



Break it Down: Effective Scenario Analysis in a Dynamic Interest Rate Environment

Presented by Zach Englert

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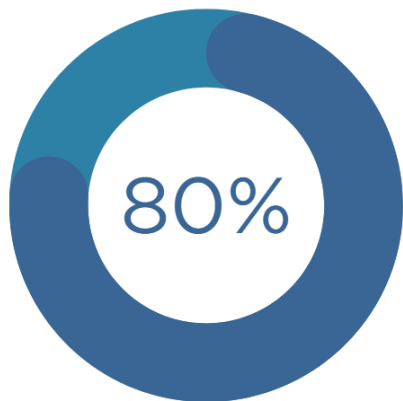
Empyrean Clients



140 EMPLOYEES

\$70M - \$210B

Asset Range of our Clients



80%
staff dedicated to
product development
& support

80+

banks and credit unions
chose Empyrean in 2023

100% products made for
bankers & finance professionals



750+ financial institutions leverage
the **Empyrean ALM Model**



110+

Budgeting & Planning
customers since release in
2022

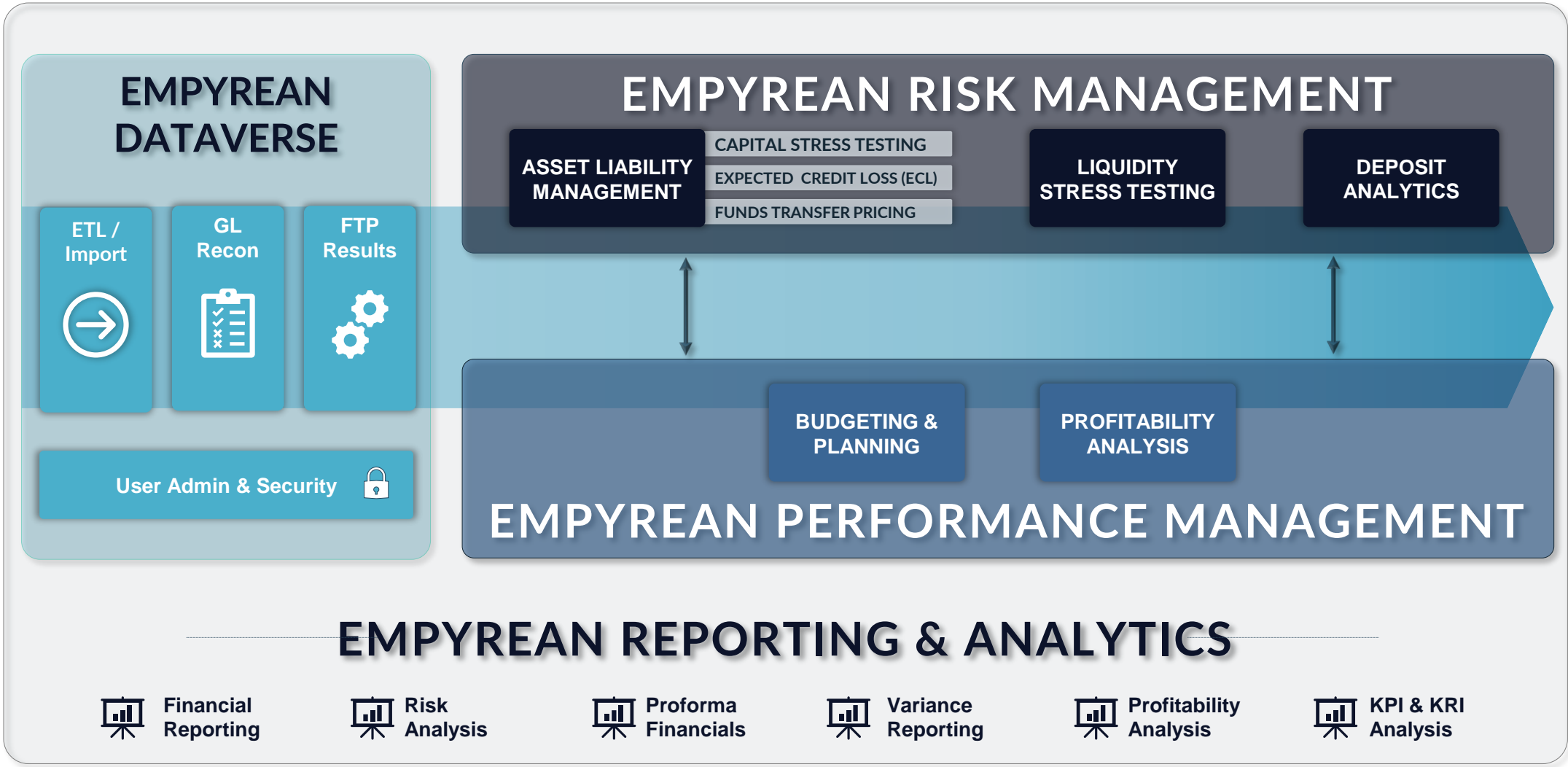
52

states & provinces
throughout USA and
Canada



EMPYREAN RISK & PERFORMANCE PLATFORM

- SOURCE DATA**
- Core Instrument & Transaction
 - Accounting (GL, F.A., Transaction)
 - Customer
 - Employee
 - Statistical Data (Internal and Market)
 - Additional Sources (Credit, Industry, etc.)



Introduction to ALM

- Asset Liability Management (ALM) is a strategic process that balances a financial institution's financial assets (loans, investments, cash) with its liabilities (deposits, borrowings, operational costs) to ensure financial stability and profitability.
- Key Components of ALM include:
 - Interest Rate Risk Management (IRR)
 - How rate fluctuations impact earnings and balance sheets.
 - Strategies include duration matching, hedging, and rate-sensitive asset/liability alignment.
 - Liquidity Risk Management:
 - Ensuring adequate cash flow to meet obligations.
 - Contingency funding planning and stress testing for deposit outflows.
 - Capital Adequacy & Regulatory Compliance
 - Maintaining adequate capital buffers.
 - Aligning ALM with NCUA requirements.

Regulatory Considerations in ALM

- The NCUA requires all federally insured credit unions with assets greater than \$50 million to incorporate the following six elements into their IRR program:
 - A board-approved IRR policy
 - Oversight by the board of directors and implementation by management
 - Risk measurement systems assessing the IRR sensitivity of earnings and/or asset and liability values
 - Internal controls to monitor adherence to IRR limits
 - Risk limits
 - Decision making that is informed and guided by IRR measures

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TYPES OF INTEREST RATE RISK

- **Repricing Risk:** arises from the possibility that a credit union's assets and liabilities will reprice at different times or amounts and potentially negatively affect the credit union's earnings, net worth, and financial position
- **Basis Risk:** arises from a change in the relationship of rates in different financial markets. Basis risk occurs when market rates, or the indices used to price assets and liabilities, change at different times or by different amounts
- **Yield Curve Risk:** reflects exposure to various changes in the shape or slope of the yield curve. It occurs when assets and funding sources are linked to similar indices with different maturities
- **Option Risk:** risk that a financial instrument's cash flows (timing or amount) will change at the exercise of the option holder (such as a depositor, borrower, or other transaction counterpart), who may be motivated to exercise an option by changes in market interest rates
- **Price Risk:** risk that the fair value of a financial instrument will change due to market factors

Risk Limits

- IRR limits should be consistent with the credit union's overall approach to measuring and monitoring IRR and should address the potential impact of changes in market interest rates on earnings and Net Economic Value (NEV).
- The limits for monitoring a credit union's income and NEV should be appropriate for the size and complexity of its underlying positions.
- Policies defining IRR limits should set the expectation that any violation of a credit union's chosen IRR limits will receive prompt management action.

