilities	18.1	18.1	18.1
	Total Liabilities	***1,932.2***	***1,864.4***	***1,766.4***
NEV Stats	CU NEV $ (Book / Base / +300)	238.94	305.73	234.20
	CU NEV Ratio (Book / Base / +300)	**11.01%**	**14.09%**	**11.71%**
	CU Net Worth Ratio	**11.03%**		
	CU NEV IRR Sensitivity			**-23.40%**

FIGURE 4. ASSET AND LIABILITY CATEGORIZATION MATRIX (FROM TAB H)



Asset and Liability Category Matrix*

Assets

Cash & Cash Equivalents (C&CE)	- Cash - Fed Funds Sold - If investments with original maturity of 90 days or less are reported, otherwise report in Investments
Loans	- All Loans including ALLL
Investments	- All Investments excluding what is reported in CCE
Other Assets	- All Other assets not recorded in prior categories to equal Total Assets - Gain(Loss) associated with Derivatives if hedging Assets (fair Value hedge)
Reported Effective DUR (+300)	- Record the CU =+300 total asset Effective Duration

Liabilities

Share Drafts	- Checking accounts (i.e., high yield checking, club checking, honors checking, advantage checking, privilege checking, etc.) - Non-interest bearing accounts - Non-interest bearing deposits (NIB deposits) - Demand deposits accounts (DDA) - Business sweep accounts - Business accounts (i.e., business checking)
Regular Shares	- Regular shares - Share account - IRA (i.e., IRA only, IRA savings, IRA shares, IRA Roth) - Wealth builder account - Health savings accounts (HAS) - Saving accounts - Short durations saving accounts (i.e., club savings, summer holiday savings, etc.) · Escrow accounts - Deferred compensation - Custodial shares
MMA (Money Market Accounts)	- Money market shares - MMA (i.e., investment plus accounts and value plus money market) - Deferred compensation money market
Certificates	- Certificate of deposits (CDs – 6 month, 1 year, 2 year, etc.) - Time deposits - Non-member deposits - Rate builders (i.e., 60 months, other terms) - IRA certificates (i.e., 6 month, 1 year, 2 year, etc.)
Borrowings	- Borrowings - Notes payable - Advances - Affiliate deposits - FHLB (type of advanced / borrowing) - Loan participations sold
Other Liabilities	- Other liabilities - Gain(Loss) associated with derivative instruments if hedging liabilities (cashflow hedge) - Interest payables - Non-interest bearing current liability (NIBCL)
Reported Effective DUR (+300)	- Record the CU =+300 total Liability Effective Duration
CU NW %	- Credit Union Net Worth Ratio as of Report Date

***Detailed products were grouped on the basis of similar IRR sensitivities**

NEV Supervisory Test

The NEV Supervisory Test is a capital-at-risk measure, or “shock test,” used to evaluate the change in the economic value of a credit union’s balance sheet for an instantaneous, parallel, and sustained shock in market interest rates.

There are two conditions of the test, both of which determine a credit union’s supervisory classification with respect to IRR:

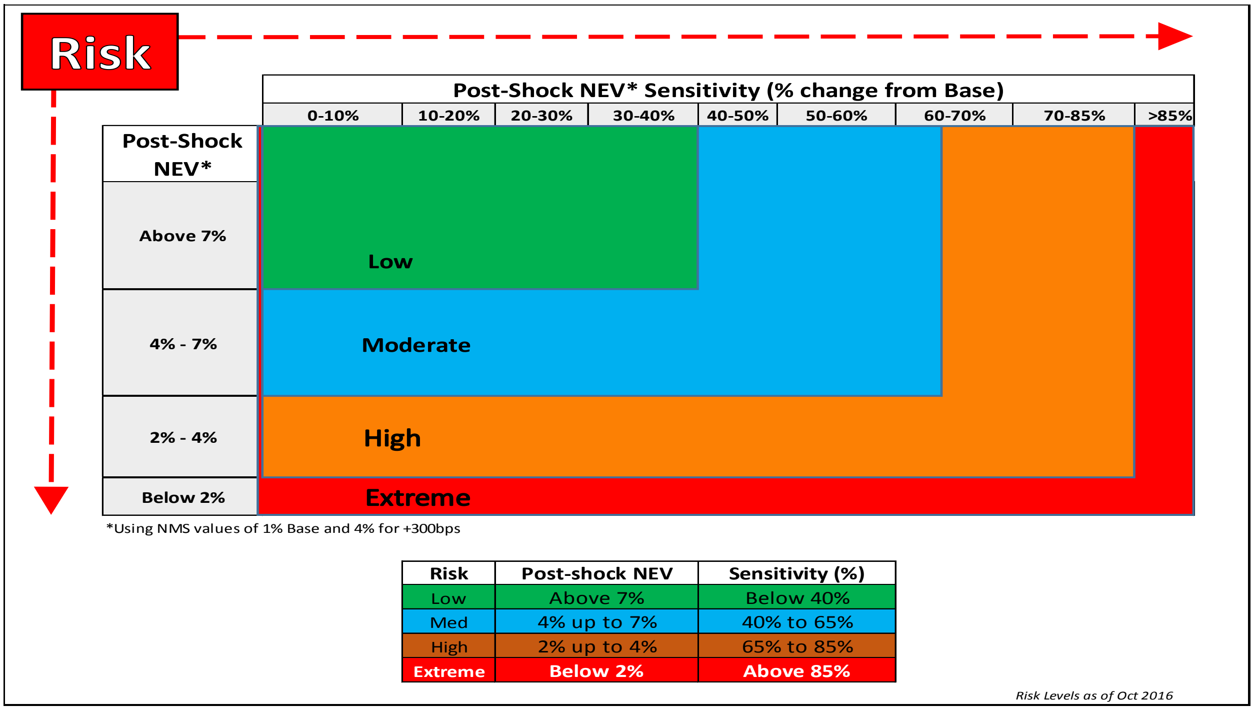
1. The post-shock NEV ratio (vertical axis)
2. The post-shock NEV sensitivity (horizontal axis)

For both test conditions, a credit union will be assigned a low, moderate, high, or extreme classification. See *Figure 5* for risk classifications.

Both tests apply in all circumstances, and a credit union’s assigned NEV Supervisory Test result will be the more severe rating of the two. For example, if a credit union’s post-shock NEV ratio falls into the low range, but its post-shock sensitivity is moderate, the risk classification defaults to moderate (that is, the more severe of the two outcomes).

The test outcomes always determine the classification. The result of the NEV Supervisory Test risk classification is used whether the source of the data is a credit union’s IRR report or NCUA’s Estimated NEV Test.

FIGURE 5. SUPERVISORY CLASSIFICATION FOR IRR (BASED ON RESULTS OF NEV SUPERVISORY TEST)



*Using NMS values of 1% Base and 4% for +300bps

Risk	Post-shock NEV	Sensitivity (%)
Low	Above 7%	Below 40%
Med	4% up to 7%	40% to 65%
High	2% up to 4%	65% to 85%
Extreme	**Below 2%**	**Above 85%**

Risk Levels as of Oct 2016

Source: Estimated NEV Tool (ENT)

Not all credit unions generate internal NEV reports, and those that do may not produce reliable reports. When a credit union's IRR reporting for NEV does not exist or is insufficient or inaccurate for NEV Supervisory Test purposes, examiners should use the ENT residing in Exam.xls workbook.

WHAT IS NCUA'S ESTIMATED NEV TOOL?

NCUA's ENT approximates an NEV measure using a credit union's Call Report data, as well as valuation and sensitivity estimates developed by NCUA. The tool also serves to estimate the level of IRR in a credit union's balance sheet. The ENT requires no user input. The worksheet resides in the AIRES Exam Workbook and automatically populates when an exam is created.

WHEN WILL EXAMINERS USE THE ESTIMATED NEV TOOL?

The ENT is used:

- When a credit union does not internally estimate its NEV; or
- When a credit union's NEV report is materially deficient for the use of the NEV Supervisory Test; or
- For credit unions with assets less than $50 million.

NCUA prefers to use the NEV Supervisory Test wherever practicable for credit unions with greater than $50 million in total assets.

HOW DOES THE ESTIMATED NEV TOOL WORK?

The ENT automatically populates select information from a credit union's current Call Report into the AIRES Exam Workbook when an exam is created. The tool estimates a credit union's NEV based on aggregate Call Report data and pre-established duration estimates assigned for the main asset and liability accounts held in the credit union's portfolio.[6] As with the NEV Supervisory Test, the ENT estimates book NEV, base NEV, and shocked NEV. The shock scenario is an instantaneous, parallel, and sustained 300 basis point increase in interest rates. The tool also generate NEV sensitivity for the +300 shock scenario.

Consistent with the risk-level rating scale from NCUA's NEV Supervisory Test, the ENT assigns a risk rating of low, moderate, high, or extreme for both the post-shock NEV ratio and post-shock NEV sensitivity. The risk rating assigned is the more severe of the two test conditions.

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[6] It is important to note that the starting NEV will not always match regulatory net worth because NEV is intended to show an approximated fair value of a credit union's equity to total assets. Regulatory capital, on the other hand, is calculated off net worth (retained earnings per GAAP) to total assets.

HOW IS THE ESTIMATED NEV TOOL STRUCTURED?

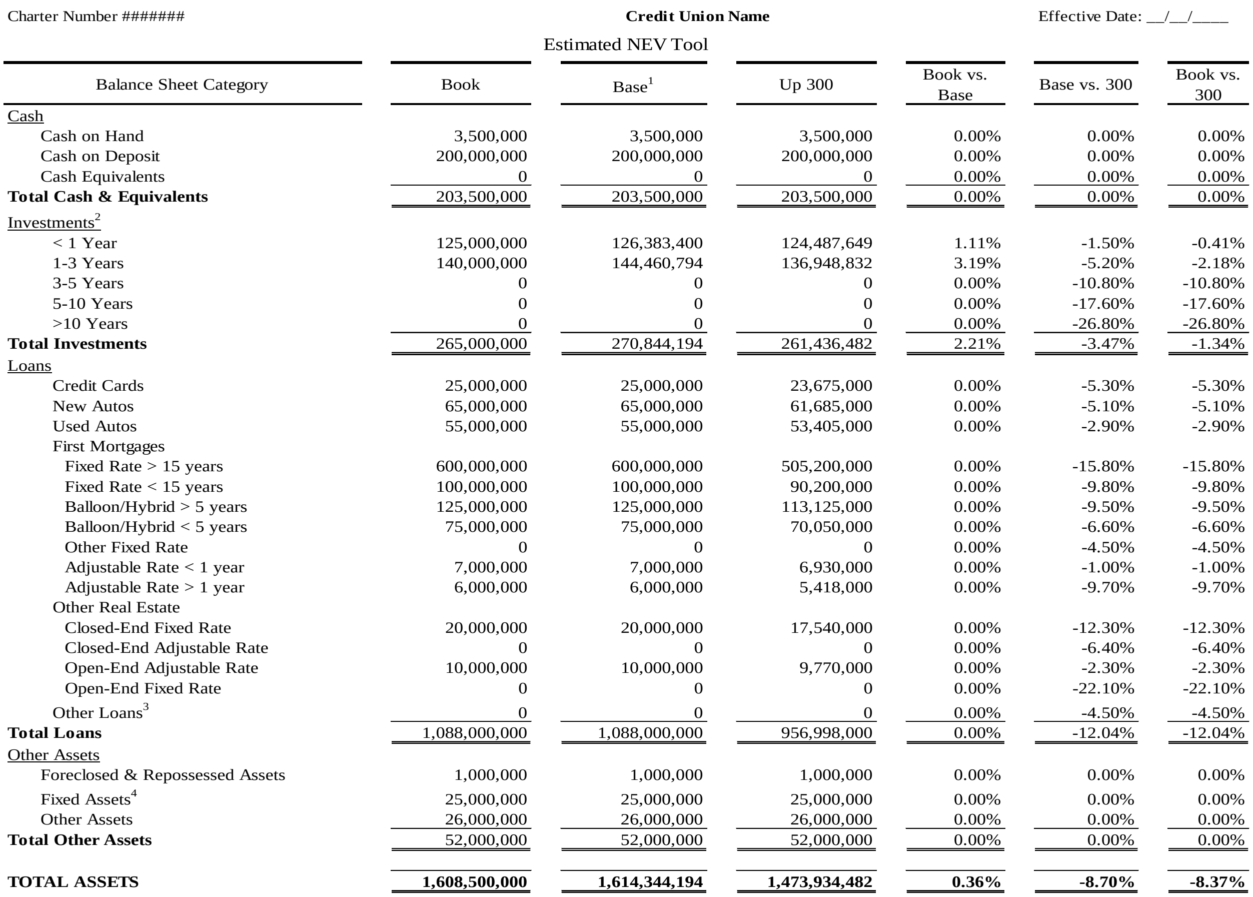
Figure 6 is an illustration of the ENT worksheet as it resides in the AIRES Exam Workbook. (**NOTE:** The risk levels in this example are for demonstration purposes only, and may not be the risk levels at the time of the examination.)

ASSETS

The tool assigns no premium or discount for a credit union's cash or other assets. The tool presents the devaluation for loans and investments separately from cash and other assets. Sensitivities for all assets are then combined on a weighted average basis to produce a total asset sensitivity.

NOTE: The base asset valuation includes the fair value of investments available-for-sale (AFS) and held-to-maturity (HTM) by the credit union. Currently, the tool assumes no difference between book and base loan values. This model assumption is based upon prior data that revealed the difference to be immaterial in the current rate environment. This model assumption will be periodically evaluated going forward, and modified if necessary.

FIGURE 6. ESTIMATED NEV TEST WORKSHEET (FROM EXAM.XLS) ILLUSTRATED AS TWO TABLES (ASSETS, LIABS/EQUITY)



Charter Number ####### **Credit Union Name** Effective Date: __/__/____

Estimated NEV Tool

Balance Sheet Category	Book	Base[1]	Up 300	Book vs. Base	Base vs. 300	Book vs. 300
Cash						
Cash on Hand	3,500,000	3,500,000	3,500,000	0.00%	0.00%	0.00%
Cash on Deposit	200,000,000	200,000,000	200,000,000	0.00%	0.00%	0.00%
Cash Equivalents	0	0	0	0.00%	0.00%	0.00%
Total Cash & Equivalents	203,500,000	203,500,000	203,500,000	0.00%	0.00%	0.00%
Investments[2]						
< 1 Year	125,000,000	126,383,400	124,487,649	1.11%	-1.50%	-0.41%
1-3 Years	140,000,000	144,460,794	136,948,832	3.19%	-5.20%	-2.18%
3-5 Years	0	0	0	0.00%	-10.80%	-10.80%
5-10 Years	0	0	0	0.00%	-17.60%	-17.60%
>10 Years	0	0	0	0.00%	-26.80%	-26.80%
Total Investments	265,000,000	270,844,194	261,436,482	2.21%	-3.47%	-1.34%
Loans						
Credit Cards	25,000,000	25,000,000	23,675,000	0.00%	-5.30%	-5.30%
New Autos	65,000,000	65,000,000	61,685,000	0.00%	-5.10%	-5.10%
Used Autos	55,000,000	55,000,000	53,405,000	0.00%	-2.90%	-2.90%
First Mortgages						
Fixed Rate > 15 years	600,000,000	600,000,000	505,200,000	0.00%	-15.80%	-15.80%
Fixed Rate < 15 years	100,000,000	100,000,000	90,200,000	0.00%	-9.80%	-9.80%
Balloon/Hybrid > 5 years	125,000,000	125,000,000	113,125,000	0.00%	-9.50%	-9.50%
Balloon/Hybrid < 5 years	75,000,000	75,000,000	70,050,000	0.00%	-6.60%	-6.60%
Other Fixed Rate	0	0	0	0.00%	-4.50%	-4.50%
Adjustable Rate < 1 year	7,000,000	7,000,000	6,930,000	0.00%	-1.00%	-1.00%
Adjustable Rate > 1 year	6,000,000	6,000,000	5,418,000	0.00%	-9.70%	-9.70%
Other Real Estate						
Closed-End Fixed Rate	20,000,000	20,000,000	17,540,000	0.00%	-12.30%	-12.30%
Closed-End Adjustable Rate	0	0	0	0.00%	-6.40%	-6.40%
Open-End Adjustable Rate	10,000,000	10,000,000	9,770,000	0.00%	-2.30%	-2.30%
Open-End Fixed Rate	0	0	0	0.00%	-22.10%	-22.10%
Other Loans[3]	0	0	0	0.00%	-4.50%	-4.50%
Total Loans	1,088,000,000	1,088,000,000	956,998,000	0.00%	-12.04%	-12.04%
Other Assets						
Foreclosed & Repossessed Assets	1,000,000	1,000,000	1,000,000	0.00%	0.00%	0.00%
Fixed Assets[4]	25,000,000	25,000,000	25,000,000	0.00%	0.00%	0.00%
Other Assets	26,000,000	26,000,000	26,000,000	0.00%	0.00%	0.00%
Total Other Assets	52,000,000	52,000,000	52,000,000	0.00%	0.00%	0.00%
TOTAL ASSETS	**1,608,500,000**	**1,614,344,194**	**1,473,934,482**	**0.36%**	**-8.70%**	**-8.37%**

LIABILITIES

For liabilities, the tool uses the account categories as presented in the credit union's Call Report (for example, non-maturity shares, certificates/IRAs, and borrowings, and other deposits and liabilities). These deposit accounts are valued in the tool based on predetermined levels. The value benefit assigned to non-maturity shares is identical to those used in NCUA's NEV Supervisory Test. All 'Other' liabilities with contractual maturities are valued in the model at book value. For shares and borrowings, the premium is specified for both the base case and +300, allowing for comparisons of base versus +300, book versus base, and book versus +300.[7]

For credit unions that hold interest rate derivatives, the base and shocked values are reported on a separate liability line in the Estimated NEV tool. Derivatives with a net positive fair value reduces total liabilities while derivatives with a net negative fair value increases total liabilities.[8]

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[7] As with the NEV Supervisory Test, book equity is measured by subtracting liabilities from total assets; book equity may differ from the statutory measure of net worth used for Prompt Corrective Action.

[8] The book values for derivatives are currently reported in Other Assets and Liabilities as per the call report. The Base value for the "Derivatives" line represents the reported values from Schedule "D", Section 5 in the call report.

The value of the derivatives in the +300 scenario are calculated using an estimate for how much the contract value would change based on the maturity of the derivatives.[9]

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[9] The Up300 values of pay-fixed swap derivatives are estimated as 2.7% of the notional value for each additional year in the maturity of the derivatives. (e.g., $1 Million notional on a five year maturity pay-fixed swaps would increase by 13.5% for a 300 basis point increase in interest rates.) Receive fixed swaps decrease by 2.7% of the notional value for every additional year of maturity. Caps increase by 1.2% of the notional value for every year increase in maturity assuming an option strike price of 100 basis points above the at-the-market Strike rate.

Charter Number ####### **Credit Union Name** Effective Date: __/__/____

Estimated NEV Tool

Balance Sheet Category	Book	Base[1]	Up 300	Book vs. Base	Base vs. 300	Book vs. 300
Liabilities						
Non-Maturity Shares						
Regular Shares	225,000,000	222,750,000	213,840,000	-1.00%	-4.00%	-4.96%
Share Drafts	200,000,000	198,000,000	190,080,000	-1.00%	-4.00%	-4.96%
Money Markets	650,000,000	643,500,000	617,760,000	-1.00%	-4.00%	-4.96%
Total Non-Maturity Shares	1,075,000,000	1,064,250,000	1,021,680,000	-1.00%	-4.00%	-4.96%
Certificates & IRA/Keogh Shares						
Certificates & IRAs < 1 Year	200,000,000	200,500,000	197,492,500	0.25%	-1.50%	-1.25%
Certificates & IRAs 1 - 3 Years	100,000,000	100,250,000	94,235,000	0.25%	-6.00%	-5.77%
Certificates & IRAs > 3 Years	40,000,000	40,100,000	35,288,000	0.25%	-12.00%	-11.78%
Total Certificates & IRA/Keogh Shares	340,000,000	340,850,000	327,015,500	0.25%	-4.06%	-3.82%
Borrowings						
Borrowings < 1 Year	0	0	0	0.25%	-1.50%	-1.25%
Borrowings 1 - 3 Years	0	0	0	0.25%	-6.00%	-5.77%
Borrowings > 3 Years	0	0	0	0.25%	-12.00%	-11.78%
Total Borrowings	0	0	0			
Other Maturity Shares & Deposits						
Other Shares & Deposits < 1 Year	730,000	731,825	720,848	0.25%	-1.50%	-1.25%
Other Shares & Deposits 1 to 3 Years	0	0	0	0.25%	-6.00%	-5.77%
Other Shares & Deposits > 3 Years	0	0	0	0.25%	-12.00%	-11.78%
Total Other Maturity Shares & Deposits	730,000	731,825	720,848	0.25%	-1.50%	-1.25%
Other Liabilities						
Total Other Liabilities	22,092,123	22,092,123	22,092,123	0.00%	0.00%	0.00%
Derivatives[5]		4,331,603	(46,278,685)	0.00%	-1168.40%	
TOTAL LIABILITIES	**1,437,822,123**	**1,432,255,551**	**1,325,229,786**	**-0.39%**	**-7.47%**	**-7.83%**
NET ECONOMIC VALUE[6]						
Net Economic Value (NEV)	170,677,877	182,088,643	148,704,696			
NEV Ratio	10.61%	11.28%	10.09%	**Low**		
NEV Sensitivity			-18.33%	**Low**		
Overall Rating (highest of two ratings)				**Low**		

[1] At present, the base scenario uses book-value for most asset groups. Non-maturirty share premiums reflect the values used in the NEV Supervisory Test, while DCCM provided estimated premiums for other shares and liabilities.