Credit unions can vary significantly with respect to their tolerance for different business risks, and IRR is no exception. The NCUA does not have a preferred level of IRR exposure, but rather an expectation that risk management will be scaled to match the risk level that is adopted.

- NCUA Examiner's Guide

IRR Measurement System

- The IRR measurement system should capture and reliably estimate all material risk exposures. Therefore, the system should consider all significant balance sheet categories, income statement items, and underlying risk factors.
- Whether using a 3rd party or internal system for IRR measurement, management should fully understand its capabilities and assess its suitability by evaluating the system's ability to reasonably capture all relevant and material IRR exposures. Additionally, management should periodically re-evaluate the system's adequacy as the credit union's balance sheet, strategies, and activities change.
- Some measurement systems have limited ability to change model assumptions. In these cases, the examiner may need to determine if the measurements are suitable for the size and complexity of the credit union. More complex systems can support many scenarios and assumptions, and management should thoroughly support and document assumptions related to the most significant risks.

- The usefulness of IRR measures depends on the integrity of the data on current holdings, validity of the underlying assumptions, and IRR scenarios used to model IRR exposures.
- A model's accuracy depends on the assumptions and data used. Like any model, inaccurate data or unreasonable assumptions will render unreliable results.
- The system's input process should focus on the procedures for inputting and reconciling system data, categorizing and aggregating account data, ensuring the completeness of account data, and assessing the effectiveness of internal controls and independent reviews.
- System data should accurately reflect the credit union's current condition. When evaluating the adequacy of a model, management should consider the extent to which the model uses automated versus manual processes, how it interfaces with the credit union's core systems, and the staff and expertise needed to run and maintain the model.

Model Assumptions

Measurement systems should effectively process several data elements for IRR, including, but not limited to:

- Projected balance sheet volumes
- Prepayment rates for loans and investment securities
- Repricing sensitivity
- Decay and beta rates of NMS
- Projected interest rates
- Discount versus offering rates relationships

- NII simulation is a modelling technique that considers IRR through an Earnings at Risk (EAR) construct. It projects the changes in asset and liability cash flows, expressed in terms of NII, over a specified time horizon for defined interest rates scenarios.
- Credit unions use income simulations to forecast NII under varying interest rate scenarios to reveal the sources and levels of IRR inherent in their balance sheets.
- NII simulation analysis allows a credit union to learn which rate scenarios pose the greatest potential threat to its expected earnings stream and to identify which of its assets and/or liabilities are the source of potential earnings volatility under different scenarios.
- NII simulations generate insight into the impact of changes in market rates on earnings and guide risk management decisions.

Net Economic Value

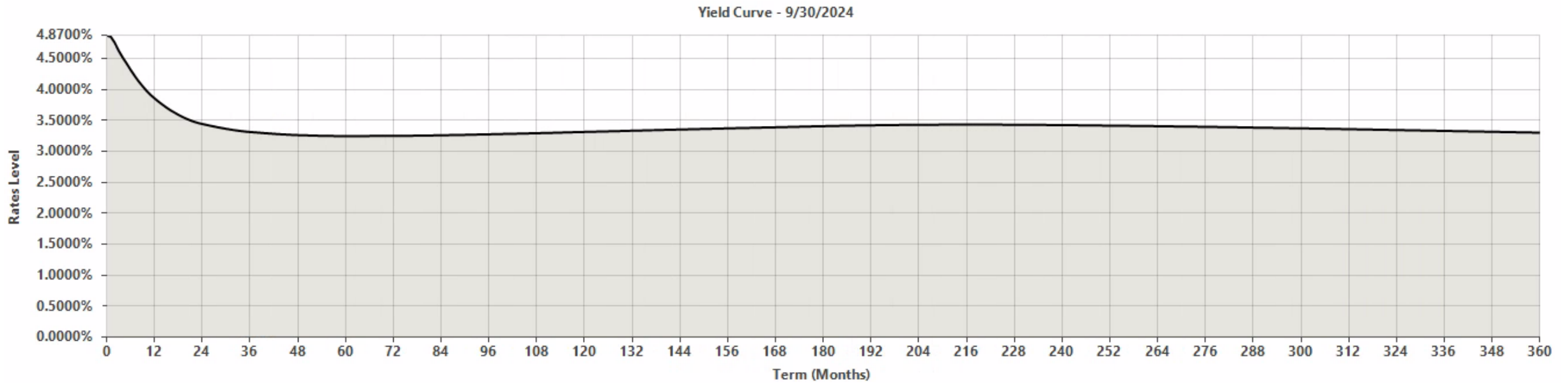
- NEV can be used to measure a credit union's long-term IRR by capturing the impact of interest rate changes on the value of all future asset and liability cash flows. It measures the long-term IRR exposure on a credit union's balance sheet at a fixed point in time. NEV measures and quantifies IRR by capturing the impact of interest rate changes on the present value calculation of all future cash flows on both sides of the balance sheet
- Declines in a credit union's NEV measures signal a reduction in a credit union's overall economic position just as increases in NEV measures signal an improvement (gains). When model results show a falling NEV level, it implies that a negative earnings. Conversely, results that show NEV increasing indicate earnings in that scenario are favorable

Scenario Testing

Scenario testing allows a credit union to assess a range of alternative or potential interest rate scenarios. There are multiple scenario types.

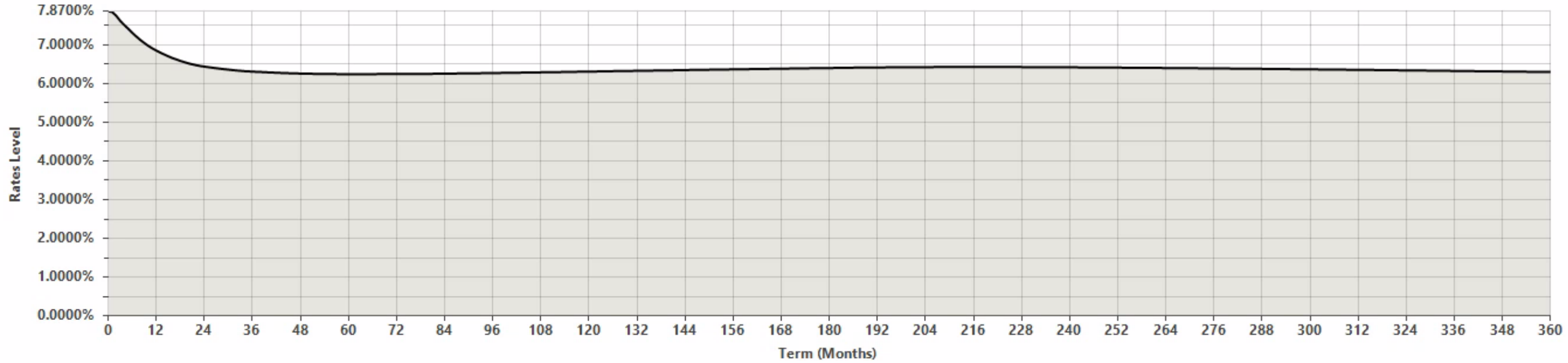
- **Rate Shock Scenario:** parallel rate changes are immediate and sustained.
- **Yield Curve Test:** changes in the shape or slope of the yield curve are imposed, such as a steepening or flattening scenario run from the current term structure.
- **Rate Ramp Scenario:** rate changes are applied gradually over a period.
- **Stair Step Scenario:** rate changes are at less frequent intervals over a period.