[2] Base investment values reflect unrealized gains and losses on AFS and HTM securities. The gains and losses are allocated on a duration-weighted basis. The base value of the remaining investment categories are measured at book value.

[3] Other loans combines all loan types specifically listed above, including other unsecured, PALs, student, and all other loans, and leases receivable.

[4] Fixed assets includes land & buildings, NCUA share insurance capitalization deposit, and other fixed assets.

[5] The estimated Base and Up300 are reported in the Liability section of ENT (negative balances representing an increase in value). The book values for derivatives may be represented in Other Assets/Liabs as per the call report. The Base value for the "Derivatives" line represents the reported values from Schedule "D", Section 5 in the call report. The Up300 values of pay-fixed swap derivatives are estimated as 2.7% of the notional value for each additional year in the maturity of the derivatives. (e.g., $1 Million notional on a five year maturity pay-fixed swaps would increase by 13.5% for a 300 basis point increase in interest rates.) Receive fixed swaps decrease by 2.7% of the notional value for every additional year of maturity. Caps increase by 1.2% of the notional value for every year increase in maturity assuming an option strike price of 100 basis points above the at-the-market Cap rate.

[6] Net economic value is measured off equity, not statutory net worth.

	NEV Supervisory Test Risk Levels			
NEV INDICATOR	**Extreme**	**High**	**Moderate**	**Low**
Post Shock NEV Ratio	≤ 2%	2% - 4%	4% - 7%	> 7%
Base to Shock NEV Sensitivity	≤ -85%	-65% to -85%	-40% to -65%	> - 40%

HOW WAS THE ESTIMATED NEV TOOL (ENT) DEVELOPED?

NCUA determined that a rough proxy for NEV was necessary in order to estimate and evaluate IRR for those credit unions that do not internally model NEV. The ENT uses Call Report information and generalized assumptions regarding the average duration for asset and liability categories to generate this NEV proxy.

Initial model assumptions were derived through industry research and based upon the average levels of value sensitivity found in data samples compiled by NCUA. To the extent practicable, NCUA relies on observed levels of credit union and industry data to establish and/or modify its standardized parameters.

Balance sheet asset accounts are organized as shown in *Figure 7*. The corresponding estimate of asset sensitivity in a +300 basis point rate shock is also presented.

While asset valuation and sensitivity techniques were highly consistent among observed credit unions, the valuation and sensitivity treatment of liabilities was not. In order to cohere the ENT model output to the NEV Supervisory Test results and make these two models relatively consistent, the same value assumptions for non-maturity shares are used in both (i.e., a 1 percent value benefit on NMS for the base case and a 4 percent value benefit on for the +300 shock scenarios).

The sensitivity of maturity shares and borrowings in the base case and +300 shock scenarios may differ between the ENT model and the NEV Supervisory Test. The NEV Supervisory Test uses the sensitivity estimates of term deposits from the credit union. The ENT model provides sensitivities for the maturity deposits based on the length of maturity as reported by the credit union in the Call Report. Certificates, IRA/Keogh accounts, borrowings, and other shares and deposits with maturities less than 1 year, between 1 and 3 years, and greater than 3 years, provide the credit union with a value benefit of 1.5 percent, 6 percent, and 12 percent, respectively, in the +300 shock scenario. The base case value for these maturity shares adds 25 basis points to the book value of these liabilities.

Figure 7. Asset and Liability Sensitivity Assumptions

Balance Sheet Account	Estimated Sensitivity Assumptions (+300bps)
Loans (First Mortgages)	
Fixed Rate > 15 years	-15.8%
Fixed Rate < 15 years	-9.8%
Balloon/Hybrid > 5 years	-9.5%
Balloon/Hybrid < 5 years	-6.6%
Other Fixed Rate	-4.5%
Adjustable Rate < 1 year	-1.0%
Adjustable Rate > 1 year	-9.7%
Loans (Other Real Estate)	
Closed-End Fixed Rate	-12.3%
Closed-End Adjustable Rate	-6.4%
Open-End Adjustable Rate	-2.3%
Open-End Fixed Rate	-22.1%
Credit Cards	-5.3%
New Autos	-5.1%
Used Autos	-2.9%
Other Loans*	-4.5%

Balance Sheet Account	Estimated Sensitivity Assumptions (+300bps)
Investments	
< 1 Year	-1.5%
1-3 Years	-5.2%
3-5 Years	-10.8%
5-10 Years	-17.6%
>10 Years	-26.8%
Other Assets	0.0%
Cash	0.0%
Deposits and Other Liabilities	
Non-Maturity Shares	-4.0%
Maturity Shares and Borrowings	
< 1 Year	-1.5%
1-3 Years	-6.0%
3-5 Years	-12.0%
Other Liabilities	0.0%
* Other loans includes: 1) all other unsecured loans/lines of credit, 2) payday alternative loans, 3) leases receivable, and 4) total all other loans/lines of credit.	

WHAT ARE THE BENEFITS TO USING THE ESTIMATED NEV TOOL?

The greatest benefits are speed, simplicity, and consistency.

- The data used to populate the ENT flows automatically from a credit union's latest Call Report.
- Since the data and formulas are housed in Exam.xlsm, no user input is required for this test. Since no user input is required, there is essentially no risk of user-input error.
- The test can be performed for all credit unions that do not have an NEV model (and for those that do, should a need arise).
- The examiner can view the results of the test immediately. New ENT output results are available as soon as new Call Report data becomes available.
- The ENT is simple to use. The credit union's balance sheet is aggregated per the Call Report fields, and a factor is applied to obtain the result. The examiner can also look at the asset accounts individually to determine the impact of a single account on the overall results.
- The use of a standardized methodology makes it straightforward to compare results across credit unions.

WHAT ARE THE LIMITATIONS OF USING THE ESTIMATED NEV TOOL?

It is important to understand that results from the ENT are a general proxy for risk. The tool contains aggregated data and generalized assumptions about value and sensitivity for broad balance sheet categories (both assets and liabilities). It is not based on instrument-level cash flows the way the NEV Supervisory Test is. Because it is less precise, it is only suitable for smaller, less-complex balance sheets. The tool's parameters are fixed, and need to be evaluated over time for possible changes to ensure the model output remains reliable as a gauge of overall sensitivity to changes in market rates.

- The ENT model uses average sensitivity estimates derived from a sample of credit union IRR reports. The portfolio of the credit union being examined may differ from the sample average. For example, the credit union's investments may have a relatively high degree of optionality. While the ENT applies the same loan book to base assumptions for all credit unions, in reality each credit union has a unique premium or discount.
- ENT incorporates the market value of available-for-sale (AFS) and held-to-maturity (HTM) investments as reported by the credit union into the base valuations of investments.
- The balance sheet accounts in the model are only as detailed as the content of the Call Report. This means the model is based on highly aggregated data and not as precise or

rigorous as analyses that generate actual NEV measures from instrument-level cash flows.

- The model's underlying assumptions for liability values and sensitivities are also standardized and may require adjustment over time.

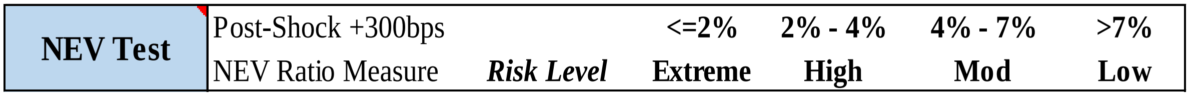
CAN EXAMINERS ASSIGN AN IRR RATING BASED ONLY UPON RESULTS FROM THE ESTIMATED NEV TOOL?

Yes. If the exam scope requires the examiner to use the IRR Workbook, then the ENT result can serve as the basis for the Market Risk rating. However, unlike the NEV Supervisory Test, the Market Risk rating for an ENT exam is not a required rating floor for the IRR supervisory rating. The examiner may adjust the overall rating based on how the other components of the IRR review are rated but he/she also has the flexibility to use only the ENT result to make a ratings determination and, in those cases, the rating would be the ENT outcome.

NCUA examiners will view the ENT model's output in the Exam.xlsm workbook in AIRES. For IRR Workbook users, the "Market Risk" risk score automatically populates as the assigned risk level.

Steps B, C, and D

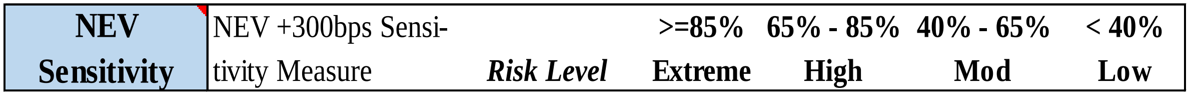
b)



NEV Test	Post-Shock +300bps		<=2%	**2% - 4%**	**4% - 7%**	**>7%**
	NEV Ratio Measure	***Risk Level***	**Extreme**	**High**	**Mod**	**Low**

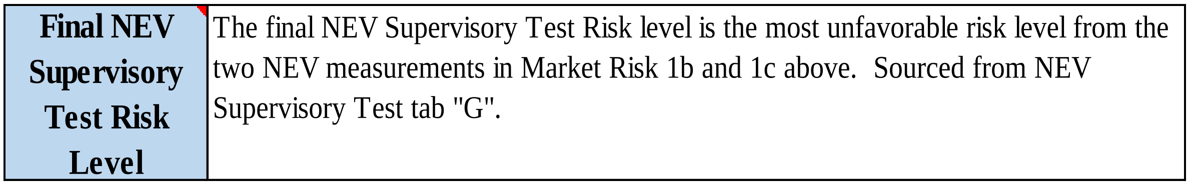
OR

c)



NEV Sensitivity	NEV +300bps Sensi-		>=85%	**65% - 85%**	**40% - 65%**	**< 40%**
	tivity Measure	***Risk Level***	**Extreme**	**High**	**Mod**	**Low**

d)



Final NEV Supervisory Test Risk Level	The final NEV Supervisory Test Risk level is the most unfavorable risk level from the two NEV measurements in Market Risk 1b and 1c above. Sourced from NEV Supervisory Test tab "G".

Examiners will use the NEV Supervisory Test (Tab G) to calculate the post-shock NEV ratio and post-shock NEV sensitivity. The NEV Supervisory Test standardizes the value benefit for all non-maturity shares at -1.0 percent for the base case and -4.0 percent in a +300 bps parallel shock.

The shocked NEV Supervisory Test results are the primary driver for evaluating and assigning a rating to a credit union's Market Risk. The test results flow automatically to Tab A for most of the questions/review steps and permit the examiner to easily verify the results.

The quantitative tests for post-shock NEV and NEV sensitivity are not combined risk measurements. Each is a binding result, and the more severe of the two outcomes becomes the credit union's Market Risk level.

The IRR workbook formulas will automatically take the quantitative results of the NEV Supervisory Test and generate the Market Risk rating based on the criteria described above. Of course, the test results are only usable after the examiner has gone through a data verification process to ensure the data inputs are reasonable and supportable, as described in Section II.

Section II: Verification of Supervisory Test Results (using NEV Supervisory Test results)

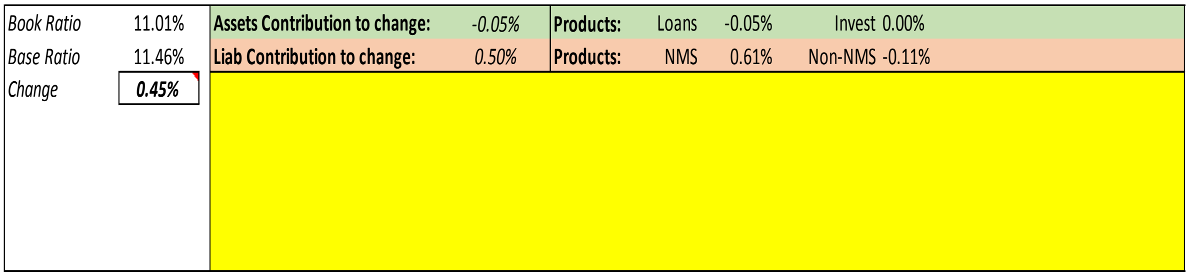
- Step A: *Book to Base NEV*
- Step B: *Base to Shock NEV*
- Step C: *Asset Review*
    - Prepayment Speed Analysis
    - Discount Rate Assumption Analysis
    - Investment Assumption Analysis
- Step D: *Funding Review*
- Step E: *Account Aggregation and Data Completeness*
- Step F: *Analysis*

Step A: *Book to Base NEV*

Book to Base	Attribute the variance from Book values (Assets minus Liabs, not NWR) to the Base NEV without consideration to the underlying assumptions and pricing methodologies. Identify the account groups that are contributing to the Premium or Discount using the CU IRR Report. *(e.g. if Loans are the primary group contributing to the change, what sub-account(s) of loans are the largest contributor(s))(AFS securities and Derivatives should have little impact from book to base given the accounting requirement for Fair Value)*

Using the results of the NEV Supervisory Test, examiners will attribute the variance from book to base NEV. What are the book and base case metrics? What is the credit union's change in book to base case?

FIGURE 8. TAB A: *MARKET RISK* – CHANGE IN BOOK TO BASE NEV RATIOS



Book Ratio	11.01%	**Assets Contribution to change:**	*-0.05%*	**Products:**	Loans	-0.05%	Invest	0.00%
Base Ratio	11.46%	**Liab Contribution to change:**	*0.50%*	**Products:**	NMS	0.61%	Non-NMS	-0.11%
Change	***0.45%***							

By comparing the book measure of net worth to the base case NEV, one can observe if there is a reported increase or decrease in economic value of the current balance sheet. This helps determine whether the base NEV (that is, the starting point from which shock scenarios are run) is reasonable. It is important that base NEV be realistic and supportable because an overstated base NEV can lead to understated and misleading post-shock test results.

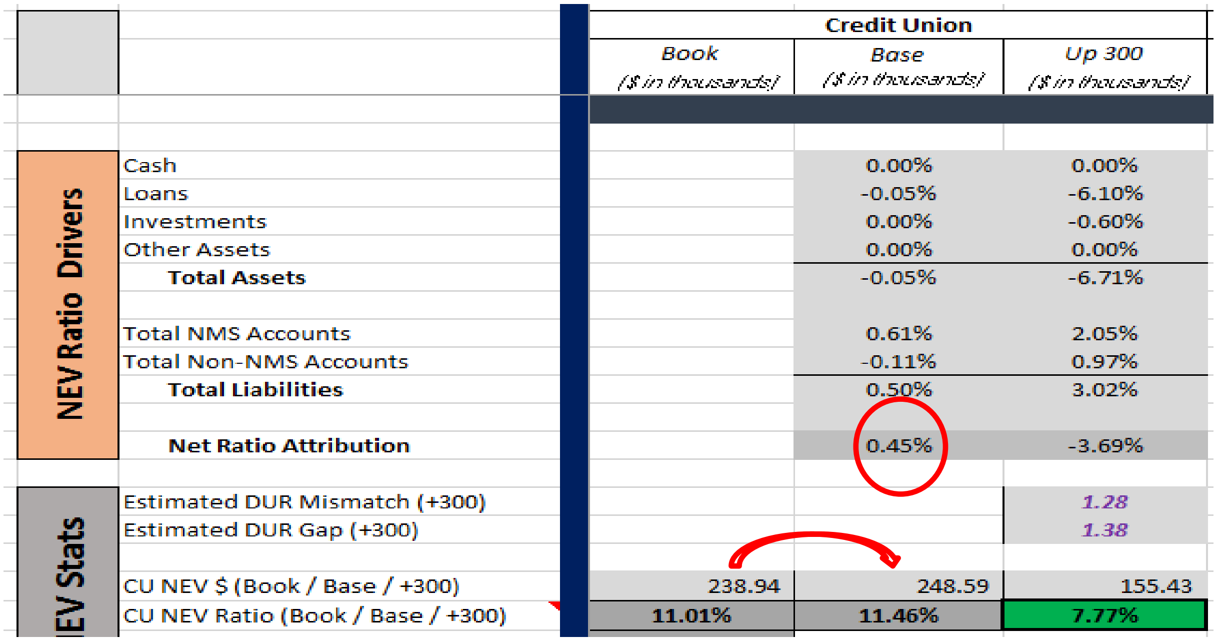
Examiners need to attribute the change between book ratio and base ratio. Specifically, did assets or liabilities have largest impact on the change? This is a critical step in understanding the valuations assigned to assets and liabilities (with the exception of NMS) and how their economic value compares to the book value. This attribution can be done by reviewing NEV drivers in Tab G: NEV Supervisory Test.

In *Figure 8*, for example, Tab A: *Market Risk* indicates that the book to base change in ratio was 45bps (11.01 percent to 11.46 percent).

The table in Tab A will also identify which major account category(s) is contributing to the change. In the example in *Figure 8*, loans contribute -5bps, investments have zero impact, NMS contribute 61bps, and other contractual liabilities contribute -11bps, all netting/totaling to a change of +45bps.

Figure 9 is a sample of model results as presented in the NEV Supervisory Test. This figure illustrates the Net Ratio attribution from book to base.

FIGURE 9. SAMPLE RESULTS FROM NEV SUPERVISORY TEST



		Credit Union		
		Book *($ in thousands)*	*Base* *($ in thousands)*	*Up 300* *($ in thousands)*
NEV Ratio Drivers	Cash		0.00%	0.00%
	Loans		-0.05%	-6.10%
	Investments		0.00%	-0.60%
	Other Assets		0.00%	0.00%
	Total Assets		-0.05%	-6.71%
	Total NMS Accounts		0.61%	2.05%
	Total Non-NMS Accounts		-0.11%	0.97%
	Total Liabilities		0.50%	3.02%
	Net Ratio Attribution		0.45%	-3.69%
EV Stats	Estimated DUR Mismatch (+300)			*1.28*
	Estimated DUR Gap (+300)			*1.38*
	CU NEV $ (Book / Base / +300)	238.94	248.59	155.43
	CU NEV Ratio (Book / Base / +300)	**11.01%**	**11.46%**	**7.77%**

Examiners' review of these results need to assess the key account groups that contribute to any change from book net worth to base case NEV. Four key metrics are provided in the Market Risk tab: loans, investments, NMS, and non-NMS.

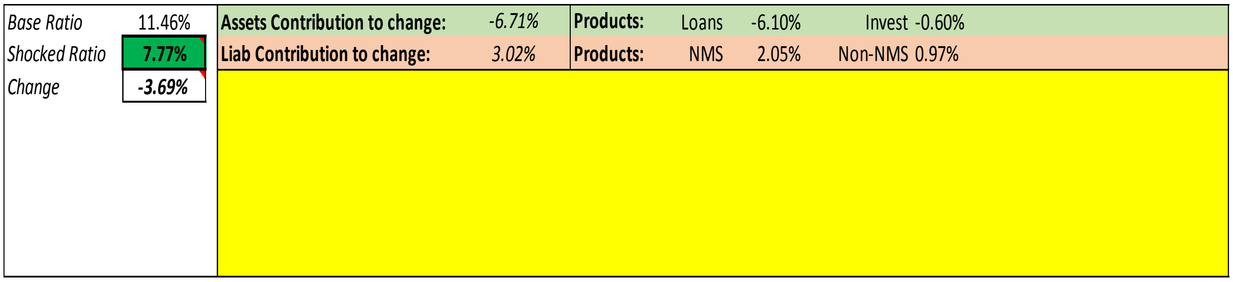
Unusual or high premiums/discounts in any of these account groups should be further explained by referring to the credit union's IRR report. Examiners may need to review sub account groups (that is, real estate loans, consumer loans, indirect loans, investment types, etc.) in greater detail to explain and isolate the underlying source of sensitivity that is impacting the main account group(s) variance. Here, examiners do not need to provide an assessment of the reasonableness and supportability of the discount or premium. Rather, he/she is capturing data to help explain which assets or liabilities create the most impact on the variance between book net worth and base case NEV.