Rate Shock Scenario



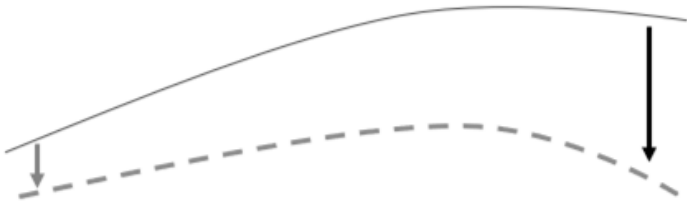
Rate Shock Scenario - Shocked

Yield Curve - 9/30/2024

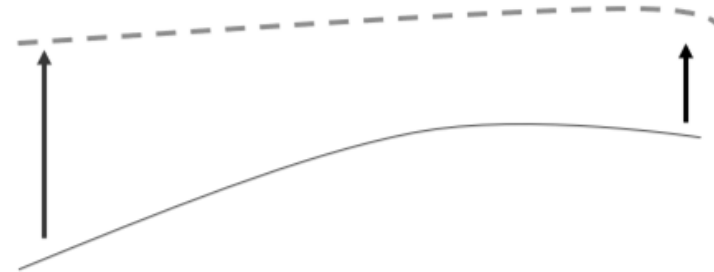


Rate Shock Scenario – Steepeners & Flatteners

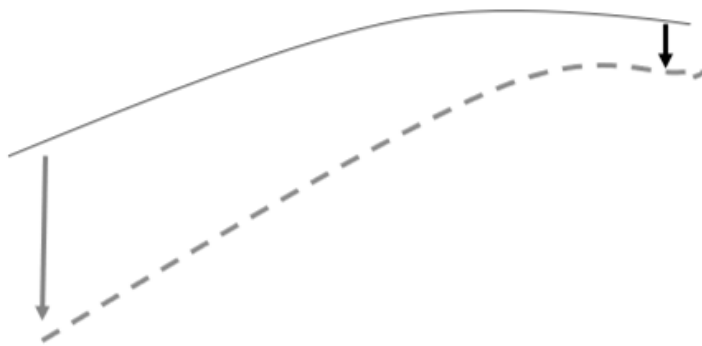
Bull Flattening



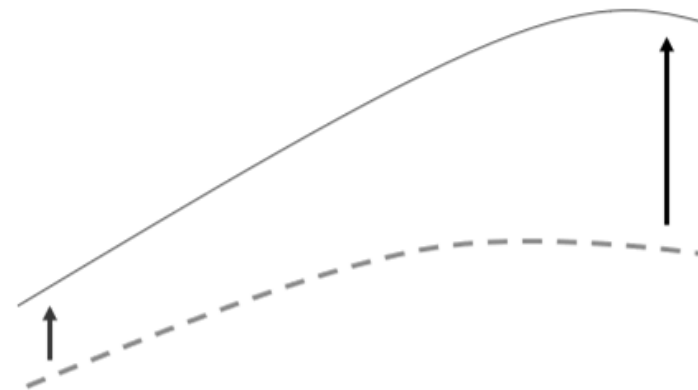
Bear Flattening



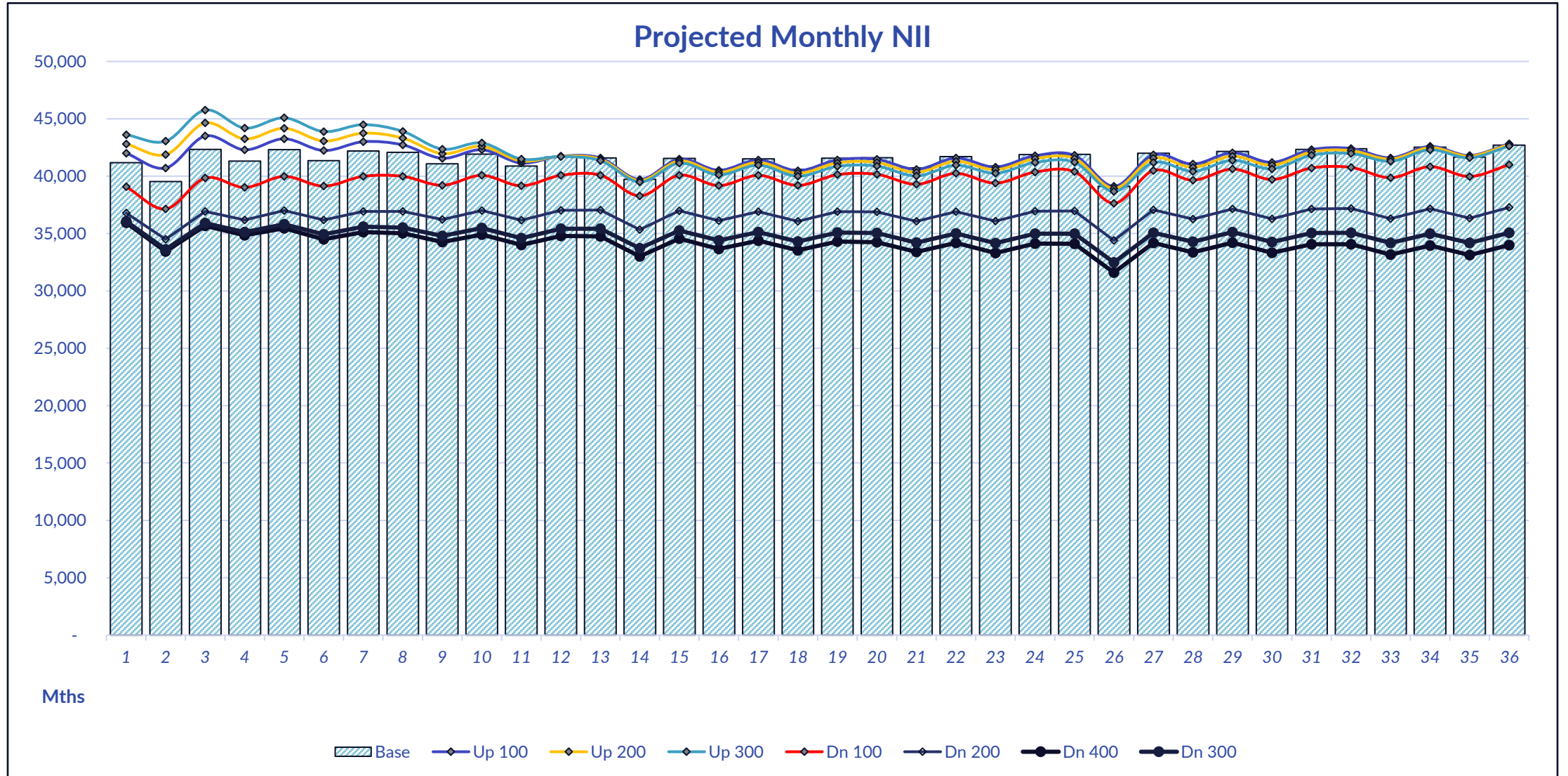
Bull Steepening



Bear Steepening



Model Results - NII

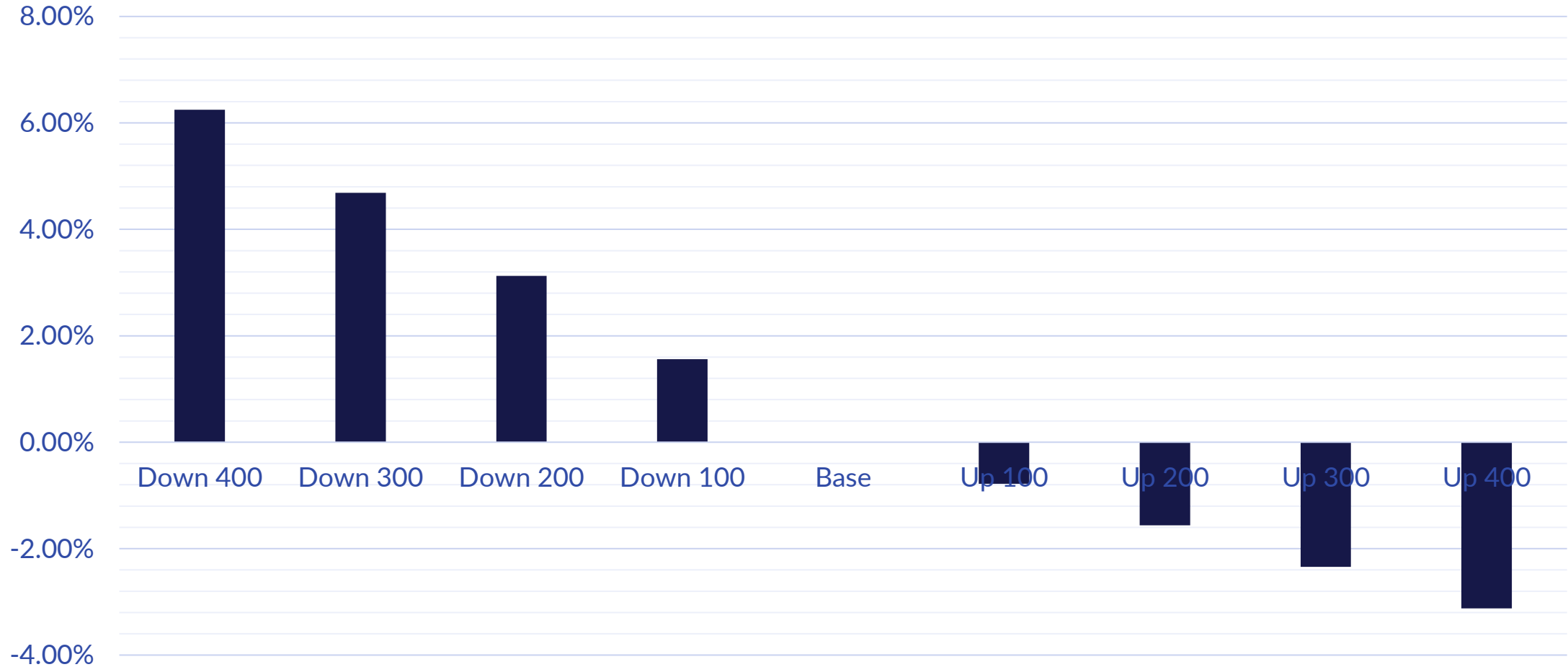


Model Results - NII

<i>Base</i>									
	Down 400	Down 300	Down 200	Down 100	No Change	Up 100	Up 200	Up 300	Up 400
NII	\$428,796.67	\$433,677.82	\$449,361.24	\$486,619.87	\$514,251.87	\$532,713.39	\$550,788.61	\$568,976.04	\$587,234.09
%Change	16.62%	15.67%	12.62%	5.37%	0.00%	-3.59%	-7.10%	-10.64%	-14.19%
<i>Beta Up</i>									
	Down 400	Down 300	Down 200	Down 100	No Change	Up 100	Up 200	Up 300	Up 400
NII	\$53,013.30	\$53,999.48	\$54,501.68	\$54,931.71	\$55,356.88	\$55,201.06	\$55,037.05	\$54,859.36	\$54,670.81
%Change	4.23%	2.45%	1.54%	0.77%	0.00%	0.28%	0.58%	0.90%	1.24%
<i>Beta Down</i>									
	Down 400	Down 300	Down 200	Down 100	No Change	Up 100	Up 200	Up 300	Up 400
NII	\$51,963.60	\$52,452.24	\$53,372.59	\$54,362.30	\$55,356.88	\$55,969.21	\$56,578.89	\$57,180.48	\$57,776.88