Step B: *Base to Shock*

b)	**Base to Shock**	Attribute the variance from base values to the shocked NEV without consideration to the underlying assumptions and pricing methodologies. Identify the account groups that are contributing to the premium or discount using the CU IRR Report. *(e.g. if Loans are the primary group contributing to the change, what sub-account(s) of loans are the largest contributor(s)).*

Using the results of the NEV Supervisory Test from Tab G, examiners will attribute the variance from base to post-shock NEV. What are the base and post-shock case metrics? What is the change in base to post-shock scenario? What are the key drivers affecting the change from base to post-shock? Four key metrics are provided: loans, investments, NMS, and non-NMS.[10]

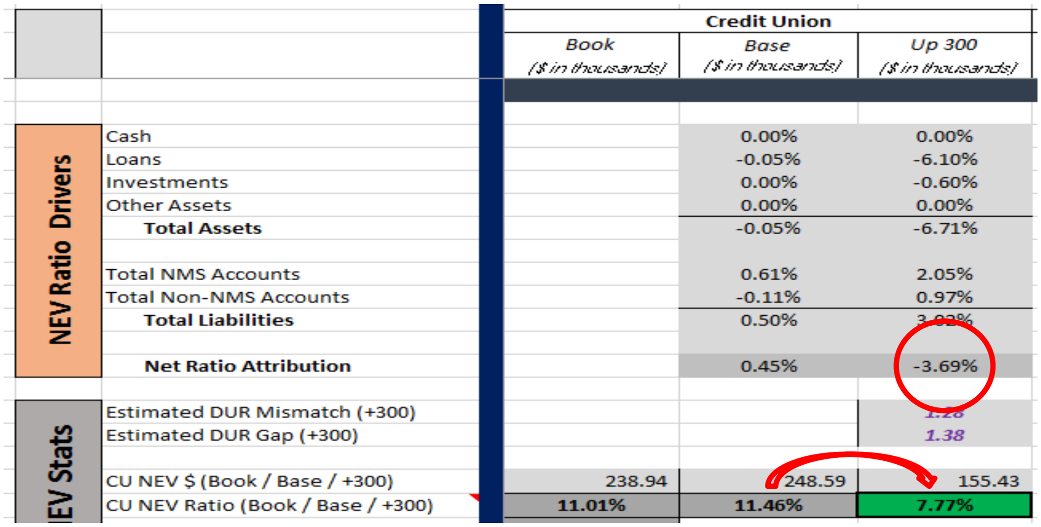
FIGURE 10. TAB A: *MARKET RISK* – CHANGE IN BASE TO POST SHOCK NEV RATIOS



Base Ratio	11.46%	**Assets Contribution to change:**	*-6.71%*	**Products:**	Loans	-6.10%	Invest	-0.60%
Shocked Ratio	**7.77%**	**Liab Contribution to change:**	*3.02%*	**Products:**	NMS	2.05%	Non-NMS	0.97%
Change	***-3.69%***							

A table like the one in *Figure 10* resides in the Market Risk tab and flows up automatically from the NEV Supervisory Test tab. Examiners will review and compare the base case versus post-shock values for each balance sheet component to identify the primary contributors to the change in post-shock NEV. Examiners will identify the asset categories that are most sensitive to rate shocks. In *Figure 11*, the attribution for the -3.69 percent variance between base NEV and post-shock NEV (11.46 percent to 7.77 percent, respectively) is summarized.

FIGURE 11. SAMPLE RESULTS FROM NEV SUPERVISORY TEST



		Credit Union		
		Book *($ in thousands)*	*Base* *($ in thousands)*	*Up 300* *($ in thousands)*
NEV Ratio Drivers	Cash		0.00%	0.00%
	Loans		-0.05%	-6.10%
	Investments		0.00%	-0.60%
	Other Assets		0.00%	0.00%
	Total Assets		-0.05%	-6.71%
	Total NMS Accounts		0.61%	2.05%
	Total Non-NMS Accounts		-0.11%	0.97%
	Total Liabilities		0.50%	3.02%
	Net Ratio Attribution		0.45%	-3.69%
EV Stats	Estimated DUR Mismatch (+300)			*1.28*
	Estimated DUR Gap (+300)			*1.38*
	CU NEV $ (Book / Base / +300)	238.94	248.59	155.43
	CU NEV Ratio (Book / Base / +300)	**11.01%**	**11.46%**	**7.77%**

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[10] Non-NMS refers to other liability accounts that are not classified as NMS. In the example in *Figure 11*, loans are the asset category that drive most of the variance on the asset side, while the NMS accounts are the primary driver on the liability side.

In *Figure 11*, observe the changes in valuations for assets in the rate shock and observe the changes at the category line.

The overall percentage change from the base NEV to the post-shock NEV is a -369bps, attributed by combining -671bps from assets and +302bps from liabilities. The primary attribute in the assets section is loans (-610bps), with investments showing a modest -60bps, and no contribution (as expected) from cash and other assets.

To understand which types of loans or investments are causing the percentage change, examiners will need to review the credit union's detailed IRR report. The report should disaggregate the loans and investments in greater detail. It is important to understand which assets are the most sensitive in the shock scenarios. Products with cash flows that do not reprice quickly (for example, fixed rate mortgages) or reprice to a limit (for example, adjustable-rate mortgages with caps) are more sensitive to interest rate shocks than those with shorter maturities.

For this step, examiners do not need to provide an assessment of the reasonableness of the discount or premium. The objective of this step is simply to attribute and capture assets or liabilities that generate the most sensitivity.

Step C: *Asset Review*

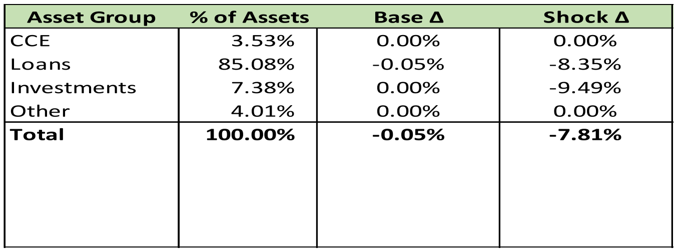
c)	**Asset Review**	Determine the reasonableness of the material asset categories price or value changes (% movement) for Base and Shock using the CU IRR report. Are Asset valuations, durations and sensitivity measures reasonable, supportable and observable? *The analytics to the right are the changes in values from book-to-base and base-to-shock, however, examiners should review the valuations that support these changes.*

Examiners will review the reasonableness of the credit union's IRR model output for each unique asset category for book versus base and base versus shock.

The *NEV Supervisory Test* tab presents four asset categories: cash, loans, investments, and other assets. Examiners should focus on the three main account groups in the assets category: cash, loans, and investments. The "other assets" category will usually represent an insignificant portion of total assets. Unusual or high premiums or discounts in any of these account groups should be further explained by referring to the credit union's IRR report. Examiners should review the sub account groups (e.g., real estate loans, consumer loans, investment types) to determine whether the effects of these sub account groups on the main account group(s) are reasonable. This can be accomplished by analyzing the changes from book to base case scenarios and base case to shock scenarios.

Examiners will review and compare the book and base values for each balance sheet component to determine the primary contributors to the base case NEV premium or discount. Large premiums or discounts at the base level will have a significant impact on the post-shock measurements and the NEV Supervisory Test results. If such large premiums/discounts are not reasonable and supported, then the NEV measures become distorted and unreliable. *Figure 12* illustrates how the sensitivities of the general asset groups are presented to show how much each is contributing to the base case and shocked valuations.

FIGURE 12. SAMPLE OF ASSET SENSITIVITIES



Asset Group	% of Assets	Base Δ	Shock Δ
CCE	3.53%	0.00%	0.00%
Loans	85.08%	-0.05%	-8.35%
Investments	7.38%	0.00%	-9.49%
Other	4.01%	0.00%	0.00%
Total	**100.00%**	**-0.05%**	**-7.81%**

By looking at these results, examiners can determine whether to look at underlying sub accounts to determine what is driving the higher sensitivities within an asset category. Examiners may wish to review these categories when they see large or unreasonable sensitivities. There are multiple factors that can account for higher sensitivity and these include the estimated timing of cash flows and the respective discount rates used to present value them. Sensitivity is a function of an instrument's average life and the discount rate used to calculate the present value of its future cash flows. For assets, shorter maturities and lower discount rates raise values (and higher asset values benefit NEV). For liabilities, longer maturities and higher discount rates bring down liability values (and lower liability values benefit NEV). All things remaining equal, maximizing aggregate asset values maximizes the calculated base case NEV (and higher NEV values are indicative of financial strength).

In *Figure 12*, loans are marked down at a discount of -.05 percent. Normally, the loans and investments will have a change from book to base (either a premium or discount). In some instances, if a credit union only has available-for-sale (AFS) securities, the book and base values will be equal because they are reported at fair value on the balance sheet. Valuations for AFS portfolios should be consistent between accounting and risk management; however, differences may occur. If the differences are significant, they should be explained by the credit union. Review the Equity section of the Call Report to identify the credit union's net unrealized gains (losses) associated with the AFS portfolio.

Again, the objective of this step is to determine if the credit union is using reasonable and supportable values and to identify the account components that may materially impact the NEV results. Establishing reasonable and supportable values for assets may involve the use of market or matrix prices in the case of investments and/or modeled fair value estimates in the case of loans. Examiners should be comfortable with the sources for price/value estimates.

For example, an observable input for investments would be a price quote or estimate from an industry recognized pricing service and a modeled fair value estimate for real estate loans could be derived from observed values of instruments issued by government-sponsored enterprises (for example, Fannie Mae or Freddie Mac).

NCUA (OIS) pricing tables can help examiners understand current valuation and shock sensitivities for mortgage loans.

To gauge the reasonableness of a credit union's price/value assumptions, it is important to understand how certain embedded options will impact the estimated values of instruments. A credit union's cash flow estimates, earnings-at-risk, and NEV measures need to sufficiently capture these effects. A common example of an embedded option in investment assets is a callable bond, one that can be "called" prior to the stated legal final maturity at the discretion of the issuer (mature early). For callable securities, the strike price or strike yield (the price or yield at which the security will be called) may be reached under a falling rate scenario. This reduces the amount of price appreciation as compared to a non-callable bond with the same legal final maturity. For earnings simulation models, this will result in reduced earnings (due to reinvestment at reduced yields). For valuation models, asset appreciation in a falling rate environment will be restricted by the call. The cash flows and valuation estimates must capture option risk.

In rising rate scenarios, the callable security's performance will resemble a fixed-rate Treasury of similar legal final maturity.

Embedded options also exist in loans. For example, the option to make unscheduled principal payments (prepayments) on a mortgage. Credit unions will need a reliable means to establish the estimated cash flows and values for loan assets. This is a major input for NEV because the majority of most credit unions' assets are held in loans, and a significant portion of those loans are mortgage related. For credit unions lacking advanced ALM models, there are additional methods for measuring IRR in mortgage loans. Using mortgage-backed securities as a proxy, credit unions can obtain estimates of risk exposure on their mortgages. Industry-recognized information providers (such as Bloomberg and CMS BondEdge) also provide estimated price sensitivity of individual securities.

For most securities, current and shocked values can readily be obtained through industry-recognized pricing sources or from a primary market maker such as a broker/dealer. Many securities have embedded options and, if the feature is available, the price source should be generated in an Option Adjusted Spread (OAS) mode so as to more accurately treat embedded options consistent with market convention. If the credit union's source is Bloomberg, for example, this service has an OAS pricing capability if the user activates it. The underlying risk management objective is to use reasonable and supportable prices, discount rates, and cash flow assumptions whenever practicable. This process becomes more dynamic as instrument holdings become more material, complex, and risky (especially embedded options).

If the model computes investment valuations, it should consider the impact on principal and interest cash flows of all types of embedded options and payment structures. Such options include calls and interest rate caps and floors. Furthermore, the model should be able to accommodate those investments with structured features (such as real estate mortgage investment conduit (REMIC) securities), prioritized cash flows, or subordinated classes of bonds within a deal. A model that fails to accurately forecast expected cash flows will reduce the accuracy and reliability of the risk measures and may materially misstate the level of risk.

If unusually high asset premiums or discounts are observed in the book versus base case, examiners should review the model assumptions for reasonableness. If the loan or investment portfolios are incorrectly valued in the model, the credit union needs to correct the deficiency and re-run the model to ensure model results and the revised NEV Supervisory Test are accurate; otherwise, these results will cause the NEV Supervisory Test to produce unreasonable and inaccurate results.

If the credit union is unable to correct and re-run the model during the examination, examiners should consult with a supervisor, regional capital markets specialist (RCMS), or senior capital markets specialist (SCMS) from the Division of Credit and Capital Markets (DCCM) to review the situation and assess the potential need for additional supervision in the future. A credit union’s inability to correct and re-run a model during an examination may also require an examiner to utilize the ENT for NEV Supervisory Test purposes. While the ENT is less dynamic, it does provides a risk proxy that can help identify the potential level of market risk inherent in a balance sheet.

Effective duration for total assets can be found in cell G27 of Tab G: NEV Supervisory Test. The lower the effective duration, the more favorable the IRR risk level will be. This metric is optional and not required for the calculation of the NEV Supervisory Test.

In general, the longer the loan term, the higher its duration (for example, the duration of a newly issued mortgage will be greater than that of a new auto loan). Also, the longer the duration, the more sensitive the asset’s value becomes for a given interest rate shock (for example, mortgage values decline more than car loans in a +300bps shock). Examiners should look for price changes that don’t appear consistent with the asset maturity or type. Unusual duration estimates or shocked-value changes may indicate a model weakness and should be discussed with the credit union. If the credit union cannot provide a reasonable explanation for the durations and shocked changes in the IRR model report, this may be an indication of weak IRR management. Not all ALM models in the marketplace provide effective duration for each asset type. Examiners’ review should focus on the valuation and shocked sensitivity of each asset class and duration, if available.

Asset valuations, sensitivity, and duration measures are distinct but have similar ways to gauge the level of IRR. Because not all ALM models provide results for these three measures, examiners can choose to analyze the credit union’s assets using any one of these measures.

For more guidance, see NCUA Letter to Credit Unions 99-CU-12, *Real Estate Lending and Balance Sheet Management* (August 1999).

To develop an intuition about the factors that drive value sensitivities and risk, the table below provide some general guidance in the form of short-hand observations. These are helpful reminders of how key drivers of risk impact asset values and NEV results.

Assets
Higher NEV could be the product of higher market values or from lower discount rates and/or shorter cash flows.
Lower NEV could be the product of lower market values or from higher discount rates and/or longer cash flows.

As a guideline for understanding how much duration is inherent in different asset types, examiners would benefit from reviewing *Figure 7*, *Asset and Liability Sensitivity Assumptions*, to understand the typical asset devaluations expected for a +300bps shock.

Prepayment Speed Analysis

Retail amortizing loans and mortgage-related investments contain embedded prepayment options, where the borrower has the right to make unscheduled principal payments or pay off a loan entirely without penalty. Commercial loans may contain prepayment penalties or contractual clauses deterring prepayments, but prepayments will occur if the incentive is sufficient. If the credit union's model does not account for prepayments, or does not account for them properly as addressed in the following questions, the results will be inaccurate. This is true for both earnings-at-risk and NEV measures.

To accurately capture the projected cash flows of these instruments, prepayment of principal should be estimated under static, positive, and negative rate shocks. Estimating prepayments under these different interest rate scenarios is important because prepayments tend to decline in rising rate scenarios, and increase in falling rate scenarios due to the refinancing incentive.

Credit unions are likely to obtain prepayment estimates from a recognized industry source. Information providers can provide prepayment estimates for mortgage-related securities. These estimates can also be used as proxies for mortgage loans with similar terms and characteristics. Prepayment behavior is dynamic and estimates change over time in response to market factors, such as rate levels and home prices. It is important for modelers to keep current with prepayment estimates and recognize that different types of loans can have very different prepayment behavior.

Stale prepayment data can lead to inaccurate prepayment assumptions and an inaccurate IRR measurement. Accordingly, a credit union should assess its prepayment assumptions no less frequently than once each year to determine if the assumptions are still valid. For complex institutions, the prepayment estimate may need to be updated more frequently.

The prepayment estimates must be consistent with the characteristics of the asset (such as loan or structured investment). Prepayment estimates may be created on a highly segregated basis (where a separate prepayment estimate is developed for each account) or on an aggregated basis. If the credit union develops a prepayment table on an aggregated basis, the prepayment data should reflect the aggregate prepayment history for each type of loan. For example, if the credit union aggregates its fixed-rate real estate loans for modeling purposes, the prepayment table should incorporate the prepayment performance for each type and maturity of fixed-rate real estate loans in portfolio. Applying an inappropriate prepayment estimate will lead to less reliable results.

It is preferable if the prepayment estimates come from a source independent from the risk modeler. The lending officer or third-party information provider (for example, Bloomberg or CMS BondEdge) should be a suitable source. It is also preferable that estimates are documented with empirical evidence (such as a regression analysis). However, the observed borrower type's historical experience with prepayments can be sufficient if the estimates appear reasonable. For example, a high prepayment estimate may be valid if the credit union's membership consists of transitory members (for example, loans will be repaid with the sale of the property). Conversely, if a credit union's portfolio consists of seasoned loans with low loan-to-value ratios made to a stable membership, then the prepayments may be low even in a falling rate scenario. These factors tend to reduce the member's refinancing incentive, thus precluding high prepayments.

If a credit union cannot support its prepayment assumptions with empirical evidence or reasonable assumptions, exception should be taken. The prepayment assumptions should be considered questionable and the results are likely to be unreliable.

At a minimum, prepayments should increase in declining rate environments and decrease in rising rate environments. In crude models, the prepayment rate is not adjusted to reflect changing prepayments in rising and falling interest rate environments (meaning that the prepayment rate for the static rate scenario is maintained for the shocked interest rate environment). This does not adequately reflect the true prepayment behavior of mortgages and is unacceptable. At a minimum, the prepayment factor should be adjusted to reflect the static and stressed interest rate scenarios.

A static prepayment factor is one where a single prepayment rate is applied to an account (for example, assuming that mortgages will prepay at 10 percent until maturity). Because loans do not generally exhibit the same prepayment rate over their entire maturity, maintaining a constant prepayment rate for the entire horizon of expected cash flows will lead to increasingly less reliable results.

A better way to project prepayments of amortizing cash flows is to use a prepayment table. In this case, the credit union (or third-party information provider, such as Bloomberg) develops a prepayment matrix to estimate the potential prepayment rate based on factors such as refinancing (most common), defaults, curtailments (additional principal payments made by members), and insurance payoffs. For example, to determine the prepayments due to refinancing, the prepayment model may compare the mortgage portfolio's weighted average coupon rate with the current market rates.

For each period that cash flows are calculated, the model will apply the prepayment factor from the table to determine the amount of unscheduled principal that is paid down. Thus, rather than assuming a constant rate, prepayments will change from period to period.

Discount Rate Assumption Analysis

Each account being valued should be assigned a distinct observable market discount rate/source. The discount rate should reflect the current market offering rate for an asset or liability with similar characteristics. For example, a 5-year Treasury note with 3 years to maturity should be discounted by the current 3-year Treasury yield, and a mortgage portfolio with a weighted average remaining term of 15 years should be discounted by the current market rate on 15-year mortgages.

In general, the discount rate used in the model should be tied to an observable market rate for a similar product type to ensure that the estimated value is consistent with how market participants would consider a similar fair value transaction. Using the loan's coupon rate as the discount rate would be inappropriate because a loan's coupon rate does not incorporate readily observable market inputs. Similarly, it would be inappropriate to use the credit union's current offering rates on loans/shares as discount rates if the offering rates are not reflective of the market. Using implausible or unreasonable discount rates (those at significant variance from observable market proxies) will provide unreliable valuation results.

Examiners should considering the following effects of discount rates on NEV when evaluating asset valuations:

Lower Discount Rates
Lower discount rates generate a higher present value of assets.
Higher asset values result in higher NEV.
Higher Discount Rates
Higher discount rates generate lower present value of assets.
Lower asset values result in lower NEV.

Investment Assumption Analysis

For most securities, current and shocked values can be readily observed and obtained through a market source such as Bloomberg, CMS BondEdge, or another industry-recognized information provider. As indicated above, AFS securities should have a similar value in the book versus base case given that generally accepted accounting principles (GAAP) require AFS securities to be presented at fair value on the balance sheet.