%Change	6.13%	5.25%	3.58%	1.80%	0.00%	-1.11%	-2.21%	-3.29%	-4.37%
<i>Prepay Up</i>									
	Down 400	Down 300	Down 200	Down 100	No Change	Up 100	Up 200	Up 300	Up 400
NII	\$52,661.69	\$53,281.88	\$53,938.71	\$54,663.92	\$55,389.23	\$55,632.98	\$55,871.41	\$56,099.11	\$56,318.87
%Change	4.92%	3.80%	2.62%	1.31%	0.00%	-0.44%	-0.87%	-1.28%	-1.68%
<i>Prepay Down</i>									
	Down 400	Down 300	Down 200	Down 100	No Change	Up 100	Up 200	Up 300	Up 400
NII	\$52,721.08	\$53,304.74	\$53,929.99	\$54,629.70	\$55,324.04	\$55,536.69	\$55,743.82	\$55,939.96	\$56,127.90
%Change	4.70%	3.65%	2.52%	1.26%	0.00%	-0.38%	-0.76%	-1.11%	-1.45%

Model Results - NEV

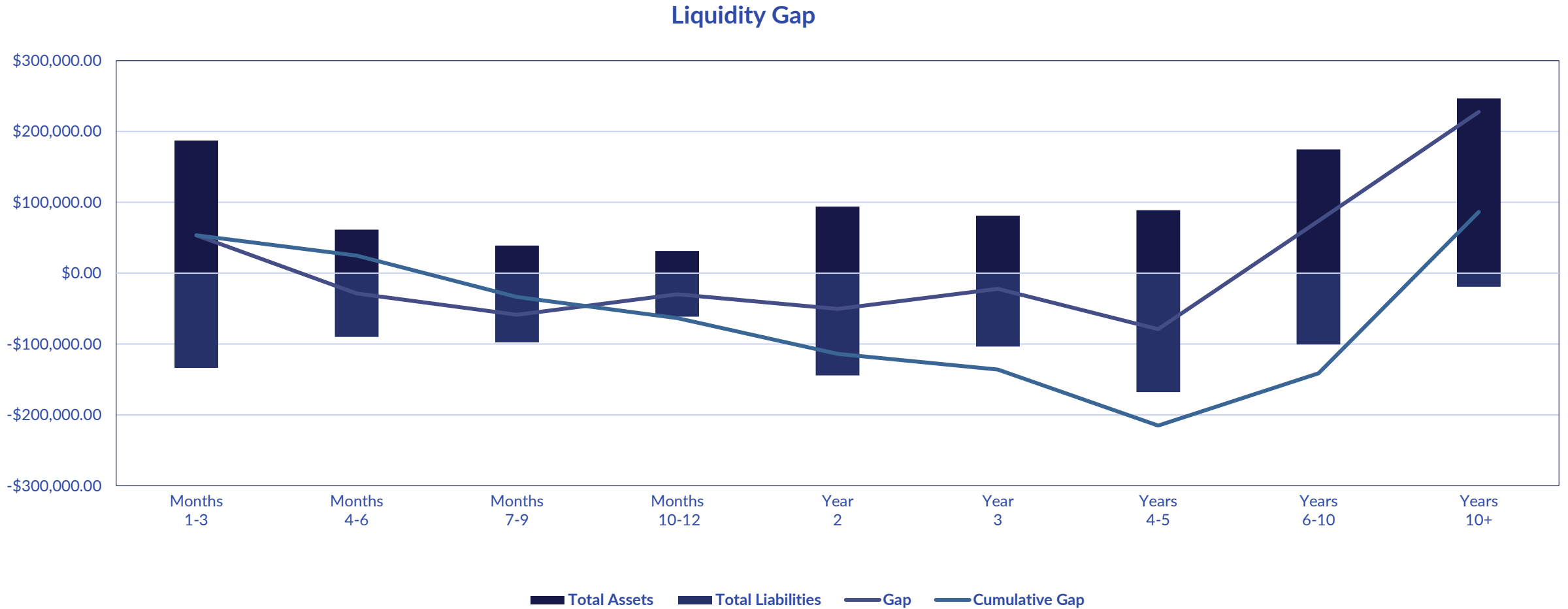
NEV % Difference From 0 Shock



Gap Analysis

- Gap analysis is a simplistic IRR measurement model used by small or non-complex institutions that provides an easy way to identify repricing gaps. It can be used to estimate how changes in rates will affect future income.
- Gap analysis has several weaknesses and is generally not sufficient as the sole IRR measurement model for large or complex credit unions. Gap analysis can be a first step in identifying IRR exposures and may serve as a reasonableness check for more sophisticated forms of IRR measurement models

Model Results – Liquidity Gap



Stress Testing – Examiners Guide

- Loss of access to unsecured borrowings
- Material changes in terms and collateral requirements for secured borrowings
- Deterioration in asset quality
- Significant operating losses and declining net worth
- High or unexpected loan growth
- Higher deposit run-off than expected
- Changes in market value and price volatility of various asset types
- Severe economic conditions or the public's perception of the market
- An inability to renew or replace maturing funding liabilities
- Disturbances in payment and settlement systems due to operational or local disasters
- Severe draws against open-end lines of credit
- Slowdown in cash flows from a change in prepayments

Overview of the 2025 Stress Test Scenarios

- Scenarios:
 - Baseline Scenario: Moderate growth, stable inflation, and steady interest rates
 - Severely Adverse Scenario: Deep recession, rising unemployment (10%), asset price collapse
 - Global Impacts: International recessions, currency fluctuations, market shocks
- Domestic Economic Indicators:
 - GDP, Unemployment, Consumer Price Index, Interest Rates
 - Market Variables:
 - Stock market volatility, corporate bond spreads, real estate prices
- International Factors: GDP and inflation trends in major economies

Baseline Scenario

Table 3.A. Supervisory baseline scenario: Domestic variables, Q1:2025–Q1:2028

Percent, unless otherwise indicated

Date	Real GDP growth	Nominal GDP growth	Real disposable income growth	Nominal disposable income growth	Unemployment rate	CPI inflation rate	3-month Treasury rate	5-year Treasury yield	10-year Treasury yield	BBB corporate yield	Mortgage rate	Prime rate	Level			
													Dow Jones Total Stock Market Index	House Price Index	Commercial Real Estate Price Index	Market Volatility Index
Q1 2025	2.1	4.5	2.4	4.9	4.3	2.8	4.3	4.2	4.4	5.6	6.4	7.6	58,399	324	311	26.7
Q2 2025	1.9	4.4	2.1	4.6	4.3	2.7	4.0	4.1	4.4	5.7	6.2	7.4	58,399	325	312	26.6
Q3 2025	1.9	4.4	2.5	5.0	4.3	2.6	3.9	4.0	4.3	5.8	6.1	7.2	58,399	327	314	26.6
Q4 2025	1.9	4.5	2.3	4.8	4.3	2.6	3.8	4.0	4.3	5.8	6.0	7.0	58,399	329	316	26.8
Q1 2026	2.0	4.7	2.6	5.2	4.3	2.8	3.7	4.0	4.2	5.8	5.9	6.9	58,399	330	317	27.0
Q2 2026	2.0	4.2	2.2	4.6	4.3	2.6	3.6	3.9	4.2	5.9	5.8	6.8	58,399	332	319	27.2
Q3 2026	2.0	4.2	2.1	4.3	4.3	2.4	3.6	3.8	4.2	5.8	5.7	6.7	58,399	334	320	27.4
Q4 2026	2.0	4.3	2.3	4.5	4.3	2.4	3.5	3.7	4.1	5.9	5.7	6.6	58,399	335	322	27.5
Q1 2027	2.0	4.2	2.1	4.3	4.2	2.3	3.4	3.7	4.1	5.9	5.7	6.6	58,399	337	323	27.6
Q2 2027	2.0	4.0	2.0	4.2	4.2	2.2	3.4	3.6	4.1	5.9	5.6	6.5	58,399	339	325	27.8
Q3 2027	2.0	4.0	2.0	4.1	4.2	2.2	3.4	3.6	4.1	5.9	5.6	6.5	58,399	340	327	27.9
Q4 2027	1.9	4.0	2.0	4.1	4.2	2.1	3.4	3.5	4.1	5.9	5.6	6.5	58,399	342	328	28.0
Q1 2028	1.9	4.0	2.0	4.1	4.2	2.2	3.4	3.5	4.1	5.9	5.6	6.5	58,399	344	330	28.1

The Severely Adverse Scenario

- Representative of an Economic downturn:
 - GDP drops by 7.8% by 2026
 - Unemployment rate spikes to 10%
 - Asset Price Declines:
 - House prices (-33%)
 - Commercial Real Estate (-30%)
 - Interest Rates fall: 3-month Treasury drops to 0.1%

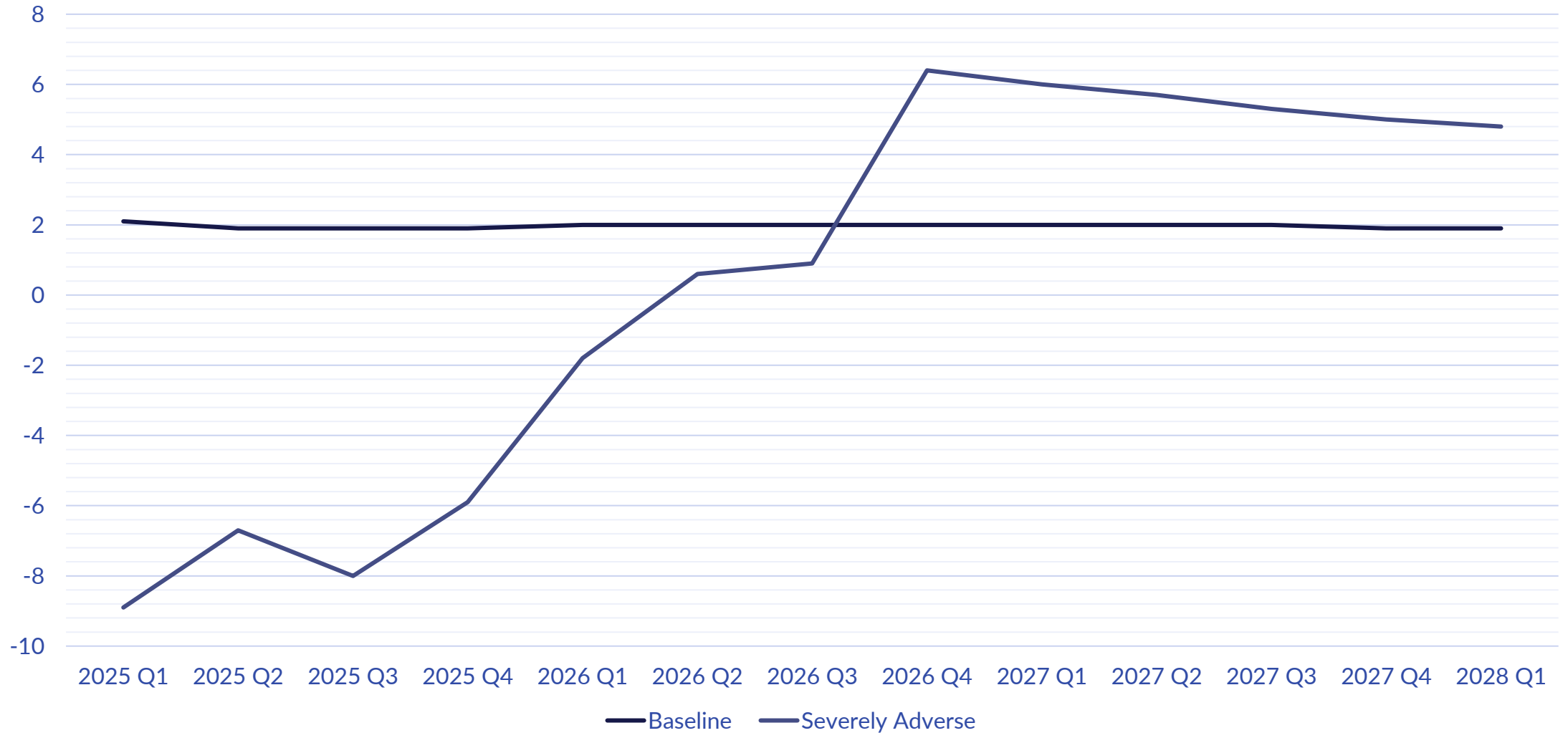
Severely Adverse Scenario

Table 4.A. Supervisory severely adverse scenario: Domestic variables, Q1:2025–Q1:2028