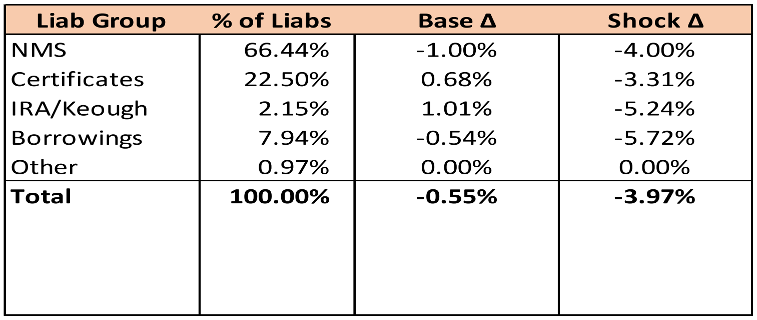
Step D: *Funding Review*

d)

Funding Review	Determine the reasonableness of the material contractual liability categories (e.g. CDs, borrowings and derivatives) price or value changes (% movement) for Base and Shock using the CU IRR report. Are the valuations, durations and sensitivity measures reasonable, supportable and observable? *The analytics to the right are the changes in values from book-to-base and base-to-shock, however, examiners should review the valuations that support these changes.*

Examiners will review the reasonableness of the modeled output for each unique contractual liability category[11] for book versus base and base versus shocked liability valuations, sensitivity, or effective duration. Again, for the purpose of this review, NMS review is simplified because the NEV Supervisory Test standardizes the value benefit applied to these liability types.

FIGURE 13. SAMPLE OF LIABILITY VALUES



Liab Group	% of Liabs	Base Δ	Shock Δ
NMS	66.44%	-1.00%	-4.00%
Certificates	22.50%	0.68%	-3.31%
IRA/Keough	2.15%	1.01%	-5.24%
Borrowings	7.94%	-0.54%	-5.72%
Other	0.97%	0.00%	0.00%
Total	**100.00%**	**-0.55%**	**-3.97%**

Figure 13 represents a standard extract from the data template and it illustrates an example of values for a credit union's liabilities. In this example, the credit union has a -0.55 percent value on total liabilities for the base case.[12] Contractual funding (such as certificates of deposit and term borrowings) also contributes to the liability value. The book to base amount on certificates

is a discount of 0.68 percent. Examiners will review premiums on contractual funding for reasonableness. Examiners are to use this same process for all remaining liabilities (like IRA/Keogh certificates, borrowings, and other liabilities).

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[11] For example, liabilities with explicit maturities, such as certificates of deposit and term borrowings.

[12] For liability values, negative numbers will be referred to as "premiums" and positive numbers will be referred to as "discounts."

Member share certificates have generally observable values because they are term deposits with known contractual cash flows and are typically present valued using the relevant discount rates for market funding (such as advance rates for Federal Home Loan Banks member borrowing). Share certificates are still susceptible to early redemption risk, however, and if there is a large concentration of members who call (or withdraw) their share certificates early, these liabilities can experience a reduced value benefit. One reason why members may call certificates could be to take advantage of alternative income opportunities during a rapid rise in market interest rates. This may become a relevant modeling issue when a credit union has a sizable concentration of certificates (that is, >20 percent of shares) with longer maturities (for example, 1–5 years). Examiners should keep in mind that longer term liabilities produce more favorable NEV outcomes. The model assumptions should take early-redemption risk into account when projecting cash flows if there is a reasonable expectation that early redemptions will occur.

Borrowings with call options are likely to be called in rising rate scenarios because the lender can reissue debt at a higher interest rate. For NEV, liability depreciation in a rising rate environment should be restricted by the call option. This is an example of how optionality in the balance sheet needs to be captured in the model.

In falling rate scenarios, the callable liability's performance will resemble a non-callable liability of similar maturity (for example, the liability's interest cost will fall modestly, as principal paydowns result in funding at lower costs, and valuation will be more favorable).

If a credit union uses derivatives to hedge IRR, examiners will confirm where the impact of these instruments is reported on the ALM report. If derivative values are embedded in the NMS categories, then the impact needs to be isolated and recorded onto the Other Liability line. For questions about derivatives, examiners can contact their supervisor, an RCMS, or E&I specialized staff.

Step E: *Account Aggregation and Data Completeness*

e)	**Account Aggregation and Data Completeness**	Are the account aggregations for risk assessment suitable for consistent risk characteristics and is there a documented reconciliation of the data in the ALM model vs the call report and general ledger?

Examiners will review the account aggregation in the credit union's ALM model and determine if the aggregation is suitable for the balance sheet complexity. Examiners will confirm that the account information in the ALM report is complete and reconciled to the credit union's general ledger. At a minimum, examiners should compare the ALM report data to the credit union's financial statements to ensure all accounts are captured.

Account aggregation is the process of grouping together accounts of similar types and cash flow characteristics. This is an important component of the data input process as account aggregation improves the measurement system's efficiencies. Typically, loans of similar rate, maturity, and type are aggregated. For example, credit unions may group 6 percent, 30-year fixed rate residential loans together, but it would be inappropriate to group 6 percent, fixed-rate residential loans with 6 percent, adjustable-rate residential loans.

The degree of account aggregation will vary from one credit union to another. Credit unions should ensure the model allows for a sufficient separation of accounts with significantly different cash flow patterns. For example, models that aggregate information based on Call Report data may not provide the granularity necessary for institutions with significant levels of embedded options. When applicable, credit unions should ensure their systems have the ability to model highly structured instruments and credit union-specific products.

Both contractual and behavioral characteristics should be considered when determining the cash flow patterns of accounts to aggregate. The process of determining which accounts are combined should be transparent, documented, and periodically reviewed. Furthermore, requests for changes to existing groups or new account aggregations should be formalized and documented. Credit unions should maintain documentation disclosing the characteristics of aggregated assets and liabilities (including all derivative instruments) and off-balance sheet items.

Step F: *Analysis*

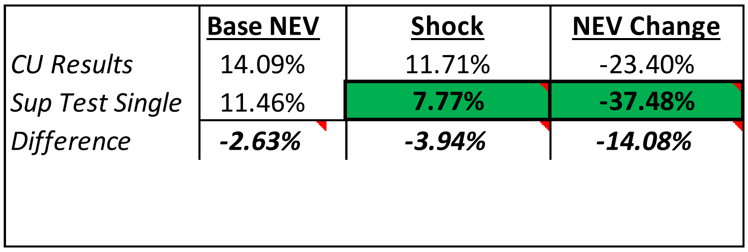
f)	**Analysis**	How does the Supervisory Test NEV and NEV Sensitivity metrics compare to the credit union NEV results. *The difference between the two measurements will be the valuations assigned to NMS. Describe the base and shock difference and how the difference contribute to the differences in NEV.*

Examiners will compare the NEV Supervisory Test results to the credit union's NEV model outputs. Because both models use the same data inputs except for NMS, any variance should only be attributed to the difference between the credit union's NMS values and the standardized values used in NCUA's valuation assumptions for base and shock scenarios. Also, examiners will compare the results of the credit union's measures to its IRR policy limits.

Depending on the degree of variance between the credit union's results and the IRR test, examiners will apply judgement on what corrective action will be taken, if any. For excessive variances, examiners should report on the difference. The NEV Supervisory Test is meant to help the agency rank-order risk and identify outliers by measuring all institutions on a relative basis. When large variances exist between a credit union's internal NEV measure and the results of the NEV Supervisory Test, NCUA seeks to understand the underlying source of the difference and whether a high Market Risk score result is cause for concern. An NEV Supervisory Test that results in high market risk will require a commensurate elevated level of risk management expertise, measurement systems, contingency planning, and liquidity. A credit union with high market risk may possess a sufficiently commensurate program, but its burden of proof will be significantly higher than for moderate or low market risk rated institutions.

Figure 14 presents such a variance. This example shows how a credit union's model may generate favorable IRR results, yet the NEV Supervisory Test indicates that the credit union's IRR position is significantly higher. The variance does not necessarily indicate a problem with the credit union's model input or results. However, the examiner should ensure premiums assigned to assets and liabilities are supported with observable data and that the credit union's scenario analysis is focused on identifying key drivers of risk in the balance sheet through thoughtful sensitivity analysis around their key assumptions, including the behavior of NMS.

FIGURE 14. ILLUSTRATION OF VARIANCE BETWEEN RESULTS OF CREDIT UNION'S NEV TEST AND NCUA'S NEV SUPERVISORY TEST



	Base NEV	**Shock**	**NEV Change**
CU Results	14.09%	11.71%	-23.40%
Sup Test Single	11.46%	**7.77%**	**-37.48%**
Difference	***-2.63%***	***-3.94%***	***-14.08%***

Scoring Guidelines

The credit union's Market Risk score will automatically populate using the risk level results from the NEV Supervisory Test. However, the IRR indicators shown in *Figure 15* are additional balance sheet factors that can contribute to the level of market risk.

FIGURE 15. MARKET RISK INDICATORS FOR IRR

Interest Rate Risk Indicators				
	Low	**Moderate**	**High**	**Extreme**
Market Risk	• Balance sheet valuations and interest rate sensitivities indicate there is a minimal (low) IRR exposure.	• Balance sheet valuations and interest rate sensitivities indicate there is a moderate IRR exposure.	• Balance sheet valuations and interest rate sensitivities indicate there is a significant (high) IRR exposure.	• Balance sheet valuations and interest rate sensitivities indicate an extreme potential that the capital position will be adversely affected.
	• The level of net worth provides substantial support for the degree of IRR exposure taken by the credit union.	• The level of net worth provides adequate support for the degree of IRR exposure taken by the credit union.	• The level of net worth may not be adequate to support the level of IRR exposure taken by the credit union.	• The level of net worth may not be adequate to support the level of IRR exposure taken by the credit union.
	• Accounts are well stratified and there are appropriate settings to support valuations for IRR reporting.	• Accounts are adequately stratified with material accounts detailed using appropriate settings to support valuations and sensitivities for IRR reporting.	• Accounts do not adequately stratify the material accounts on the balance sheet, nor are the settings appropriate to support the valuations for IRR reporting.	• Accounts do not adequately stratify the material accounts on the balance sheet, nor are the settings appropriate to support the valuations for IRR reporting.

The Market Risk scoring tab will automatically populate with the score that results from the NEV Supervisory Test as a “Ratings Floor” for the Overall Rating (see Ratings Guidance in the Market Risk section).

MR Score	**Automatic Scoring of Risk Score from NEV Supervisory Test results**

Tab B: *Earnings at Risk (EAR)*

Credit unions generate multiple income simulations for a variety of scenarios in order to assess the EAR exposure that can arise from changing interest rates. The EAR review delves into the credit union's income simulation analyses and is an important complement to NEV. EAR information provides insights into the actual structure and timing of cash flows for assets and liabilities and allows the user to get behind what the NEV number conveys and understand when IRR impacts the credit union's earnings stream. Credit unions should be utilizing multiple scenarios to understand how IRR will impact its earnings stream over a multi-year horizon. Examiners will verify the assumptions, rate scenarios, and results of EAR measurements versus the credit union's internal IRR policy limits. Examiners will also use income simulation information to get a more comprehensive understanding of the credit union's liquidity and contingent capability to address any concerns that may be raised by the results of the Market Risk score.

An income simulation analysis projects interest cash flows of all assets, liabilities, and off-balance-sheet instruments in a credit union's portfolio to estimate future net interest income over a chosen timeframe. Generally, income simulations focus on short-term time horizons (for example, one to three years). Forecasting income is sensitive to a number of assumptions; thus, the reliability of simulation results becomes more uncertain as the forecast horizon period gets longer. Simulations typically include evaluations under a base case scenario and for stressed conditions including an instantaneous, parallel, and sustained rate shock. Many credit unions generate other alternate interest-rate scenarios, such as more gradual or "ramped" changes in rates, changes in the shape of the yield curve, or any other stressed rate environments devised by a user or provided by a vendor.

Tab B: *EAR and Other IRR Measurements Risk* is broken into two sections containing six steps.

- Section I: Earnings at Risk
- Section II: Earnings at Risk Verification
- Scoring Guidelines

Section I: Earnings at Risk

- Step A: *Base Simulation Results*
- Step B: *Shocked Simulation Results*

Step A: *Base Simulation Results*

a)

Base Simulation Results	How do the Base Case results compare to the credit union's actual performance? How do the projected interest income levels and earnings metrics (NII, NIM) compare to results historically achieved by the credit union? If management uses other means to measure the earnings risk exposure, explain the credit union's approach and how the results compare to the results historically achieved by the credit union.

Examiners should evaluate base case results relative to a credit union's actual earnings performance based on the most recent annual Financial Performance Report (FPR). The credit union's projected net interest income and net interest margin (NIM) should generally be in line with results historically achieved by the credit union. For example, an examiner should question a credit union that projects a base case net interest margin of 4.00 percent when the FPR shows that the highest NIM achieved by the credit union in recent years is only 3.50 percent. The base case income simulation for the near-term horizon should be highly consistent with credit union's corresponding pro forma earnings forecast, since both represent an expected (or most likely) earnings amount.

The starting point for income simulations needs to be firmly rooted in accurate, reasonable, and supportable conditions. Similar to overstated base case NEV results, overstated base case EAR results could lead to an understatement of earnings sensitivity in the shocked and alternative EAR scenarios. Examiners that find unreasonable base case EAR results (in relation to the credit union's historical performance) should review carefully the asset and liability assumptions described in the Earnings at Risk Verification section.

Not all ALM models measure EAR in the same way. One common method projects a credit union's net interest income for a 12-month period under base case and alternative interest rate scenarios, and then calculates the percentage change in net interest income relative to the base case results. However, other variations and time horizons do exist and are acceptable approaches. The review of EAR will note a credit union's basic approach and explain how the results compare to those historically achieved by the credit union. In addition to running scenarios for parallel rate shocks, credit unions should be encouraged to run income simulations that incorporate yield curve shape changes (that is, steepening and flattening scenarios), as well as sensitivity analysis for assumptions that have a largest impact on EAR results, such as changing prepayment speeds, NMS behavior, and spread widening from key market index rates.

Step B: *Shocked Simulation Results*

b)	**Shocked Simulation Results**	How do the Shocked results compare to Policy limits? Compare the earnings simulation NII/NIM levels of base case to the shocked scenarios and review the results to determine if reasonable and supportable.

Examiners should evaluate the shocked EAR results relative to internal policy limits and determine if any policy limits have been breached. Preferably, the policy limits are based on the industry standard: an instantaneous and parallel shift in interest rates of +/- 300 bps. If policy limits have been breached, examiners should determine if the violation has been reported to the ALCO and board of directors in a timely manner and whether management has elected to take corrective action to reduce the credit union's EAR exposure.

An important indicator of effective risk management is how credit union staff monitor and react to IRR measures. Credit unions that use risk measurement information to make business decisions (whether it be purchases, sales, or some other kind of risk mitigation such as hedging) are more likely to optimize their net worth and earnings performance over time. Examiners should take into account the degree to which the credit union is conducting EAR analysis for proactive risk management purposes as opposed to generating test results to meet compliance expectations.

Section II: *Earnings at Risk Verification*

- Step A: EAR Results - Assets
- Step B: EAR Results - Liabilities
- Step C: EAR Scenarios
- Step D: Assumption Changes

Step A: *EAR Results - Assets*

a)	**EAR Results Assets**	Evaluate if the interest income generated by the material asset account categories are reasonable for base case and shocked scenarios relative to the credit union's current and historic levels. Evaluate the material assumptions used to generate interest income (e.g. prepay speeds, maturity distribution, key rates, spreads).

Interest income projections under EAR simulations are generated from a combination of both a credit union's existing asset product mix and its new business volume attributes. This is because the modeler must decide whether or not to replace maturing and runoff activity. If it is replaced, the modeler must decide whether to keep the portfolios unchanged (static) or incorporate new business (like planned reallocations or growth).

The reasonableness of the interest income generated by the credit union's existing asset product mix is dependent on the type of processing performed within the model (instrument level or portfolio level), the accuracy and completeness of the core data input into the model (contractual cash flows, repricing dates, repricing spreads, rate sensitivity factors, caps, floors, or others), and the reasonableness of prepayment assumptions. As with NEV, the model's rigor and precision is a function of how detailed or granular the data inputs for assets and liabilities are. If the model uses instrument-level cash flows, the model output is considered more precise and reliable.

The reasonableness of the interest income generated by the credit union's new business volume is largely dependent on additional factors, such as the maturity distribution of new business (like the percentage of car loans made for 36-months, 60-months, and 72-months, or other maturity terms) and the rates received on the new business. These assumptions can also be assessed for reasonableness by looking at them in relation to historical pricing, the market in which they operate, and recent trends in member behavior.

To evaluate the reasonableness of the existing asset product mix, an examiner should review the results of any independent model validation or review that the credit union might have. This validation or review may have been performed by an outside vendor or the credit union's internal auditor. If a model validation or review has not been performed, examiners should ask the credit union to provide a list of the account fields that are input (automatically or manually) into the model in order to determine if any key fields are missing. For example, an adjustable-rate mortgage loan should have fields for repricing date or interval, repricing index and spread, and periodic and lifetime caps and floors, among others.

If the credit union is not populating these fields with actual account data, interest income will not be correctly computed in the different interest rate scenarios.

To evaluate the reasonableness of new asset volume assumptions, examiners should review reports from the credit union showing the recent and/or historical maturity distribution of new loan or investment security business and pricing reports to show the rates received on the different asset products.

Step B: *EAR Results - Liabilities*

b)	**EAR Results Liabilities**	Evaluate if the interest expense generated by the material liability account categories are reasonable for base case and shocked scenarios relative to the credit union's current and historic levels? Evaluate the material assumptions used to generate interest expense (e.g. RSF/Beta, decay, repricing lags, maturity distribution, key rates, spreads).

Like interest income projections, interest expense projections under EAR simulations are also generated from both a credit union's existing liability product mix and its new business volume attributes.

The reasonableness of the interest expense generated by the credit union's existing liability product mix is dependent on the accuracy and completeness of the core data input into the model (such as maturity dates) and the reasonableness of the NMS rate sensitivity factor and repricing lag assumptions.

The reasonableness of the interest expense generated by the credit union's new business volumes is largely dependent on additional factors such as the maturity distribution of new business (like the percentage of CDs made for 6-months, 24-months, and 60-months, or other maturity terms) and the rates paid on the new business.

To evaluate the reasonableness of new liability volume assumptions, examiners should review reports from the credit union showing the recent and historical maturity distribution of new certificate of deposit business and pricing reports to show the rates paid on the different certificate of deposit terms.

The most critical assumptions influencing the interest expense projections in an EAR simulation and the overall simulation results are the rate sensitivity factors and repricing lags assigned to non-maturity shares. Non-maturity shares are typically a significant portion of a credit union's total liabilities and represent a material driver of risk in EAR simulations.

To evaluate the reasonableness of the NMS assumptions, examiners should review any NMS study performed by the credit union, or a third-party ALM vendor, if applicable. Because past rate-setting behavior provides a guide, the credit union's historical rates for NMS can be compared to market interest rates (like a three month T-Bill) over a historical period covering both rising and declining market interest rates. The ratio between the change in the credit union's NMS rates and the change in market interest rates provide an estimate of the rate sensitivity factor.

Third-party ALM vendors typically calculate rate sensitivity factors are typically calculated by regressing the change in the credit union's offering rate on the NMS against the change in some key short-term market rate over a representative period of time. The representative period of time should include instances where short-term market rates both increased and decreased.

While a detailed study of the historical performance of the credit unions' NMS by a qualified third party may provide reasonable assumptions, this can be quite costly. In the absence of a formal NMS study, examiners should determine if the credit union has internal documentation to support its rate sensitivity factor assumptions. ALCO or Pricing Committee meeting minutes may evidence discussions on proposed NMS rate changes relative to recent (at the time of the committee minutes) or anticipated interest rate changes.

Another option to evaluate the reasonableness of NMS rate sensitivity factors is to review a series of the credit union's rate sheets over time to see how the credit union has changed its NMS pricing relative to changes in short-term market rates.

NOTE: The most important consideration with NMS assumptions (from a supervisory oversight perspective) is to determine whether the credit union recognizes that NMS behavior is a key driver for EAR results and whether the credit union conducts meaningful sensitivity analysis surrounding the NMS rate sensitivity and decay assumptions to see how sensitive EAR results are to those changes. Volatility in the sensitivity analysis for NMS provides important risk information and should be the focus of discussion (as opposed to debating the individual assumptions themselves).

Step C: *EAR Scenarios*

c)	**EAR Scenarios**	Identify what balance sheet scenario (e.g. time horizon, static, dynamic) the credit union uses to generate earnings simulations and are EAR simulations run under parallel rate shock or ramp scenarios? If ramp scenarios, how long to reach maximum rate change (e.g. 12 months, 24 months)?

At a minimum, earnings-at-risk simulations should be run under an instantaneous, parallel, and sustained rate shock of +/- 300 bps using a static balance sheet over a period of at least two years. This expectation is consistent with FFIEC interagency guidance issued in 2010. In very low interest rate environments, like the extended period during which the term structure of rates was below 3 percent, some downward rate shocks may be temporarily waived, although credit unions should research and monitor developments in those market economies where negative interest rates have been introduced as a monetary stimulus. Negative interest rates have not occurred in the U.S. system, but practitioners should be aware of how instrument values could be affected if U.S. Treasury yields became negative because they are a dominant market benchmark.

EAR simulations are not pro forma accounting forecasts. They are intended to reveal the potential IRR exposure in a credit union's balance sheet and to identify key drivers of risk that could adversely affect earnings under select risk scenarios. With the exception of the base case earnings forecast, EAR simulations are not meant to represent a "most likely" income scenario.

The longstanding convention for bank supervisors to assess EAR is through objective stress scenarios using instantaneous, parallel, and sustained rate shocks. NCUA advocates the use of +/- 300 bps generated in increments of 100 bps. Ramp scenarios, where a credit union models an absolute change in rates staged over a discreet period of time (for example, if rates change 25 bps per month for 12 months to arrive at a total 300 bps rate movement at the end of one year) may not be sufficiently stressful to identify potential IRR exposure. Ramp scenarios like this should be discouraged if they are the only EAR measure by which a credit union measures, monitors, and manages its IRR.

If a credit union only runs ramp scenarios, examiners should disregard the results during the ramp-up period, and concentrate on the results for the year after which the ramp is completed. Furthermore, if a credit union only projects EAR for the ramp-up period (like a 12-month ramp and 12-month time horizon, or 24-month ramp and 24-month time horizon), examiners should direct the credit union to extend the time horizon for the EAR simulation to at least one year beyond the ramp-up period. It should be noted that extending the EAR scenario horizon out beyond 2–3 years introduces significant replacement assumptions because much of a credit union’s balance sheet can change over this span. This makes the outlying years of a longer-term simulation analysis less certain and reliable.

A static EAR simulation assumes the balance sheet structure (mix of assets and liabilities) remains constant with no additional growth. Again, this approach, at a minimum, is advocated in the 2010 FFIEC interagency guidance for all depository institutions. Asset and liability cash flows that mature or prepay during the forecasted time horizon are replaced with an equal amount of new business volume for the particular loan, investment, share, or borrowing product. As an example, when $3 million in principal from a 30-year, fixed-rate mortgage runs off in month three of the simulation period, but then another $3 million in new 30-year, fixed-rate mortgages are booked in month three that replace the runoff at the then prevailing 30-year, fixed-rate mortgage interest rate for the specific interest rate scenario.

Dynamic balance sheet scenarios (incorporating growth scenarios and different asset/liability mixes) are useful for conducting “what if” scenarios and provide additional information to help credit unions think about how their risk profile changes when the balance sheet changes. Used on their own, dynamic EAR scenarios may disguise potential IRR by assuming a more favorable (or lower risk) balance sheet composition than the existing portfolios. While not necessarily intentional, a dynamic balance scenario could inadvertently mask the IRR inherent in the current mix of assets. For example, a credit union may project overly optimistic growth in longer-term, fixed-rate share certificates of deposit during a rising interest rate environment to lock in the cost of some funding and thereby curb rising dividend costs.

Step D: *Assumption Changes*

d)	**Assumption Changes**	If management changed any assumptions since the last examination what were the changes, what was the impact of those changes, and how did management support the changes?

It is necessary for risk modelers to review and modify their underlying assumptions over time to reflect changes in the composition of portfolios, market conditions, and observed asset and liability behaviors. It is sound practice to perform a comprehensive review of material modeling assumptions at least annually to ensure major assumptions remain relevant. An appropriate simulation process includes sensitivity analysis that isolates the major risk drivers within a balance sheet and, in turn, reveals the assumptions with the greatest materiality to the risk measurement results. Assumptions don't have to change but there should be evidence that a decision to leave things unchanged was based on an analysis that determined the assumptions remain reasonable.

It is also possible for credit unions to improperly alter modeling assumptions (like arbitrarily reducing NMS rate sensitivity factors) to improve results or to avoid exceeding policy compliance. To avoid this scenario, credit unions should have a well-documented, transparent process for tracking assumption changes. Assumption changes should be supported and be reported to the ALCO and/or board of directors for approval or subsequent ratification. Failure to document assumption changes is an unacceptable practice and can lead to concerns about the validity of modeling results. By documenting and justifying changes to key assumptions, credit unions enhance the integrity and reliability of their modeling process.

It is important for credit unions to document impact of changes to key assumptions on EAR results. Tracking this information can help risk management staff isolate any factors that pose a threat or vulnerability to the credit union's earnings stream, and can inform decision making about how best to mitigate IRR, if necessary. Credit unions should generate the pre- and post-modeling results when changing assumptions and review the comparison. Best practice would be to run the model with original assumptions and then with adjusted assumptions based on the same effective date. Additionally, when making several assumption changes, credit unions should apply the changes incrementally in order to fully understand the impact to the credit union's IRR exposure from each assumption change.

Section Scoring Guideline

Examiners will indicate a score for the EAR section using the information from the review steps. The IRR indicators shown in *Figure 16* are EAR and Other IRR Measurement factors that can contribute to the overall IRR.

Figure 16. EAR and Other IRR Measures Indicators for IRR

	Interest Rate Risk Indicators		
	Low	**Moderate**	**High**
EAR and Other IRR Measures	• Measurements and scenarios supporting the income simulations result in a minimal exposure to earnings volatility.	• Measurements and scenarios supporting the income simulations result in a moderate exposure to earnings volatility.	• Measurements and scenarios supporting the income simulations result in a high exposure to earnings volatility.
	• Methodologies and assumptions are	• Methodologies and assumptions require some enhancements, but still	• Methodologies and assumptions are not adequate and contain

	appropriate and supportable.	provide reasonable reliability as a supportable risk measure.	material weaknesses that undermine the reliability of the EAR results. The process is not commensurate with the size and complexity of the CU portfolios.

Examiners will use the dropdown box to score this section (that is, low, moderate, or high).

EAR Score	**Use Drop Down Menu in this box for Risk Scoring of High, Moderate or Low**

Tab C: *Stress Testing*

In addition to the standard shock tests run for internal IRR policy compliance, it is prudent to stress the balance sheet using other rate scenarios. Static parallel NEV shock tests are meaningful, but they do not capture certain risks that may be relevant to a credit union's balance sheet. For example, parallel rate shocks do not reveal how a change in the shape of the yield curve impacts capital-at-risk and earnings-at-risk measures. Other relevant stress scenarios can include shocks to the level of prepayments, rate sensitivity factors for non-maturity shares, and credit spreads.

The use of stress testing is an essential discipline within the IRR management process. By generating a variety of stress test results, a credit union gains critical insight into the specific factors which have a material impact on the risk measurement results. Risk management decisions are better supported when the decision makers have a range of information available to guide risk mitigation actions.

Stress testing, which includes both scenario and sensitivity analysis, is an integral component of IRR management. In general, scenario analysis uses the model to show the financial effects from a macro event, such as "boom" or "bust" scenario. On the other hand, sensitivity analysis shows the impact of changes to one or a select number of risk factors (for example, changes in pre-payment speeds on mortgages, or decay rates on NMS accounts) on the credit union's financial position as reflected through the risk measurement results.

The *Stress Testing* tab consists of one section containing three steps to complete.

Section I: Stress Testing

- Step A: *Rate Scenarios*
- Step B: *Sensitivity Testing*
- Step C: *Limit Monitoring*
- Scoring Guidelines

Section I: Stress Testing

Step A: *Rate Scenarios*

a)		
	Rate Scenarios	What are the interest rate (e.g. changing slopes and twist of the yield curve), and shocked rate scenarios (e.g. severe but plausible rate shocks relative to existing level of rates), the CU uses to evaluate the IRR exposure of the balance sheet? Specify the frequency of testing. Is the frequency of testing sufficient? *For Baseline II review, does the credit union conduct interest rate stress testing, if so, describe and determine if commensurate with the size and complexity of the balance sheet?*

Examiners should request all scenario analytics performed since the prior exam. When conducting scenario analyses, credit unions should assess a range of alternative future interest rate scenarios in evaluating IRR exposure. This range should be sufficiently meaningful to fully identify basis risk, yield curve risk, and the risks of embedded options.

In most cases, static interest rate shocks consisting of parallel shifts in the yield curve of +/-300bps may not be sufficient to adequately assess a credit union’s IRR exposure. As a result, credit unions should regularly assess IRR exposures beyond typical industry conventions, including changes in rates of greater magnitude (e.g., +/-400 bps and +/-500bps) across different tenors to reflect changing slopes and twists of the yield curve. Credit unions should ensure their scenarios are severe, but plausible, in light of the existing level of rates and the interest rate cycle.

For example, in low-rate environments, scenarios involving significant declines in market rates can be de-emphasized in favor of increasing the number and size of alternative rising-rate scenarios. By generating stress test scenarios with periodic frequency, credit unions will hone their understanding of the particular alternative scenarios and assumptions to which they should be more sensitive. In turn, this will guide a more strategic and effective stress-testing discipline.

The frequency and extent of testing is dependent on complexity and risk found on the credit union’s balance sheet. Furthermore, the credit union should select a model that is capable of running scenarios based on the credit union’s complexity.

Step B: *Sensitivity Testing*

b)

Sensitivity Testing	What assumptions has management determined to influence the model output most (RSF/Beta, Lag, Decay, Prepays)? Has the credit union performed sensitivity analysis to identify what degree of change in these assumptions cause model results to fall outside of management’s risk tolerance level? Specify the frequency of testing. Is the frequency of testing sufficient? *For Baseline II review, does the credit union conduct sensitivity stress testing, if so, describe and determine if commensurate with the size and complexity of the balance sheet?*

Examiners will request all sensitivity tests since the last exam, and confirm that the ALCO reviewed sensitivity analysis reports. Examiners should look for evidence that ALCO discussions utilize sensitivity information to assess portfolio activities and guide risk mitigation strategies, if any.

In addition to scenario analysis, stress testing should include a sensitivity analysis to help determine which assumptions have the most influence on model output. Credit unions will generally focus more of their efforts on verifying the most influential assumptions. If the credit union has not made this determination, a few key assumptions that generally affect the model results include prepayments, changes in credit spreads, and NMS behaviors (like rate sensitivity factors and decay rates).

Sensitivity analysis can be used to determine the conditions under which key business assumptions and model parameters break down or when IRR may be exacerbated by other risks or earnings pressures. Credit unions should focus their sensitivity analysis around the assumptions that underlie larger balance sheet concentrations. For example, a credit union with a significant concentration in real estate-related assets may choose to test prepayment speed assumptions by varying speeds at faster and slower rates than expected. Another example on the liability side: A credit union with a large concentration in money market accounts may choose to stress the rate sensitivity factors above and below expected levels to capture sensitivity on NEV and earnings.

Each credit union should address the frequency and extent of testing in its policies. A credit union should also address whether its model platform can adequately capture the risk of any complex instruments. Testing is dependent on the relative complexity and levels of risk inherent in balance sheet portfolios; complexity can exist in both assets and liabilities. For sensitivity testing to be reliable, the model a credit union uses must be sufficiently robust to handle the complexity of all instruments.

Step C: *Limit Monitoring*

c)	**Limit Monitor-ing**	Does management evaluate stress tests that fall outside of policy limits? How relevant are these stress tests to the credit union and, what has management done to address stress tests that fall outside of limit? Are they discussed and reported to the board and/or ALCO?

Examiners should review the ALCO minutes to determine if management compares stress test results to policy IRR limits. Such reviews enable credit unions to properly measure and monitor key variables with volatility that significantly affects IRR sensitivity results. Look for evidence of how sensitivity testing is being utilized. An absence of sensitivity testing indicates a weakness in the risk management program. Some credit unions generate results only for compliance purposes and this may be minimally effective, especially if risk exposures are significant. Credit unions with stronger risk management disciplines will use their sensitivity analyses to challenge management's thinking and influence actions taken to deliberately increase or mitigate measured risks. Additionally, in conducting stress tests, management should closely evaluate instruments or markets in which concentrations exist, because such positions may be difficult to unwind or hedge during periods of market stress.

If limits have been breached, examiners should determine whether the credit union has assessed those stress results to determine whether those scenarios or assumptions are within a close range of the credit union's foreseeable future. It is important to remember that stress tests do not necessarily have to comply with policy limits, but they should be part of the information considered by senior staff responsible for risk oversight. When an adverse stress test result is realistic and may constitute a plausible threat to near-term earnings or net worth, a credit union should be diligent in developing plans of action in a timely manner to address the exposure. Strong policies will address how to handle circumstances where policy guidelines and limits are breached (some examples are requiring mandatory reporting or having pre-established risk mitigation actions).

In addition to covering the role and requirements of sensitivity testing in the risk management policies, the board and/or the ALCO need to be involved in the decision making process.

Scoring Guidelines

Indicate a score for the *Stress Testing* tab using the information from the review steps.

FIGURE 17. STRESS TESTING INDICATORS FOR IRR

Interest Rate Risk Indicators			
	Low	**Moderate**	**High**
Stress Testing	• The credit union produces a wide range of alternative interest rate scenarios consistent with the size and complexity of the credit union's portfolios.	• The credit union produces an alternative interest rate scenarios consistent with the size and complexity of the credit union's portfolios.	• Stress testing analysis is not sufficiently dynamic to capture plausible events and risk outcomes adequately.
	• Sensitivity analysis is an integral component of IRR management. Management has a strong understanding of the key drivers of risk in the balance sheet. Management is fully aware of how results compare to policy limits and utilizes test results to guide management decisions.	• Management uses sensitivity analysis to quantify modeling risk and has a basic understanding of key risks. Policy limits are taken into consideration and information is reviewed on a regular basis.	• Management does not have a good understanding of stress-testing discipline or key drivers of risk. Management has a weak understanding of how the underlying assumptions affect results or how the analysis relates to policy limits and are not using test results to guide risk decisions.

Examiners will use the dropdown box to score this section (that is, low, moderate, or high).

ST Score	**Use Drop Down Menu in this box for Risk Scoring of High, Moderate or Low**

Tab D: *Measurement Systems*

Overall, each credit union’s IRR measurement system should be appropriate for the credit union’s unique risk profile. The measurement system should capture all material sources of IRR and generate meaningful reports for senior management and the board of directors. Management should ensure risks are measured over a relevant range of interest rate changes, including meaningful stress situations. Further, the measurement system must be subject to appropriate internal controls and periodic independent reviews. The IRR measurement process should be well documented and administered by individuals with sufficient technical knowledge.

IRR measurement systems vary in their rigor and complexity. They can range from simple methods to sophisticated programs that include stochastic data modeling. However, all measurement systems should use generally accepted financial concepts and risk measurement techniques and have an adequate level of transparency. If a third-party model is used, management should review the adequacy and comprehensiveness of the vendor’s model-validations and internal control reviews. Also, management should consider the capabilities of the software to meet the credit union’s future needs and the adequacy of ongoing vendor support and training.

A credit union’s IRR measurement system is a critical part of its overall risk management process and an important objective of examiners’ review is to assess whether a credit union has chosen a system that is adequate to address the risk and complexity of its holdings. The reliability of the model’s estimation techniques and the veracity of its output are particularly critical to NCUA’s examination of the IRR management program. Since the IRR review begins with the Market Risk assessment, and this relies on data generated from the credit union’s model, it is imperative that examiners gain a comfort with the reasonableness of the input and output of the measurement system. A review of the system should address the following items:

- Capabilities (i.e., rigor and sophistication) of the measurement system
- Controls surrounding the modeling process
- Accuracy of system inputs
- Reasonableness and documentation of material assumptions
- Usefulness of system output/reports
- Adequacy of periodic variance analysis

Tab D: *Measurement Systems* consists of one section containing five steps.

Section I: ALM Vendor Model

- Step A: *Model Capability*
- Step B: *Model Validation*
- Step C: *Assumptions and Inputs*
- Step D: *Controls*
- Step E: *Changes*
- Scoring Guidelines

Section I: ALM Vendor Model

Step A: *Model Capability*

a)

Model Capability	Is the ALM model sufficient in its level of depth and capability to adequately capture the complexity and magnitude of the interest rate and liquidity risks being taken? (i.e. Is the ALM model an appropriate fit for the credit union's asset/liabilities product types and characteristics?)

Many ALM models available to credit unions are adequate to properly measure IRR. However, the institution's management of the measurement system process can introduce model risk. For this reason, NCUA examiners will review and assess a credit union's process for setting up and using the model. If the model is not properly employed and controlled by the risk measurement staff, confidence in the model output is reduced. Similarly, if the model itself lacks the rigor and sophistication to analyze unique balance sheet attributes (such as failing to take into account embedded options), it may not be appropriate for measuring IRR. Examiners must determine if the model environment, staff controls, and results are sufficiently reliable to be used for managing risk and, in turn, for use in the NEV Supervisory Test.

Also, examiners need to assess whether the standard interest rate scenarios (like instantaneous shock, ramp rate, stair step, etc.) used in the credit union's model are relevant for the credit union. The prevailing supervisory expectation is for institutions to perform an instantaneous, parallel, and sustained rate shock.[13] However, the measurement systems available to credit unions have expanded over time and, in many cases, have added to the variety of scenarios and conditions that can be run. If a credit union has increased its risk, but has not made corresponding changes to its measurement system, examiners should encourage management to evaluate alternatives that are commensurate with the risks the credit union needs to capture.

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[13] More experienced risk managers will perform additional rate and balance sheet scenarios. For example, they may run a dynamic simulation or a ramped interest rate shock scenario.

Step B: *Model Validation*

b)		
	Model Validation	Has the ALM model been validated by the credit union (i.e., mathematical integrity, user inputs, system output and reports, etc.) to confirm that the model produces accurate forecasts of earnings and valuations? If so, what documentation is available to support the validation?

Examiners will request the most recent ALM model validation report. Examiners should ask for a new validation report ***only*** if there have been material changes to the balance sheet, loan or share pricing methodology, a change of ALM models, or a merger. Examiners should not place too much emphasis on validating the mathematical accuracy of the model used (sometimes referred to as a certification). The model validation report should provide a review of the model set up, inputs, reasonableness of assumptions (including NMS, which may be supported by a historical regression analysis), and accuracy of results. The validation standards should ensure that it is performed by an independent and skilled party, communicated in writing, and delivered to the appropriate personnel.

The level and depth of the independent reviews should be commensurate with the credit union's risks and activities. Credit unions with a more complex balance sheet should have a more rigorous independent review process. Credit unions with a less complex balance sheet may rely upon less formal reviews. At a minimum, large, complex credit unions should obtain independent validations that review the input process, assumptions used, and system output reports.

It is acceptable for an ALM vendor to perform the validation for inputs and underlying assumptions, as long as the examiner does not have reasonable concerns that the model is inadequate and unable to capture all material IRR elements.

System-input reviews should evaluate the adequacy and appropriateness of:

- The knowledge and skills of individuals responsible for input to the measurement system
- The reconciliation of the measurement system's data to the credit union's general ledger
- The rules and methods of account aggregation used in the measurement system
- The accuracy of contractual terms captured within the measurement system
- The source, completeness, accuracy, and procedures for external data feeds

Assumption reviews should evaluate the following issues:

- The process of developing assumptions for all material asset, liability, and off-balance-sheet exposures
- The process for reviewing and approving key assumptions
- The periodic review of assumptions for relevance, applicability, and reasonableness

- The completeness of assumption analysis and its supporting documentation

System output and reporting assessments should evaluate the following:

- Inclusion of a sufficiently broad range of potential rate scenarios
- Accuracy of the IRR measurement and assurance that all material exposures are captured
- Timeliness and frequency of reporting to management and the board
- Compliance with operating policies and approved risk limits
- Performance and documentation of variance analyses (i.e., back-testing)
- Translation of model output into understandable management reports that support decision making

Benchmark assessments should evaluate the following:

- Theoretical underpinnings, methodologies, and inputs that are as close as possible to those used in the model being validated
- Inclusion of side-by-side comparison of benchmark's model output to the credit union's model output

Examiners may make recommend refinements to improve the modeling process, but if broad recommendations are necessary to address a wide range of deficiencies, there may be a need for the credit union to consider changes to the model itself or to personnel. Examiners should determine whether the board and ALCO were made aware of errors that would significantly misrepresent the model results.

Step C: *Assumptions and Inputs*

c)	**Assumptions and inputs**	What are the credit union's procedures for assessing inputs and outputs for accuracy and relevancy? If the credit union relies on a model validation to complete this task, under what instances will the credit union verify accuracy and relevancy when periodic changes in the assumptions are made? What are the assumptions in the credit union's written Assumption Summary?

Examiners will ask management to provide any documented procedures used to ensure that model inputs are properly made within the ALM model. While the credit union may choose to entrust an outside vendor to help with the modeling process, the credit union should not pass on the responsibility of checking that all inputs and assumptions are reasonable and supported. Oftentimes, a credit union will rely on the validation process to assess completeness of model inputs. However, in the event that model assumptions are made before the validation, the credit union should have a procedure for verifying accuracy and relevancy when periodic changes are made to the model.

Ideally, a credit union will maintain an Assumption Summary document that details each key model assumption, provides an explanation/rationale supporting why the assumption is used, and lists the inputs that will be made by entrusted credit union staff or outside vendors. This document can be used to track assumption changes over time. (Most often, examiners will need to refer to the IRR model report to find the model assumptions.) In the event that the Assumption Summary includes a change, examiners should determine whether changes to assumptions have been approved by the ALCO or management and documented for board review.