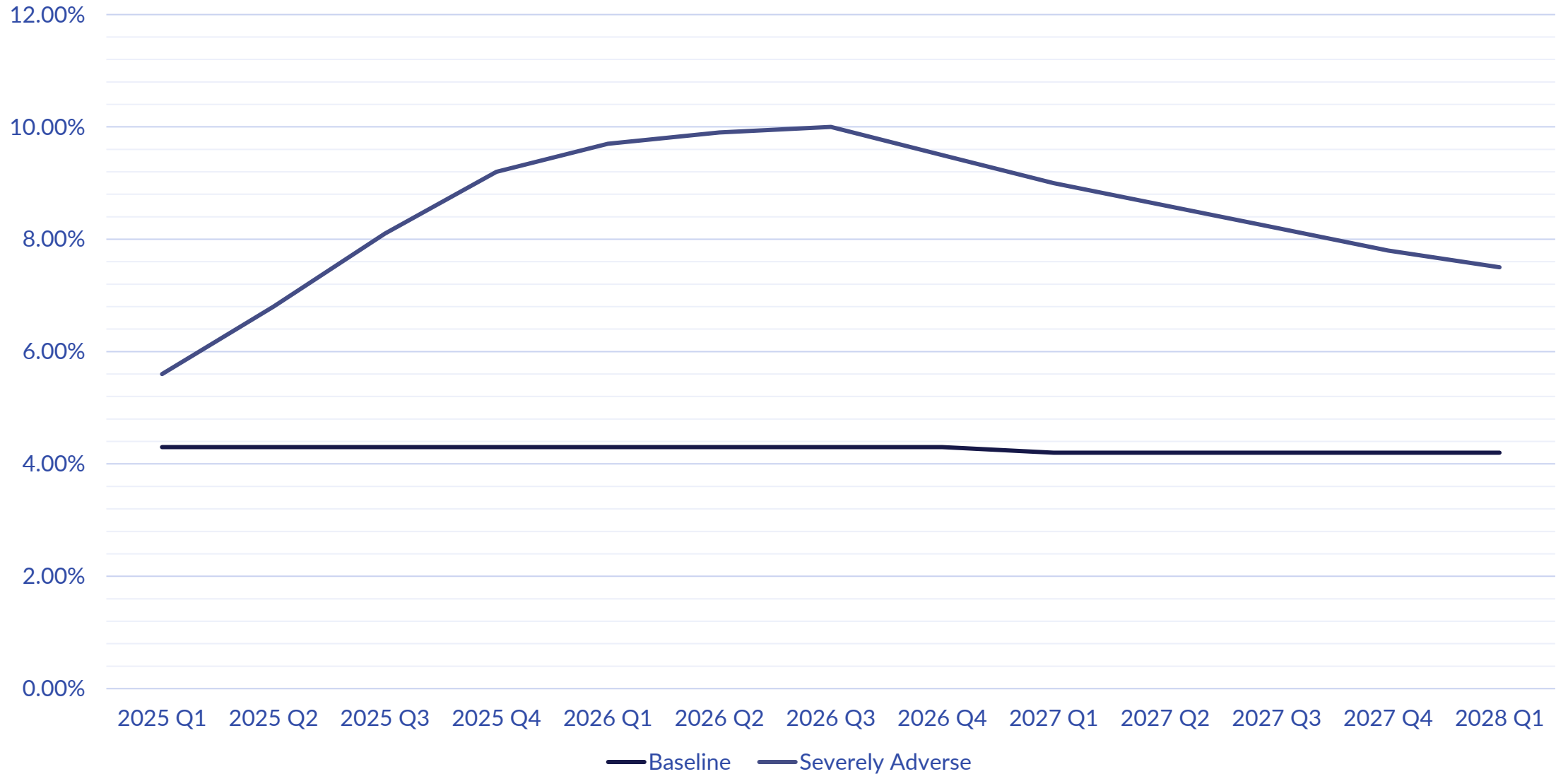
Percent, unless otherwise indicated

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													Dow Jones Total Stock Market Index	House Price Index	Commercial Real Estate Price Index	Market Volatility Index
Q1 2025	-8.9	-8.0	-6.0	-4.5	5.6	2.0	1.8	0.6	1.4	5.2	4.0	4.8	34,509	275	302	60.0
Q2 2025	-6.7	-6.0	-3.5	-2.2	6.8	1.5	0.1	0.5	1.0	5.7	3.7	3.1	30,792	255	295	65.0
Q3 2025	-8.0	-7.2	-3.5	-2.4	8.1	1.3	0.1	0.6	1.0	6.0	3.8	3.1	29,731	240	286	57.3
Q4 2025	-5.9	-5.1	-2.3	-1.1	9.2	1.3	0.1	0.8	1.1	6.0	3.8	3.1	29,200	229	272	51.2
Q1 2026	-1.8	-0.7	0.5	1.6	9.7	1.4	0.1	0.9	1.2	6.0	3.8	3.1	30,261	222	256	46.4
Q2 2026	0.6	1.7	1.6	2.7	9.9	1.4	0.1	1.0	1.2	5.8	3.7	3.1	31,854	218	243	42.6
Q3 2026	0.9	2.1	1.8	3.0	10.0	1.4	0.1	1.1	1.3	5.5	3.6	3.1	33,978	214	229	39.5
Q4 2026	6.4	7.8	5.5	6.8	9.5	1.5	0.1	1.2	1.4	5.2	3.6	3.1	36,632	220	217	37.1
Q1 2027	6.0	7.4	5.4	6.8	9.0	1.5	0.1	1.3	1.5	4.8	3.5	3.1	39,818	227	218	35.2
Q2 2027	5.7	6.8	5.2	6.8	8.6	1.5	0.1	1.4	1.5	4.6	3.4	3.1	43,003	233	220	33.7
Q3 2027	5.3	6.7	5.1	6.6	8.2	1.6	0.1	1.5	1.6	4.3	3.3	3.1	47,781	239	222	32.6
Q4 2027	5.0	6.5	4.9	6.5	7.8	1.6	0.1	1.5	1.6	4.0	3.3	3.1	53,090	245	223	31.6
Q1 2028	4.8	6.2	4.6	6.3	7.5	1.6	0.1	1.6	1.7	3.7	3.2	3.1	58,399	251	225	30.9

Real GDP Growth



Unemployment Rate



Comparison of 2024 vs. 2025 Severely Adverse Scenarios

- Unemployment Rate: Smaller increase in 2025 (5.9% vs. 6.1% in 2024)
- Interest Rates: 2025 scenario assumes a lower starting level and a milder decline
- House Prices: Smaller decline in 2025 (-33%) due to prior market adjustments
- Commercial Real Estate: Less severe drop (-30%) as the market already corrected
- Market Reactions: Corporate bond spreads and equity declines are milder than in 2024
- International Factors: Less severe downturn in most global markets compared to 2024
- Key Takeaway: 2025 scenario remains severe but incorporates recent economic shifts

Steps to Building Your Own Stress Test

- Define Objectives: Regulatory vs. Internal Risk Management
- Select Key Variables: Tailor to institution-specific risks
- Develop Scenarios: Use historical data and expert judgment
- Model Impacts: Assess capital adequacy under stress
- Analyze & Adjust: Implement findings into risk strategy