Step D: *Controls*

d)	**Controls**	Is the internal control process comprehensive enough to ensure the accuracy and completeness of the data inputs and assumptions?

Examiners will determine what internal controls are in place to ensure that data loaded into the IRR models is complete and accurate and that the assumptions used are documented and supportable. Examiners will also confirm that the credit union separates the IRR measurement function from the risk taking function.

A credit union should have adequate internal controls to ensure the integrity of its IRR management process. These controls should promote reliable financial reporting and compliance with internal policies and relevant regulations. Internal control policies and procedures should address appropriate approval processes, adherence to exposure limits, reconciliations, reporting, reviews, and other mechanisms designed to provide reasonable assurance that the credit union's IRR management objectives are achieved. Internal control policies and procedures should clearly define management authorities and responsibilities and identify the individuals and committees responsible for managing sensitivity to market risk.

A sound control environment should also ensure adequate separation of duties in key elements of the risk management process to avoid potential conflicts of interest. In other words, credit unions should have clearly defined roles and responsibilities to ensure that risk-measurement functions are sufficiently independent from risk-taking functions. Additionally, IRR exposures should be reported directly to senior management and the board of directors. The nature and scope of such safeguards should reflect the structure of the credit union, the volume and complexity of IRR exposure, and the complexity of the balance sheet. Credit unions with a more complex balance sheet should designate an independent unit responsible for the design and administration of its IRR measurement, monitoring, and control functions.

Step E: *Changes*

e)	**Changes**	Were there any significant changes to the model or functionality provided by the service provider since last exam?

Examiners will determine whether a credit union's ALM vendor has made any changes to the IRR model, assumptions, or functionality since the last exam. Examiners will review the Assumption Summary from the most recent model run and compare it to the Assumption Summary for the last completed exam. Any observed changes to assumptions should be discussed with management. Examiners will verify that management is aware of the changes and understands why the changes were made.

Scoring Guidelines

Examiners will indicate a score for the *Measurement Systems* tab using the information from the review steps.

FIGURE 18. MEASUREMENT SYSTEMS INDICATORS FOR IRR

Interest Rate Risk Indicators			
	Low	**Moderate**	**High**
Measurement Systems	• Measurement systems support the accounts, methods, and assumptions under defined and reasonable rate scenarios.	• Measurement systems adequately support the accounts, methods, and assumptions under defined and reasonable rate scenarios.	• Measurement systems do not support the accounts, methods, and assumptions under defined and reasonable rate scenarios.
	• Management completes an independent model validation periodically to assess data integrity and the reasonableness of assumptions. The mechanics and mathematics of the measurement model were tested.	• Management has reasonable oversight practices and adequate processes to confirm the integrity of modeling analysis. Validation practices could include constructing an identical model to test assumptions and outcomes.	• The depth and extent of model validation processes is not commensurate with the materiality and complexity of risk exposure.

Use the dropdown box to score this section (that is, low, moderate, or high).

MS Score	**Use Drop Down Menu in this box for Risk Scoring of High, Moderate or Low**

Tab E: *Risk Management*

A credit union’s board of directors is responsible for ensuring the adequacy of its IRR policy and limits. The IRR policy should be consistent with the credit union’s business strategies, balance sheet structure, and risk tolerance, and should take into account the credit union’s financial condition and risk measurement systems and methods. The policy should clearly state that actions and authorities required for any exceptions to policy, limits, and authorizations.

Credit unions have the option either to a) create a separate IRR policy or b) incorporate IRR management into an existing policy (for example, an investments, ALM, funds management, liquidity, or other policy). Regardless of the form, credit unions must clearly document their IRR policy in writing.

Management should utilize the results of the credit union's IRR measurement systems to make operational decisions, such as changing balance sheet structure, funding, pricing strategies, and business planning. This is particularly the case when metric results show a high level of IRR or when results approach board-approved limits.

Internal controls are an essential part of a safe and sound IRR program. If possible, there should be separation between those responsible for the risk-taking and risk-measuring functions.

Staff responsible for maintaining controls should periodically assess the overall IRR program, as well as compliance with policy. Internal audit staff would normally assume this role; however, if there is no internal auditor, management or a supervisory committee member that is independent of the IRR process may perform this role.

Where appropriate, management may also supplement the internal audit with outside expertise to assess the IRR program. This review should include policy compliance, timeliness, and accuracy of reports given to management and the board. Oftentimes, this is completed in conjunction with an ALM model validation.

Audit and model validation findings/recommendations should be reported to the board and asset/liability committee (ALCO) or supervisory committee with recommended corrective actions and timeframes. The individuals responsible for maintaining internal controls should periodically examine adherence to the policy related to the IRR program.

Tab E: *Risk Management* is broken into two sections containing 13 steps.

- Section I: Board and Senior Management Oversight
- Section II: Risk Monitoring and Management Reporting
- Scoring Guidelines

Section I: Board and Senior Management Oversight

- Step A: *BOD/ALCO Meetings*
- Step B: *Policies & Procedures*
- Step C: *IRR Triggers & Tools*

Step A: *BOD/ALCO Meetings*

a)

BOD/ALCO Meetings	What IRR information does the BOD and ALCO receive that demonstrates oversight of the IRR limits and policies? Are meeting minutes prepared and do they reflect the decisions made and discussions held?

Generally, examiners can make an assessment of board and ALCO oversight by collecting and reading through minutes and attached board/ALCO packets. These are usually in the form of monthly board meeting minutes, ALCO meeting minutes, or equivalent relevant meeting documentation. The existence of minutes establishes a formal record of ALCO meetings and member attendance. If minutes are not prepared, it may indicate the ALCO is inactive, does not follow a consistent agenda in which it evaluates risks, or does not make formal recommendations to the board.

The meeting discussion should ensure that ALM policies are reviewed at least annually, and revised whenever there are changes to business practices (such as new loan types, shares, or investments), the credit union's complexity or asset size, or changes in senior management.

The ALCO should have representation in strategic planning meetings or have the opportunity to comment on proposed plans. If the ALCO is excluded from strategic plan development, ALM integration into the planning process is impaired and possibly inadequate.

An ALCO's failure to meet as required should be documented and addressed with the credit union, not only for violating board policies, but also because this is an indication that the ALCO does not monitor risk on a regular basis. It may also signify the ALCO is not meeting other responsibilities with respect to ALM.

The ALCO should receive sufficient information from which it can make intelligent decisions (like risk output reports, summary of key model assumptions, measurement method). Examiners will determine whether the ALCO has developed and/or recommended changes that have not been adopted by the board (such as using a different model, restructuring the ALM responsibilities, or adding additional internal controls). If the board is not receptive to recommendations for improvement from the ALCO, it could indicate the board does not understand ALM or is unwilling to embrace it as a management tool.

If the ALM process is weak and the ALCO is unaware of problems the examiner has identified, the ALCO may be ineffective. Likewise, if the ALCO is aware of weaknesses but unable to resolve them, the ALCO may not be meeting its responsibilities.

Minutes should adequately address discussions related to IRR management, compliance with policies, sensitivity and scenario analytics, model assumptions reviews, and risk mitigation strategies.

Risk measurement reports included in the minutes should be received and reviewed so the ALCO can monitor IRR in relation to policy limits and make effective recommendations. If the ALCO or BOD minutes do not reflect discussion of risk measurement reports, it should be considered a red flag.

Step B: *Policies & Procedures*

b)	**Policies & Procedures**	Who has the primary responsibility for IRR policies and does senior management or ALCO ensure that all policies and procedures are being monitored and are sufficient to identify risks?

NCUA rules and regulations Part 741 – Appendix B requires credit unions with assets greater than $50 million to develop a written IRR policy and an effective IRR management program as part of Asset Liability Management. A credit union's board of directors is responsible for ensuring an IRR policy has been established commensurate with the size and complexity of the credit union, and that it is adhered to. The scope of the policy will vary depending on the size and complexity of the credit union's balance sheet. For example, a credit union that offers short-term loans, invests in non-complex or short-term bullet investments,[14] and offers basic share products may not need to create an elaborate IRR policy.

Credit unions with more complex balance sheets, especially those containing products with uncertain cash flows (like mortgage loans and complex investments), should develop a comprehensive IRR policy.

The policy should set forth responsibilities and procedures for identifying, measuring, monitoring, controlling, and reporting balance sheet risk (liquidity risk and IRR), and should establish risk limits.

The form of the policy is not as important as its scope. That is, there is no requirement that the IRR policy be independent of other policies, even for large, complex credit unions. Thus, it is acceptable to incorporate IRR elements within policies that cover investments, concentration risk, liquidity risk, etc. Regardless of form, the credit union should clearly articulate its IRR management program in writing.

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[14] A bullet investment is a debt security that returns 100 percent of principal on the maturity date.

The IRR policy should establish responsibilities and procedures for identifying, measuring, monitoring, controlling, and reporting IRR, and should establish risk limits. A written policy should:

- Identify committees, persons, or other parties responsible for review of the credit union's IRR exposure.

  NOTE: It is preferred that there is at least one board member on the ALCO to improve communication between the ALCO and the board and to improve board members' knowledge of ALM. The ALCO should consist of representatives across the credit union's divisions of responsibility (loan department, investment office, marketing department, CFO, and CEO) because ALM decisions affect the entirety of a credit union's operations.

  While individual qualifications may vary, the ALCO should be composed of persons who are knowledgeable about IRR. The complexity of the balance sheet should also be reflected in the composition of the ALCO. For simple balance sheets, a basic understanding of IRR should be sufficient. For complex balance sheets, members of the committee should understand the specific sources of risk in the balance sheet, know how to measure risks, understand what the risk measurement results indicate, and be able to develop risk mitigation strategies.

- Outline training requirements and frequency of training.
- Outline the frequency of relevant committee meetings (like ALCO) and required minutes documentation.
- Direct appropriate actions to ensure management takes steps to manage IRR, so that IRR exposures are identified, measured, monitored, and controlled.
- State the frequency with which management will report on measurement results to the board to ensure routine review of information that is timely (such as prior month and at least quarterly) and in sufficient detail to assess the credit union's IRR profile.
- Set risk limits for IRR exposures based on selected measures for short- and long-term IRR exposures (such as limits for changes in repricing or duration gaps, income simulation, asset valuation, or NEV).
- Provide guidance on the reporting, frequency, and actions/triggers to remediate policy violations.
- Identify IRR measurements (like interest rate shocks, instantaneous and parallel, ramps, twisted yield curve, flattener, steepener, etc.) that the credit union will perform using the selected measures.

- Provide for periodic review of material changes in IRR exposures and compliance with board-approved policy and risk limits.
- Provide for assessment of the IRR impact of any new business activities prior to implementation (meaning, evaluate the IRR profile of introducing a new product or service).
- Provide for the frequency of performing independent ALM model validations, internal audit reviews, and/or overall ALM program management reviews (policies, ALCO, reporting, scenario and sensitivity analysis).
- Provide for at least an annual evaluation of IRR policy to determine whether it is still commensurate with the size, complexity, and risk profile of the credit union.

NCUA rules and regulations Part 741 – Appendix B provides detailed guidance for creating an IRR policy and an effective IRR program.

Step C: *IRR Triggers & Tools*

c)	**IRR Triggers & Tools**	What triggers does management use to identify when IRR exposure is approaching or exceeding limits? What strategies and tools (e.g. balance sheet changes, derivatives, sales) are considered in managing IRR exposure within policy limits?

A credit union should proactively establish strategies describing actions to be considered when policy limits are breached. Oftentimes, credit unions establish thresholds that trigger formal deliberation and/or mitigating actions prior to reaching a policy limit.

Unforeseen circumstances can necessitate prompt remedial action. The policy should address procedures for alerting senior management, the ALCO, and board, and for bringing swift resolution.

ALCO meeting minutes should reflect that the ALCO is taking proactive steps to mitigate risk ***before*** limits are approached or exceeded. If action is not taken until limits are exceeded, the ALCO is not effectively directing the ALM program. Furthermore, the credit union may not be able to implement corrective action timely (such as selling loans or participating out loans) or the costs associated with a corrective action may be excessive (such as divesting of AFS securities in a rising rate environment at a loss).

Acting proactively requires the ALCO to develop potential alternative courses of action and to prioritize those actions based on cost/benefit relationships, long-term effectiveness, and time to implement. Credit unions should establish contingency plans to adjust balance sheet structures proactively (such as mechanisms to sell mortgage loans, or initiate hedge transactions) to ensure actions can be taken to reduce IRR exposure in a timely fashion.

Section II: Risk Monitoring and Management Reporting

- Step A: *Policy Limits*
- Step B: *Policy Limits Violations*
- Step C: *Process Validation*
    - Internal Controls
    - Independent Reviews
- Step D: *Reporting*
- Step E: *Policies and Planning*
- Step F: *Planning and Back-Test*
- Step G: *Business Forecast*
- Step H: *Qualified Staff*
- Step I: *Internal Controls*
- Step J: *Balance Sheet Risk Management*

Step A: *Policy Limits*

a)	**Policy Limits**	What policy IRR limits does the CU use for management reporting purposes? Are the limits suitable for the size and potential risk exposures of the CU? Has there been any changes to the IRR Policy since the last exam and what was the basis of the changes?

Examiners will request and evaluate the policy limits, compliance status of each limit, and appropriateness of the chosen limit in relation to risk profile and underlying modeling assumptions.

Risk limits should reflect the board's tolerance of IRR exposure by restricting the volatility of earnings and capital (NEV) for given rate movements and applicable time horizons. Risk limits should be explicit dollar or percentage parameters, or both. IRR exposure limits should be commensurate with the complexity of the credit union's activities, balance sheet structure, and off-balance-sheet items. At a minimum, income-related limits should be expressed over one- and two-year time horizons, correspond to the internal measurement system's methodology, and appropriately address all key IRR risks and their effect on earnings and capital.

Examiners should carefully evaluate policy guidelines and board-approved risk limits. Credit unions should establish limits that are neither so high that they are never breached, nor so low that exceeding them is considered ordinary exposure that does not warrant any mitigating action. Effective limits will provide management sufficient flexibility to experience some volatility around expected levels for changing economic conditions, yet be sufficient enough to prevent excessive risk-taking.

Policies should be in place to ensure that excessive IRR exposures receive prompt attention. Controls should be designed to help management identify, evaluate, report, and address excessive IRR exposures. Policies should require management to regularly monitor risk levels, and controls should be altered as needed when economic conditions change or the board alters its risk tolerance level. Reports or stress tests that reflect significant IRR exposure should be promptly reported to either the board or an appropriate board committee. Regardless, the credit union's board should review all risk limit exceptions and management's proposed actions.

Step B: *Policy Limits Violations*

b)	**Policy Limits Violations**	Were there any violations to the IRR limits since the last exam, what was the violation and what remedial action was taken in moving the risk back within limits?

Examiners will determine whether there were any policy violations during the exam period. If violations occurred, examiners will determine what action(s), if any, that management took to remedy the exposure and bring levels back within compliance. If management's remedy to a policy violation is to change the policy limit, this likely indicates weak or poor IRR management and a potential failure of governance.

Step C: *Process Validation*

c)	**Process Validation**	Does the CU obtain an independent validation of the IRR measurement process and assumptions that generate the IRR reporting? Did management implement the recommendations?

Examiners will request the most recent independent review of the credit union's IRR measurement process and assumptions. Examiners will determine whether management implemented any recommendations.

Internal Controls

Establishing and maintaining an effective system of internal controls and independent reviews is critical to the risk management process and the general safety and soundness of a credit union. Credit unions should have adequate internal controls to ensure the integrity of their IRR management process. These controls should promote reliable financial and risk reporting and compliance with internal policies and relevant regulations. Internal control policies and procedures should address appropriate approval processes, adherence to exposure limits, reconciliations, reporting, reviews, and other mechanisms designed to provide a reasonable assurance that the credit union's IRR management objectives are achieved. Internal control policies and procedures should clearly define management authorities and responsibilities and identify the individuals and committees responsible for managing sensitivity to market risk.

A sound control environment should also ensure adequate separation of duties in key elements of the risk management process to avoid potential conflicts of interest. In other words, credit unions should have clearly defined roles and responsibilities to ensure that risk-measurement functions are sufficiently independent from risk-taking functions. Additionally, IRR exposures should be reported directly to senior management and the board of directors. The nature and scope of such safeguards should reflect the type and structure of the credit union, the volume and complexity of IRR incurred, and the complexity of the credit union’s transactions and commitments. Larger and more complex credit unions should have dedicated staff or team responsible for the design and administration of IRR measurement, monitoring, and control functions.

Independent Reviews

Regular independent reviews of IRR management process are an important element of a credit union’s internal control system. Internal reviews of the IRR measurement system should include assessments of the assumptions, parameters, and methodologies used. The purpose of an independent review is to ensure that the IRR measurement and management processes are sound. Such reviews should seek to understand, test, and document the current measurement process; evaluate the system’s accuracy; and recommend solutions to any identified weaknesses. The independent review should be tailored to the type and complexity of a credit union’s activities. It should encompass a set of standards that include:

- **Independence –** Parties performing the independent review should not be involved in the day-to-day IRR measurement/management process. Credit unions may use internal staff, an outsourcing arrangement, or a combination of the two to independently review the measurement system. Management may find that the internal audit department (or other staff independent of the measurement system) has the knowledge and skills to perform certain aspects of the review, while using external resources for other areas. When the assessment of the measurement system is outsourced, senior management and the board should ensure that the procedures used meet the same standards required of a satisfactory internal review.

  Regardless of whether the review is performed by internal staff or external entities, it is important these parties be independent of any operational responsibility for the measurement and management processes. They should not perform any of the routine internal control functions, such as reconciling data inputs, developing assumptions, or performing variance analysis.

- **Skills and Knowledge –** Senior management and the board must ensure that individuals performing the independent review have the knowledge and skills to competently assess the measurement system and its control environment.

- **Transparency –** The procedures used in the independent review of the measurement system should be clearly documented, and workpapers should be available to management, auditors, and examiners for review. Senior management should ensure that they have access to work papers even when external parties perform the review.

- **Communication of Results –** Procedures should be established for reporting independent review findings to the board or board-delegated committee.

Findings of the review should be reported to the board on a periodic basis, along with a summary of the credit union's IRR measurement techniques and management practices.

- Independent reviews should be performed periodically. The scope, responsibility, and authority for the reviews should be clearly documented and encompass all material aspects of the measurement process. The scope of the independent review should generally be defined by the internal audit staff and approved by the audit committee. However, subject to board approval, it is acceptable for another department of the credit union, separate from the group that measures IRR, to define, perform, and document the independent review.

Step D: *Reporting*

d)	**Reporting**	How often do they generate IRR results and report them to ALCO and the BOD (with explicit IRR measurements against limits) and the comparative analysis on changes from period to period?

Examiners will assess how often a credit union runs its IRR model. Examiners will verify that the results are reported to ALCO and board of directors, and are reviewed over time (for trend analysis).

For credit unions with complex balance sheets (like those with mortgage-related assets or other complex structured instruments), reports should be provided to the board at least quarterly. If the balance sheet incurs significant change, monthly reports may be more appropriate. The board may only receive reports less frequently if reports are being provided to an ALCO (preferably, at least one board member will be on the ALCO) and the ALCO is charged with alerting the board to significant events (such as when a policy limit is approached).

Consistent measurement between periods is essential to understanding the changing risk structure of the balance sheet and to identify the underlying causes.

If assumptions are changed from period to period without reasonable cause, comparison between measurement periods will probably not be meaningful, and an exception should be taken. The results are likely to be misleading to decision makers (like the ALCO and board), resulting in inappropriate decision making. Any assumption changes need to be clearly documented with analysis of the impact to the modeling results.

Step E: *Policies and Planning*

e)	**Policies and Planning**	Is the CU budget forecasting consistent with the IRR risk limits? How does modeling the credit union's budget compare to the IRR limits?

ALM practices should be closely aligned with the strategic planning and budgeting process. This includes identifying components of the balance sheet that cause IRR exposure. This should impact the strategic planning process as it relates to product growth plans.

For example, a credit union's strategic plan and budget indicates large growth in fixed-rate real estate loans, but the current NEV results are approaching policy limit. This is an example of the ALM process being inconsistent with the strategic planning process. The credit union's key strategists responsible for business planning should understand the IRR implications of new business activities and determine that the projected IRR exposures will remain within the board's risk policy limits. Examiners can request and review a credit union's budget forecast and compare it to the net interest income simulation. The forecasted base net income should be in alignment with the budget forecast (1 year). Interest income should tie out with the budget.

Examiners can determine whether there are any material mismatches between ALM modeling/management and the strategic planning/budgeting process.

Step F: *Planning and Back-Test*

f)	**Planning and Backtest**	How does the credit union's NII backtest compare to actual results?

Variance analysis (also known as back-testing) can provide valuable insights into the accuracy and reasonableness of IRR models and is an integral part of the control process for IRR management.

In an environment where rates have not changed, variance analysis should generally not produce materially different results compared to the credit union's actual performance. Nevertheless, a credit union needs to demonstrate readiness and should have this tool in place for when the market environment does change.

Step G: Business Forecast

g)	**Business Forecast**	Are there any future events forecasted by the credit union that may have a material impact on the balance sheet structure (e.g., new loan, share, or investment strategies, merger, aggressive growth strategy) and what interest rate risk analysis (e.g. What-if) was done to support the proposed changes?

Examiners should review a credit union's strategic plan and discuss any forecasted events that would impact the balance sheet structure and IRR profile of the credit union (such as new loan types, rapid growth, change in investment strategies, mergers).[15] Examiners should determine what type of proactive analysis the credit union has performed and confirm the credit union has run scenario tests to determine the potential impact to IRR from the strategic plan initiatives.

Examiners may review evidence of testing for new or expanded product lines, mergers, and other events that can impact a credit union's balance sheet structure and IRR profile.

Credit unions should perform proactive risk analysis with the use of "what if" scenario testing. "What if" tests are intended to assist management in understanding the impact of business decisions or events on IRR exposure, and should be performed prior to making any business decision that could materially impact the balance sheet structure.

For example, prior to purchasing a participation in a pool of fixed-rate mortgages, a credit union can run NEV and NII simulations with the new participation loans added to the balance sheet to determine the incremental impact to IRR position. This is an effective way to ensure business decisions do not cause the credit union to fall out of compliance with the board's risk tolerance (its NEV and/or NII policy limits).

Examiners should determine whether the analysis addressed the characteristics of the product and whether or not assumptions and analysis were documented. For example, implementing a mortgage program would necessitate a comprehensive understanding of prepayment risk and a proper analysis of IRR. Similarly, if a credit union currently offers personal loans and decides to offer home equity lines of credit (HELOCS), it needs to understand uncertainty of cash flows (from prepayments and draws on the lines of credit) and variable rate features that may not exist in the current portfolio or may not be handled properly within the existing data processing system.

If the credit union does not evaluate risk/reward relationships or set appropriate limits on new or expanding programs, it is not effectively managing IRR.

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[15] A merger in particular can significantly change the continuing credit union's IRR profile if the merging entity has a different asset/liability mix. Pre-merger risk analysis is prudent.

Step H: *Qualified Staff*

h)	**Qualified Staff**	Is staff capable of managing the IRR program including having the experience and capability to support the IRR modeling and reporting?

Examiners will:

- Review the qualifications of staff responsible for monitoring and measuring IRR;
- Assess whether the credit union has received any ongoing ALM training since the last exam; and
- Assess the separation of duties.

Credit union staff should be familiar with the assumptions driving the model and experienced with the model's basis for measurement (such as earnings simulation or NEV). Examiners should assess whether staff has the institutional knowledge to verify that the model's results are reasonable and regularly makes improvements to the model or its assumptions. It is prudent for credit unions to designate back-up staff and to ensure that this person is adequately trained to use the model without supervision of the individual(s) with first line responsibility.

The complexity of the credit union's balance sheet and risk measurement model will drive the need for experienced ALM program staff. The more complex the model, the more experienced the staff should be. Also, the experience of ALM program staff may reflect the credit union's commitment toward implementing a strong ALM program. If staff knowledge is lacking, the modeling results may be unreasonable, likely warranting further training. Conversely, experienced program staff would likely develop reasonable risk reports and make recommendations to improve the risk measurement process.

The following discussion points can be used to determine if IRR modeling staff is qualified.

- Where do the prepayment speeds come from (are they externally sourced or internally generated)?
- What products do the prepayment speeds cover (such as FHLMC or FNMA 30 year or 15 year, ARMs, balloons)?
- Do the speeds change over the age of the loan and are these speeds reasonable and supportable?
- Do the speeds change according to interest rate scenarios and are these speeds reasonable and supportable?

Program staff should be able to understand and explain how the model works and the key assumptions that drive the results.

Step I: *Internal Controls*

i)	**Internal Controls**	Are the internal controls documented and approved (Governance by who?) and has a review of IRR internal controls highlighted any deficiencies? Are the staff responsible for inputs/assumptions independent from other major functions(e.g. Accounting, cash operations) in the CU?

Examiners will determine whether internal control reviews have taken place and if there any deficiencies with the process.

Strong internal controls are integral to an effective ALM program. If the risk-taker (such as investment officer or CEO) is not separate from the persons responsible for measuring risk (like an ALM program person) and assessing risk (the ALCO), it is possible that the risk measurement results will be biased toward optimistic and potentially inaccurate, resulting in inappropriate decisions. Combined, these shortcomings may exacerbate a high IRR exposure.

Among smaller credit unions, it is not uncommon for risk taking and risk measurement responsibilities to be performed by a single individual due to a lack of available resources. For small, non-complex credit unions with limited staff resources, segregation of duties may not be feasible and the credit union may consider outsourcing the model to a qualified third-party vendor. However, if this is not possible, the board and supervisory committee should take an active role in monitoring the activities of the individual(s) and/or individual authorities may need to be limited.

Step J: *Balance Sheet Risk Management (BSRM)*

j)	**BSRM**	How does management consider the impact that other risks such as credit, liquidity, strategic, and operational may have on IRR?

Examiners will determine what types of risk analysis are documented within the ALCO package related to credit, liquidity, strategic, and operational risks. Has the credit union performed advanced analytics to incorporate multiple risks simultaneously (for example, does the credit union evaluate IRR in conjunction with credit risk)? As an example, the credit union could assume heightened credit default rates and increased provision expenses within the ALM model to simulate a rising rate environment and recession simultaneously.

Scoring Guidelines

Examiners will indicate a score for the *Balance Sheet Risk Management* tab using the information from the review steps.

FIGURE 19. RISK MANAGEMENT INDICATORS FOR IRR

Interest Rate Risk Indicators			
	Low	**Moderate**	**High**
Balance Sheet Risk Management	• Management effectively understands and is regularly informed about the level and trends of IRR exposure.	• Management reasonably understands implications of the IRR strategies they pursue, including their potential impact on IRR exposure.	• Management does not understand or ignores key aspects of IRR. Regular reporting of key risk indicators is not taking place.
	• Comprehensive IRR management governance of policies and procedures is in place. Policies specify IRR tolerances in the context of plausible stressed market rate scenarios and other performance metrics.	• Policies and procedures are adequate to control all material components of IRR. Policies ensure the IRR implications of significant new strategies, products, and businesses are integrated into IRR management process.	• IRR tolerances are not clearly articulated. Policies do not address the potential impact of changing interest rates on earnings and capital from a short-term and a long-term perspective.
	• There is complete separation between those who measure risk and those who make risk-taking decisions. Internal audit regularly reviews the IRR process.	• There is reasonable separation between those who measure risk and those who make risk-taking decisions. Management has implemented appropriate oversight practices where enhanced separation of duties is not possible.	• There is a lack of separation between those who measure risk and those to make risk-taking decisions. Internal reviews do not cover any aspect of the IRR management program.
	• Management clearly defines income simulation and NEV IRR limits under an appropriate range of plausible stressed market rate scenarios.	• IRR limits are adequate to control the risk to earnings and NEV under defined stressed market rate scenarios.	• IRR limits are not reasonable or do not reflect an understanding of the risks to earnings and NEV.
	• Effective reporting of IRR exists. Comprehensive systems and standards for measuring IRR, valuing positions, and assessing performance are in place, and are accurate, complete, and reliable. The board receives reports on the	• Adequate reporting of IRR exists. Material components of IRR are measured and results are reported. Reports are generally accurate, complete, and reliable. Reports to the board are timely and concisely	• IRR monitoring and reporting are inadequate. Current measurement techniques do not capture all material risks.

	credit union's IRR profile on a regular basis. The frequency and detail of reporting is commensurate with the size and complexity of the balance sheet.	summarize IRR measurement results.	
	• Management anticipates and responds to market conditions effectively.	• Management adequately responds to changing market conditions.	• Management does not anticipate or take timely and appropriate actions in response to changing market conditions.
	• IRR is well understood at appropriate levels of the credit union and risk information is proactively used in the decision-making process and clearly documented on a continual basis.	• Knowledge of IRR exists at appropriate levels of the credit union. Risk information is reviewed on a regular basis by senior management and discussions are documented.	• Knowledge of IRR may be limited to too few individuals and risk information is only generated for compliance purposes and is not well documented or used to guide decision making.

Use the dropdown box to score this section (that is, low, moderate, or high).

RM Score	**Use Drop Down Menu in this box for Risk Scoring of High, Moderate or Low**

Tab F: *Overall IRR Rating*

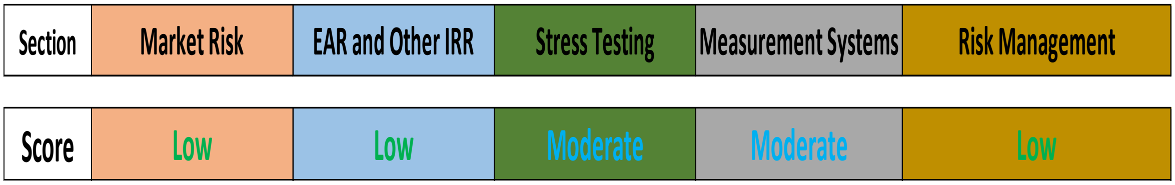
Tab F: *Overall IRR Rating* is broken into three sections.

- Section I: Section IRR Scores
- Section II: Overall IRR Rating
- Section III: Supervisory Action

Section I: Section IRR Scores

Scores in this section will automatically roll up to the *IRR Overall Rating* tab.

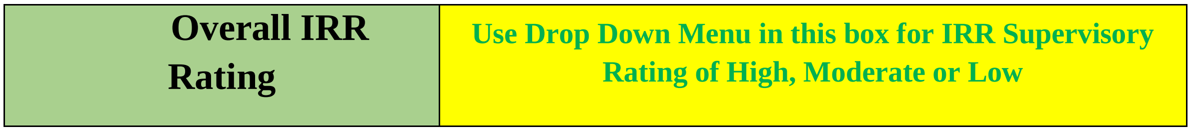
FIGURE 20. SCORING TABLE



Section	Market Risk	EAR and Other IRR	Stress Testing	Measurement Systems	Risk Management
Score	Low	Low	Moderate	Moderate	Low

Section II: Overall IRR Rating

Examiners will use a dropdown box to score this section (that is, low, moderate, or high).



Overall IRR Rating	**Use Drop Down Menu in this box for IRR Supervisory Rating of High, Moderate or Low**

Each of the scores that an examiner has assigned in tabs A through E will automatically populate into the summary scoring table (see *Figure 20*). Then, examiners must assign the overall IRR rating in Tab F as the basis for the Final Assessment (AIRES Scope).

Tab A: *Market Risk* provides a "rating floor" for the overall IRR rating, meaning that the Overall IRR Rating can never be lower than the Market Risk score. Scores from Tabs B through E cannot *improve* a credit union's Overall IRR Rating; however, these scores can *lower* a credit union's Overall IRR Rating. For example, a credit union with a low or moderate Market Risk rating could see its Overall IRR Rating elevated to high if it receives unfavorable scores in tabs B through E. (See Overall IRR Rating Scenarios below.)

Importantly, if the result of an NEV Supervisory Test is extreme, unless extenuating circumstances exist, examiners will issue a DOR or other administrative action requiring management to submit a plan to reduce the credit union's IRR position to the relevant Regional

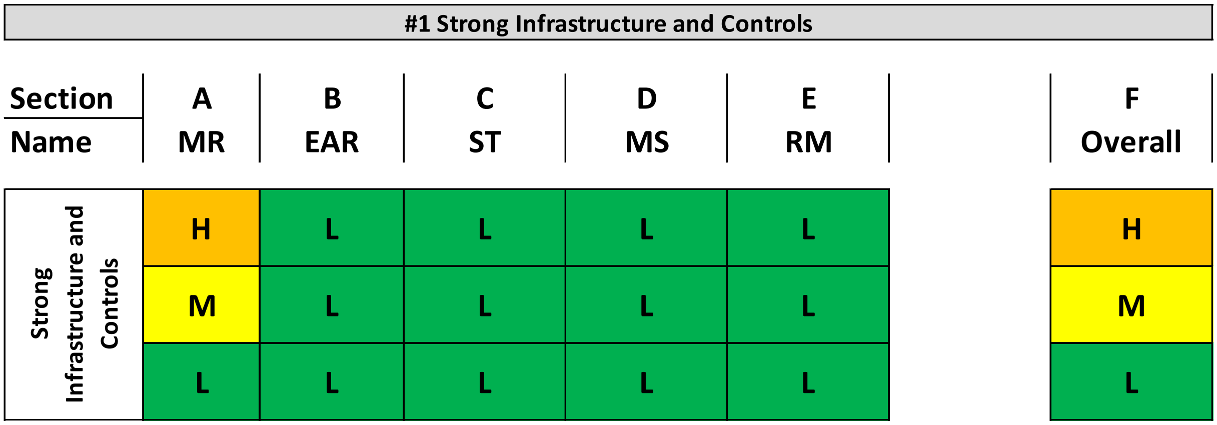
Director within 45 days. The plan must include a strategy to reduce the IRR position to a less than extreme level based upon the results of the NEV Supervisory Test.

Below, five scenarios (ordered from low to extreme) are provided to illustrate possible paths towards an Overall IRR Rating. These scenarios are for illustrative purposes only and do not encompass all possible scenarios. The scenarios use the assumptions and suggested rating definitions included in Tabs A through E as discussed above.

Overall IRR Rating Scenarios

1) Good infrastructure (systems, staff, data) and strong controls
2) Good infrastructure (systems, staff, data), but deficiencies in EAR and control environment; more stress testing is needed
3) Infrastructure, risk management, and stress testing are acceptable, but need to be strengthened
4) Infrastructure is adequate, but the controls and stress testing are weak and need improvement immediately
5) The validated NEV Supervisory Test result is extreme; the credit union needs to provide a plan to lower the risk within 45 days

Simulation #1: Credit union has a good infrastructure (systems, staff and data) and strong controls.



#1 Strong Infrastructure and Controls

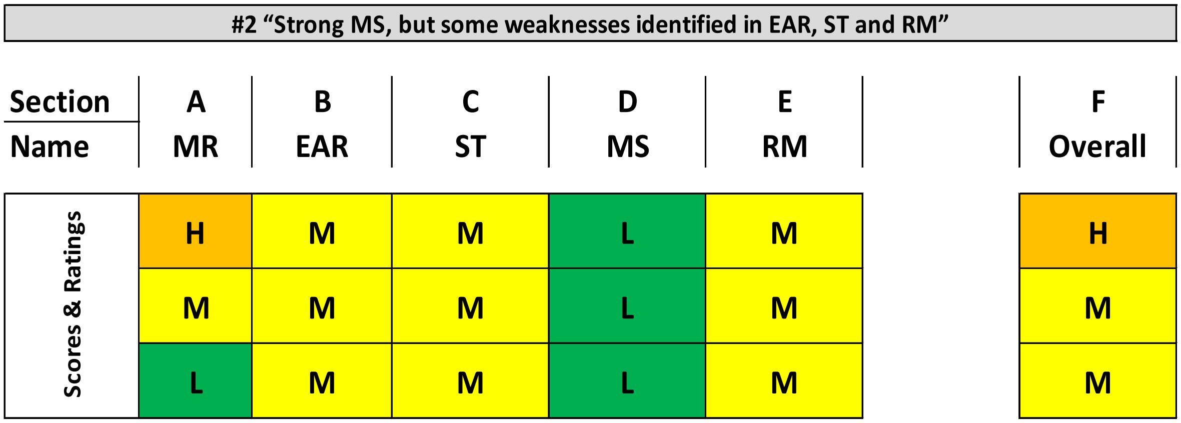
Section Name	A MR	B EAR	C ST	D MS	E RM	F Overall
Strong Infrastructure and Controls	H	L	L	L	L	H
	M	L	L	L	L	M
	L	L	L	L	L	L

Notes to Overall IRR Rating for Simulation #1:

1. The first line in Simulation #1 verifies a **high** level of quantitative risk from Tab A and low levels of risk in the other tabs, concluding with a **high** Overall IRR Rating.

2. The second line in Simulation #1 verifies a **moderate** level of quantitative risk from Tab A and low levels of risk in the other tabs, concluding with a **moderate** Overall IRR Rating.
3. The third line in Simulation #1 verifies a **low** level of quantitative risk from Tab A and low levels of risk in the other tabs, concluding with a **low** Overall IRR Rating.

Simulation #2: Good infrastructure (systems, staff, data), but deficiencies in EAR and the control environment; more stress testing is needed.



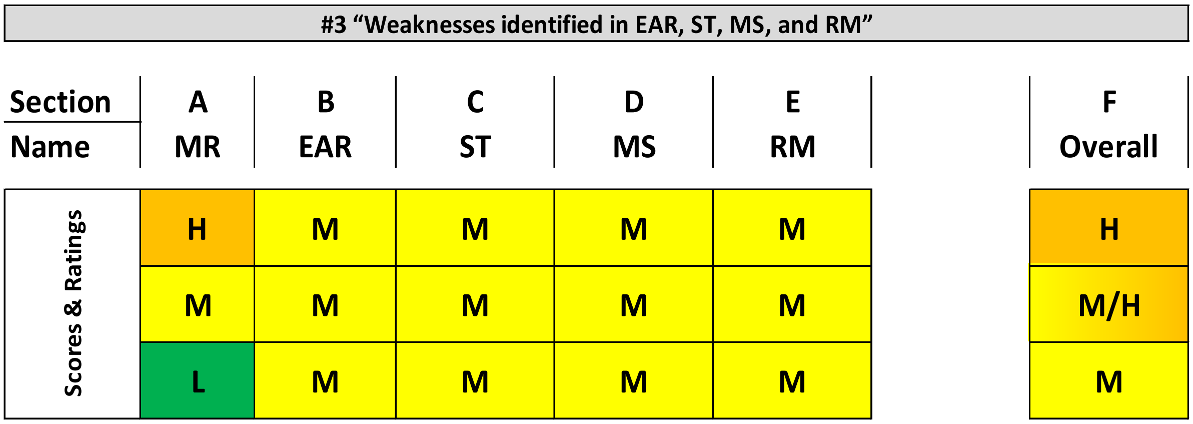
#2 “Strong MS, but some weaknesses identified in EAR, ST and RM”

Section Name	A MR	B EAR	C ST	D MS	E RM	F Overall
Scores & Ratings	H	M	M	L	M	H
	M	M	M	L	M	M
	L	M	M	L	M	M

Notes to Overall IRR Rating for Simulation #2:

1. The first line in Simulation #2 verifies a **high** level of quantitative risk from Tab A and moderate or low levels of risk in the other areas, concluding with a **high** Overall IRR Rating.
2. The second line in Simulation #2 verifies a **moderate** level of quantitative risk from Tab A and moderate or low levels of risk in the other areas, concluding with a **moderate** Overall IRR Rating.
3. The third line in Simulation #2 verifies a **low** level of quantitative risk from Tab A and moderate or low levels of risk in the other areas, concluding with a **moderate** Overall IRR Rating.

Simulation #3: Infrastructure, risk management, and stress testing are acceptable, but need to be strengthened.



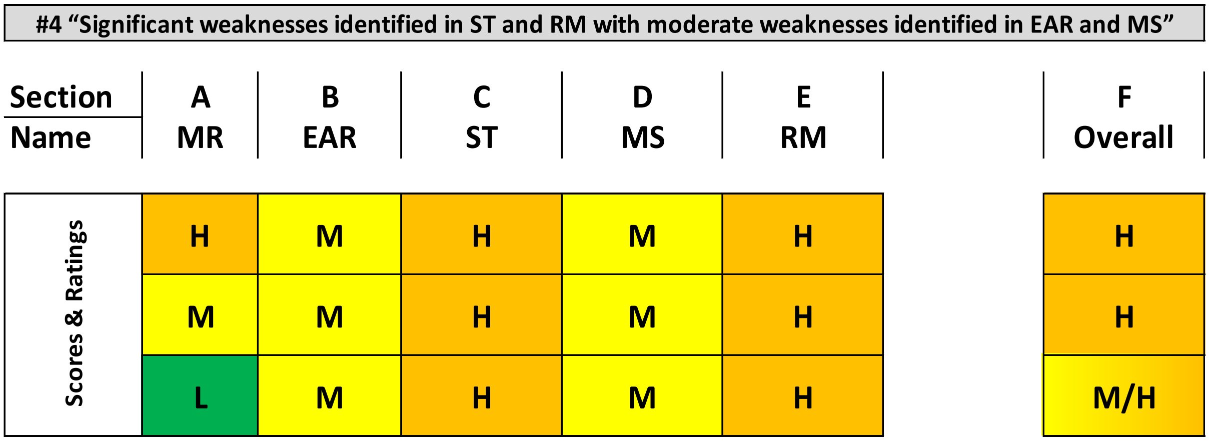
#3 "Weaknesses identified in EAR, ST, MS, and RM"

Section Name	A MR	B EAR	C ST	D MS	E RM	F Overall
Scores & Ratings	H	M	M	M	M	H
	M	M	M	M	M	M/H
	L	M	M	M	M	M

Notes to Overall IRR Rating for Simulation #3:

1. The first line in Simulation #3 verifies a **high** level of quantitative risk from Tab A and moderate results for the other review areas, concluding with a **high** Overall IRR Rating.
2. The second line in Simulation #3 verifies a **moderate** level of quantitative risk from Tab A and moderate results from the other review areas, concluding with an Overall IRR Rating of **moderate** or **high**.
3. The third line in Simulation #3 verifies a **low** level of quantitative risk from Tab A and moderate results from the other review areas, concluding with a **moderate** Overall IRR Rating.