Stress Test Information – Credit Unions

Stress Testing Resources

Credit Union Self-run Stress Testing Instruction, Results Templates, Supplemental Data Request, and FAQ

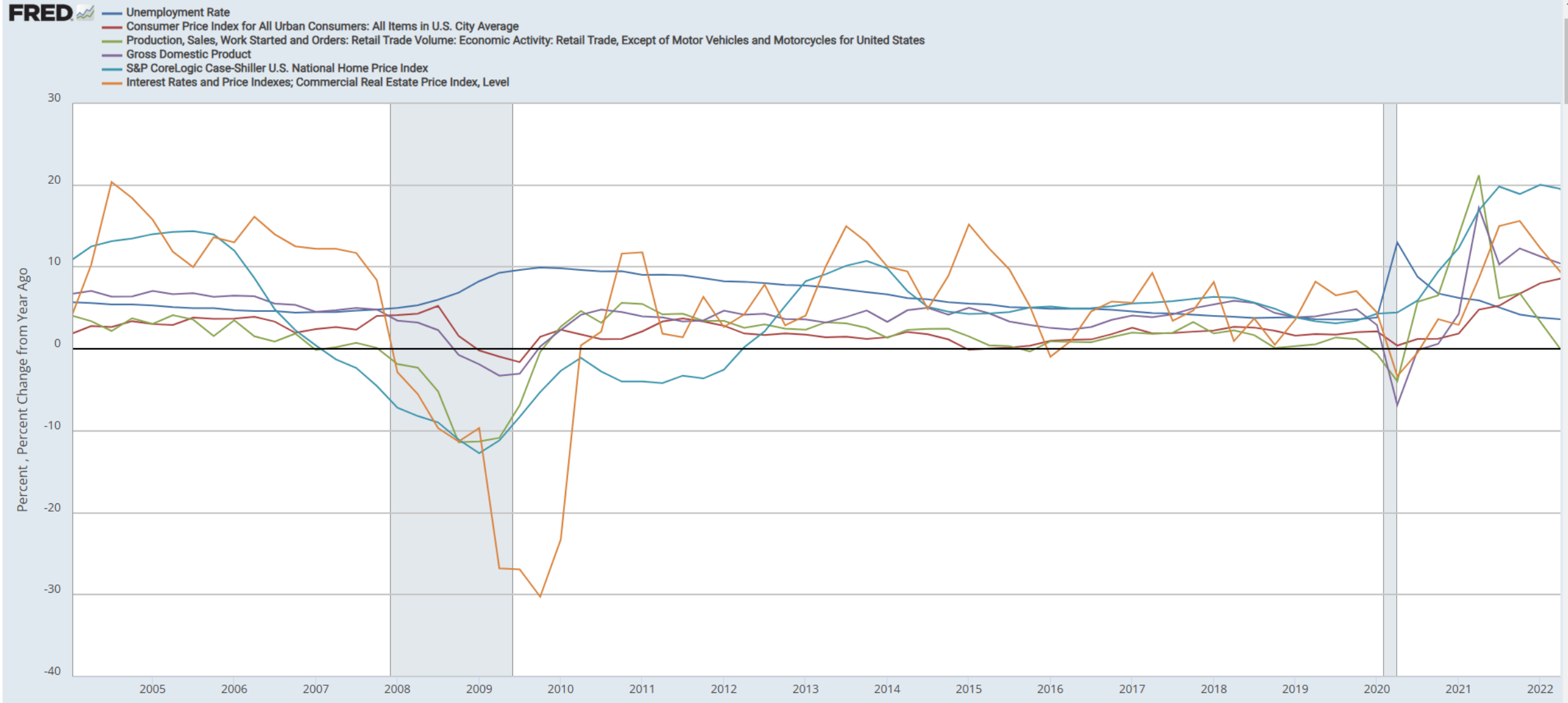
Credit unions needing access to data collection templates should contact the Office of National Examinations and Supervision at 703.518.6640 or by email at ONESMail@ncua.gov.

- [Credit Union Self-run Stress Testing Instruction](#)
- [Credit Union Self-run Stress Testing Results Reporting Templates](#)
- [NCUA Annual Supervisory Stress Test Supplemental Data Request](#)
- [NCUA Annual Supervisory Stress Test Supplemental Data Template](#)

Stress Testing Scenarios

- [2025 Scenarios](#) | [2025 Scenario Summary](#)
- [2024 Scenarios](#) | [2024 Scenario Summary](#)
- [2023 Scenarios](#)
- [2022 Scenarios](#)
- [2021 Scenarios](#)
- [2020 Scenarios](#)
- [2019 Scenarios](#)
- [2018 Scenarios](#)
- [2017 Scenarios](#)
- [2016 Scenarios](#)
- [2015 Scenarios](#)