Simulation #4: Infrastructure is adequate, but the controls and stress testing are weak and need improvement immediately.



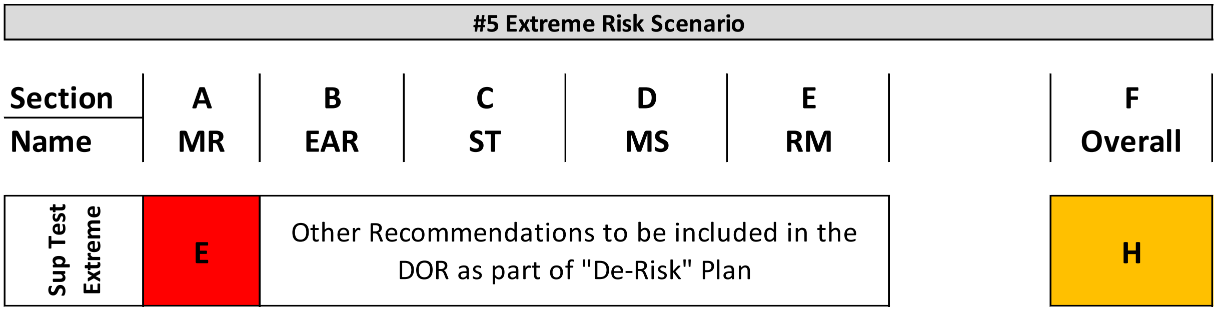
#4 "Significant weaknesses identified in ST and RM with moderate weaknesses identified in EAR and MS"

Section Name	A MR	B EAR	C ST	D MS	E RM	F Overall
Scores & Ratings	H	M	H	M	H	H
	M	M	H	M	H	H
	L	M	H	M	H	M/H

Notes to Overall IRR Rating for Simulation #4:

1. The first line in Simulation #4 verifies a **high** level of quantitative risk from Tab A and high or moderate levels of risk in the other review areas, concluding with a **high** Overall IRR Rating.
2. The second line in Simulation #4 verifies a **moderate** level of quantitative risk from Tab A and high or moderate levels of risk in the other review areas, concluding with a **high** Overall IRR Rating.
3. The third line in Simulation #4 verifies a **low** level of quantitative risk from Tab A and high or moderate levels of risk in the other review areas, concluding with an Overall IRR Rating of **moderate** or **high**.

Simulation #5: The validated NEV Supervisory Test result is extreme; the credit union needs to provide a plan to lower the risk within 45 days.



#5 Extreme Risk Scenario

Section Name	A MR	B EAR	C ST	D MS	E RM		F Overall
Sup Test Extreme	E	Other Recommendations to be included in the DOR as part of "De-Risk" Plan					H

Note to Overall IRR Rating for Simulation #5:

1. In the event that a verified Tab A indicates an **excessive** level of quantitative risk, the credit union will be required to provide a plan or corrective action plan to lower the risk within 45 days of notification. If any other assessments (that is, in Tabs B through E) need remediation or improvement, they are included in the DOR or Examiner’s Findings. The Overall IRR Rating would be **high**.

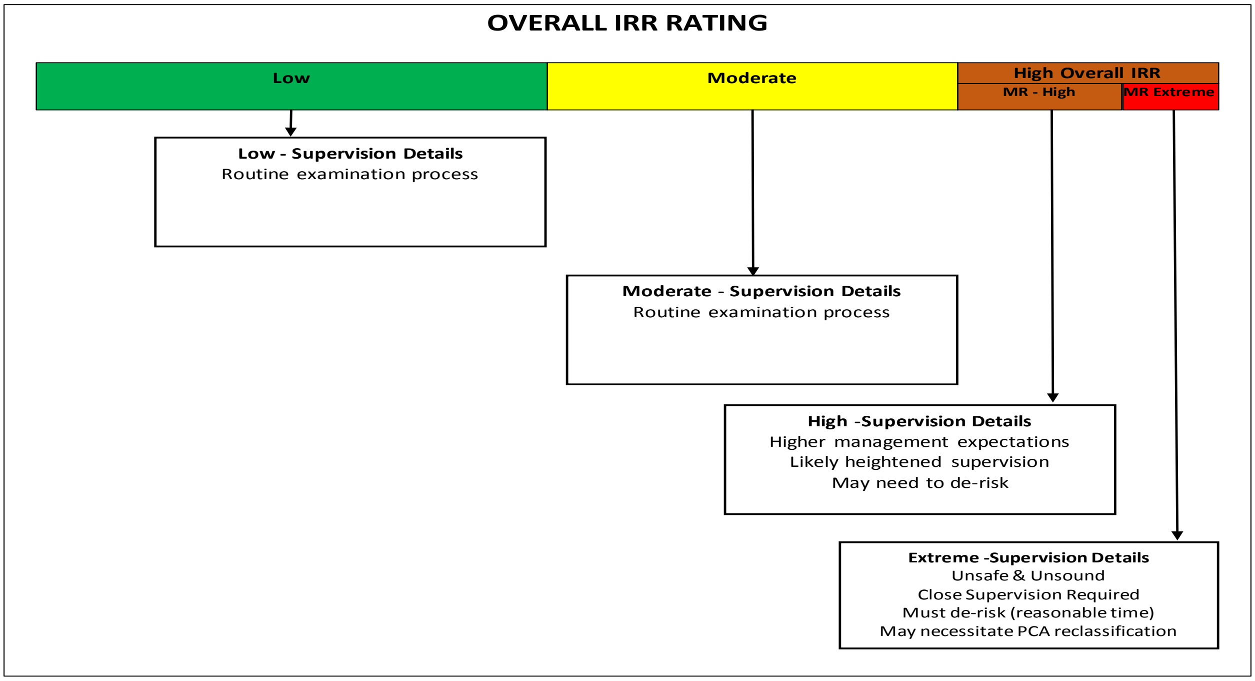
Narrative for the Scope Module

The *Overall IRR Rating* tab includes a narrative box, where examiners will provide narrative regarding the Scope Module (results of review and final assessment).

Section III: Supervisory Action

Figure 21 illustrates the potential supervisory action related to a credit union’s Overall IRR Rating. As the IRR risk level increases, supervisory expectations for management increase as well.

Figure 21. Supervisory Expectations Based on Overall IRR Rating


OVERALL IRR RATING
Low
Moderate
High Overall IRR
MR - High
MR Extreme
Low - Supervision Details
Routine examination process
Moderate - Supervision Details
Routine examination process
High -Supervision Details
Higher management expectations
Likely heightened supervision
May need to de-risk
Extreme -Supervision Details
Unsafe & Unsound
Close Supervision Required
Must de-risk (reasonable time)
May necessitate PCA reclassification

As indicated previously in *Figure 1*, once the IRR review is complete, the examiner must perform the Total Analysis Process and BSRM (Balance Sheet Risk Management) evaluations to understand and conclude on the interrelationships among the risk categories and how they relate to the CAMEL component and composite ratings. Once the examiner has a comprehensive understanding of the credit union's overall risk profile, he/she can determine whether supervisory actions (such as a Document of Resolution (DOR) or Examiner Findings (EF)) are necessary. The *National Supervision Policy Manual* (NSPM) provides the framework for developing a DOR and EF, as well as for determining which action is necessary to correct an issue.

While typically a correlation exists between an elevated IRR category and the need for a DOR or EF, examiners should understand the drivers of the rating because these may influence the need for supervisory action. For example, a credit union with high market risk score (like a high result on the NEV Supervisory Test), a modest level of net worth, and significant credit and liquidity risk exposures would likely require a DOR or EF because its net worth level is not sufficient to support the collective risk exposures. However, a credit union with a high market risk score, a significant net worth position, and low levels of other risk in the other risk categories (historically, currently, and prospectively) likely will not require a DOR or EF.

In the unusual case of an extreme Market Risk score, management will be required to develop a plan to lower the risk to at least a level less than extreme within a reasonable time. If a credit union is unable or unwilling to do so, the examiner and his/her supervisor should discuss with regional management the need to provide a recommendation to the NCUA Board to reclassify the credit union's net worth category, based on safety and soundness, as well as to pursue any other applicable enforcement actions to correct the problem, provided in the existing authority in NCUA rules and regulations §702.102.

Glossary

Assumptions: Postulations that are used as factors in IRR measurement. Assumptions are typically derived using a combination of internal/external sources. In IRR measurement, assumptions are typically made about interest rate trends, member behavior, and economic factors. Assumptions can greatly influence measurements, so it is crucial that assumptions accurately reflect operational management's and the board's expectations and are reasonable and supportable.

Base Value: The current market value as determined of a specific balance sheet account assuming no change to the level of interest rates.

Basis Point (bps): A unit of measurement used to describe changes in interest rates or other financial percentages. One basis point is equal to 1/100 of one percent.

Basis Risk: The risk to earnings and economic value when a change in one interest rate differs from that of another interest rate (relationship between two indices). For example, the rate on a money market share account typically changes less than that of an overnight investment account (earning a Federal funds rate).

Beta Factor: Assumption about non-maturity share (NMS) that is used to measure interest rate changes relative to market rate changes. (Also see Rate Sensitivity Factor.)

Book Value: The GAAP-compliant presentation of an account as it appears on the financial statements.

Cap: The maximum interest rate a variable rate product can adjust to, given a rising market rate environment. A cap, which is established at origination of the product, is generally used to protect a borrower from unlimited rate adjustments. If a cap is not used, a borrower could be subject to ever increasing payments as their variable rate product adjusts to higher rates. For depository institutions, caps present a form of option risk.

Convexity: Convexity is a measure of the curvature in the relationship between an asset price and yield that demonstrates how the duration of an asset changes as the interest rate changes.

Core Shares: A portion of shares and deposits that are not sensitive to changes in interest rates, or are less sensitive than other products. These are shares that management does not expect members to withdraw (or reinvest in a higher rate instrument) in response to an increase in market interest rates. Credit unions may consider many regular share accounts with relatively small balances, as well as the portion of share draft accounts reflecting transactional balances, to be core shares. Generally, money market share accounts and share certificates are less likely to be considered core shares.

Decay Rate: The assumed cash flows for non-maturity shares (NMS), expressed as a percentage. Also called the "run-off rate" or "prepayment rate" for shares.

Discount: The current market rate or the shocked market rate of interest at the time a measurement is made.

Discount Rate: An interest rate used in a model to calculate an estimate of fair value of a financial instrument. A discount rate is used to compute the present value of a cash flow. Measurement system models may offer other methods for assigning a discount rate, but two methods are commonly used by credit unions: 1) using a static discount rate or 2) basing the discount rate on an index, plus a spread.

Using a static discount rate means using a single discount rate for all cash flows of a particular account. The rate should represent the market offering rate for a like asset or liability. For example, when valuing its 30-year, fixed-rate mortgage portfolio, the credit union should obtain the current rate offered by the market for 30-year, fixed-rate mortgages. The credit union's current offering rate should not be used, unless management determines that the credit union's rate is equivalent to a market rate. Because credit unions typically try to offer more favorable rates on loans and shares, the current offering rate may not equal the market rate.

Basing a discount rate on an index plus a spread requires a user to establish a spread to the index to represent the risks inherent in the asset or liability being valued. For example, mortgage loans can default, and can also be prepaid by the member. Due to the credit risk and cash flow uncertainty, the mortgage portfolio's discount rate should reflect a spread over the index (e.g., Treasury curve index). The credit union should be able to support the indices and spreads used to discount each account.

Floor: The lowest interest rate a variable-rate product can adjust to given a decreasing market rate environment. A floor, which is established at origination of the product, is generally used to protect a credit union's variable-rate products from unlimited rate adjustments. If a floor is not used, then a credit union's NII could decrease as its variable-rate products adjusts to lower rates. Floors present a form of option risk.

Deterministic: A modeling technique, which allows operational management to specify the direction, amount, and timing of future interest rates in order to measure the potential impact the changes may have on earnings and capital.

Dynamic Simulation: Detailed assumptions regarding changes in existing business lines, new business, and changes in management and customer behavior. The assumptions change the existing balance sheet to reflect expected business changes.

Duration: The amount by which an asset price increases or decreases as the result of a 1 percent change in interest rates. Duration measures how much the price changes and, for that reason, is a measure of an asset volatility to price changes.

Gap Analysis: A simple IRR measurement method that reports the mismatch between rate-sensitive assets and rate-sensitive liabilities over a given time period. Gap can only suffice for simple balance sheets that primarily consist of short-term bullet-type investments and non-mortgage related assets. Gap analysis can be static, behavioral, or based on duration.

Income Simulation: An IRR measurement technique used to estimate earnings exposure to changes in interest rates. Credit unions use income simulation to forecast Net Interest Income (NII), Net Income (NI), and accounting net worth under different interest rate scenarios.

In-House Model: An asset-liability management (ALM) model developed, operated, and/or controlled by a credit union with little to no help from third-party vendors other than for maintenance purposes.

Index: The market interest rate (to which a margin may be added) that is used to reset the interest rate on a variable-rate loan.

Interest Rate Risk (IRR): The potential that changes in market interest rates will adversely affect a credit union's earnings and net worth (also referred to as market risk). This risk is present to some degree in all credit union balance sheets and can be an important source of earnings and membership value. IRR generally arises from a mismatch between the timing of cash flows from fixed rate instruments, and interest rate resets of variable rate instruments, on either side of the balance sheet. Thus, as interest rates change, earnings or net worth may decline.

Measurement Model: An analysis used to measure a credit union's level of IRR. The most common measurement models include net economic value (NEV) analysis and net interest income (NII) simulations.

Measurement System: The platform and model used to capture all material sources of IRR and generate meaningful reports that quantify the risk for consideration by operational management and a credit union's board of directors. Credit unions need to utilize a measurement system that is appropriate for the size and complexity of its balance sheet, but all measurement systems require a credit union to gather and input data and make assumptions about possible future interest rate environments and member behavior, so as to quantify IRR exposure.

Model Risk: The potential for adverse consequences from decisions based on incorrect or misused model outputs. This may be the result of model error from an incorrect mathematical calculation, input error that causes an inaccurate model output, an inadequate reporting component that fails to translate model estimates into useful business information, or from a lack of model complexity that results in the model's inability to capture all relevant risks. In all situations, it is important to understand a model's capabilities and limitations given its simplifications and assumptions.

NMS Premium: The fair value of non-maturity shares (NMS); typically, a function of the effects of NMS life, dividend rate, discount curve, and rate sensitivity factor(s). A premium is often expressed as a percentage over the change from book to base values.

Net Economic Value (NEV) Analysis: An IRR measurement technique used to measure the economic exposure of net worth to changes in interest rates. NEV equals the present value of assets less the present value of liabilities.

NEV Volatility: A measure of the change (either in dollar or percentage terms) in NEV resulting from a change in interest rates. The volatility is measured from a base case scenario. A high level of NEV volatility reflects a high level of IRR.

Non-Parallel Yield Curve Shift: A shift in the yield curve in which yields do not change by the same number of basis points for every maturity. When running various interest rate scenarios, management may set non-parallel shifts in a manner similar to deterministic rate scenarios (e.g., rate shock, rate ramp). The scenarios often have a pivot point on the yield curve from which longer-term and shorter-term rates change in different amounts. (See also Parallel Yield Curve Shift.)

Outsourced Model: An ALM model that is provided and run by a third party. Credit unions may use an outsourced model to conduct periodic ALM modeling.

Observable Inputs: Inputs that reflect the assumptions market participants would use to price an asset or liability, developed based on market data obtained from sources independent of the reporting entity. There are three levels of observability:

- Level 1 - Quoted prices in active markets for identical assets or liabilities that can be accessed at the measurement date
- Level 2 - Other than Level 1 measures that are observable for an asset or liability, either directly or indirect
- Level 3 – Unobservable inputs for an asset or liability

Option Risk: The risk that a financial instrument's cash flows (timing or amount) can change at the exercise of the option holder, who may be motivated to do so by changes in market interest rates.

Parallel Yield Curve Shift: A shift in the yield curve in which yields change by the same number of basis points for every maturity (e.g., fixed assumption that all points on the yield curve shift by the prescribed shock amount). The results of a parallel interest rate shock would measure the impact on a credit union's earnings and economic value if all interest rates increased, for example, by 300 basis points as well as the impact if all interest rates decreased 300 basis points. The results allow the user to compare the magnitude of change (i.e., the sensitivity) for various rate moves. (See also Non-Parallel Yield Curve Shift.)

Prepayment: The early repayment of principal, in advance of scheduled amortization or maturity.

Pricing: An action by credit union management to set interest rates and terms on loan and deposit products offered to members.

Rate Sensitivity Factor (RSF): A measure of how much the rate on an asset or liability will fluctuate as a result of changes in the interest rate environment. (See also Beta Factor.)

Rate Ramp Scenario: A gradual increase in interest rates over a specified time period, usually 12 months. Rate ramps are generally used for management forecasts of future earnings in income simulations. For example, when measuring the effects of a 300 basis point rate increase during a 12-month period, rates would be increased 25 basis points each month. (See also Stair-Step Scenario.)

Rate Shock Scenario: An immediate and sustained change in the level of interest rates for all assets and liabilities. Generally, a permanent and parallel rate shock of 100 to 300 basis points is applied. For example, in a +300 basis point scenario, the full effect of the rate increase would be administered in the first period measured and remain in effect for all periods.

Repricing: The change in interest rates resulting from either an interest rate reset on a variable-rate or administered-rate instrument, or a reinvestment of cash flow from a maturity, scheduled amortization, prepayment, or early withdrawal of an asset or liability. A variable-rate loan reprices on its interest rate change date and on its maturity date, when the principal can be reinvested at a current market interest rate. Repricing also occurs when a credit union administers a rate change on an account such as a money market share account.

Shocked Value: A fair value for a financial instrument given a change in interest rates (positive or negative). The difference between the current value (base) and the shocked value informs management of the price sensitivity of a financial instrument to a change in interest rates.

Spread risk: The risk to earnings and/or value resulting from variations through time of the spread between assets or liabilities to an underlying index, such as the Treasury curve.

Stair-Step Scenario: A scenario in which rate changes are administered at less frequent intervals over a measured period. For instance, in a +300 basis point rate environment measured over a two-year time period, rates may be increased 50 basis points each quarter of the first year and 25 basis points each quarter of the second year. (See also Rate Ramp cenario.)

Static Simulation: An earnings technique based on current exposures and assuming a constant, no-growth balance sheet. In order to simulate no growth in balance sheet accounts, some static models assume that all principal cash flows from a particular account are reinvested back into that same account. This assumption is sometimes referred to as replacement growth.

Stochastic Model: A technique that models an uncertain variable over time using a random selection process. The model recognizes that market variables, such as interest rates, exhibit a general trend (i.e., drift) and some degree of volatility around that trend. Stochastic models provide a framework for the evaluation of the impact of embedded options in financial instruments.

Variance Analysis (or "back-testing"): The process of identifying material differences between actual and forecasted income statement and balance sheet amounts, and ascertaining the causes of the differences. Variances can be readily identified by direct comparison of the financial statements for a particular forecast period, or by using key financial indicators, such as net interest margin, cost of funds, or asset-yield comparisons.

Variance analysis can help management understand the primary reasons for material differences between projected and actual results. It can also provide a means to improve the precision of the IRR measurement system. Periodic variance analysis helps management and the board acknowledge that the system is accomplishing its primary goal of providing meaningful information on the level of IRR. Variance analysis provides an opportunity for a deeper understanding of both the system and its results.

Valuations: The present value of future cash flows of assets and liabilities, expressed in terms of dollars or price. Valuations will differ based on the set of assumptions applied to calculate the present value.

Volatility: The change in measures of IRR, such as forecasted net income or NEV, across different interest rate scenarios. Volatility also can refer to how much market participants expect interest rates or prices to change in the future.

Yield Curve: The term structure of interest rates over a maturity spectrum. In a normal yield curve, longer maturity bonds have a higher yield compared to shorter-term bonds due to the risks associated with time.

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