Stress Test Information



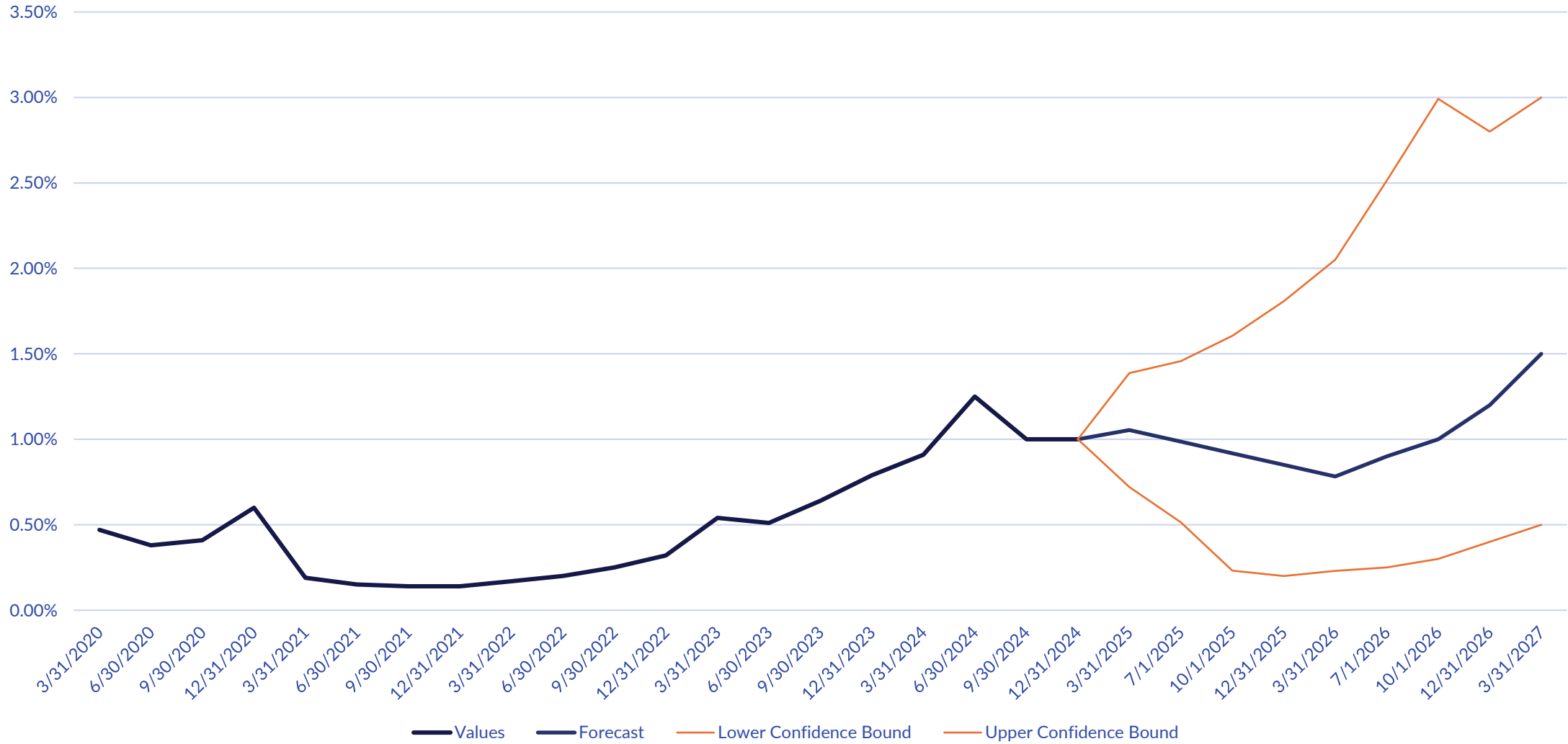
Stress Test Information



Stress Test Information

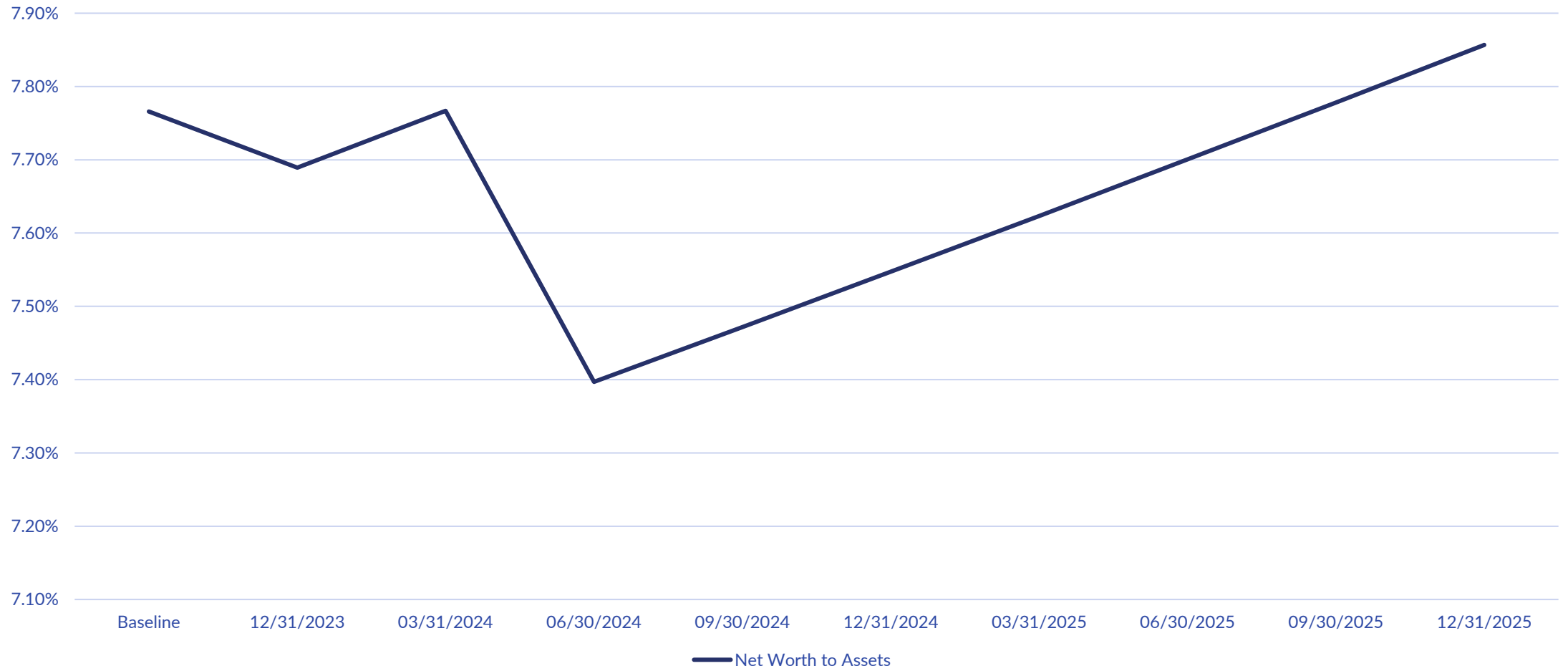
- The delinquency rate at federally insured credit unions was 98 basis points in the fourth quarter of 2024, up 15 basis points compared with the fourth quarter of 2023.
 - The delinquency rate on non-commercial real estate loans was 78 basis points in the fourth quarter of 2024, 22 basis points higher than in the fourth quarter of 2023.
 - The credit card delinquency rate rose to 216 basis points from 211 basis points one year earlier.
 - The auto loan delinquency rate increased 6 basis points over the year to 96 basis points in the fourth quarter of 2024.
 - The delinquency rate for commercial loans excluding unfunded commitments was 85 basis points in the fourth quarter of 2024, up 24 basis points from a year earlier.
- The net charge-off ratio for all federally insured credit unions was 80 basis points in the fourth quarter of 2024, up 19 basis points compared with the fourth quarter of 2023.

Net Loss Rate



Stress Test Results

Net Worth to Assets



An absence of sensitivity testing indicates a weakness in the risk management program. Some credit unions generate results only for “compliance” purposes. Credit unions with strong risk management disciplines use their sensitivity analyses to challenge their thinking and influence actions they take to manage IRR.

- NCUA Examiner’s Guide

Model Validation Best Practices

Credit unions should periodically review the accuracy and performance of their IRR measurement systems. The frequency and extent to which a credit union reviews its system will depend on:

- IRR exposures on the credit union's balance sheet
- Interest rate changes
- Compliance with internal policies for measuring and managing IRR

This review should include assessments of all assumptions, parameters, and methodologies used as part of the IRR measurement system. It should also provide an assessment of the IRR measurement system's ability to capture all material components of IRR.

Model Validation Best Practices

- The board of directors should review and approve a formal policy process that includes model validation of IRR measurement methods and assessment of corresponding model risk. The policy should specify management roles and designate who is responsible for the development, implementation, and use of models. In addition, the governance processes for model risk management needs to specify and integrate model oversight responsibilities and policies. Responsibilities and policies include:
 - Developing initial and ongoing validation procedures
 - Evaluating results
 - Processes for approval, version control, exception, escalation, modification, and decommissioning

Model Validation Best Practices

- An effective validation framework should include three core elements:
 - Evaluating conceptual/methodological soundness, including developmental evidence
 - Monitoring the model, including process verification,
 - Analyzing outcomes, including back-testing of key internal assumptions (such as deposit modeling, prepayments, pricing of assets)
- Credit unions that rely on external service providers should verify that the use of those models is adequately documented, including any specific customization. If vendors provide input for market data, behavioral assumptions or model settings, the credit union should have a process to determine if those inputs are reasonable for the risk characteristics of its portfolio and activities

Enterprise Risk Management

- Enterprise Risk Management (ERM) can be viewed as a framework for managing risk.
- ERM is a process that is:
 - Effected by people at every level of the credit union
 - Applied in strategy setting and across the enterprise
 - Designed to identify potential events that may affect the entity
- A credit union with effective risk management aggregates and evaluates risks holistically across the institution and avoids a silo approach. This typically results in more formal and centralized risk management practices.

Summary & Key Takeaways

- The Role of Scenario Analysis:
 - Help identify weaknesses before they become crises
 - Ensure financial institutions can continue to support the economy in downturns
- Customizing Scenarios for your Institution:
 - Adapt stress tests to reflect specific risk exposures and asset compositions
 - Consider additional stressors like cyber risks, geopolitical tensions, or sector-specific crises
- Long-Term Implications for Capital Planning:
 - Proactive scenario analysis aids in strategic decision-making
 - Institutions should continuously refine models as economic conditions evolve
 - Regulatory compliance remains a key driver for ongoing stress test refinement

Thank You!

- Have Questions? Reach Out!
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