

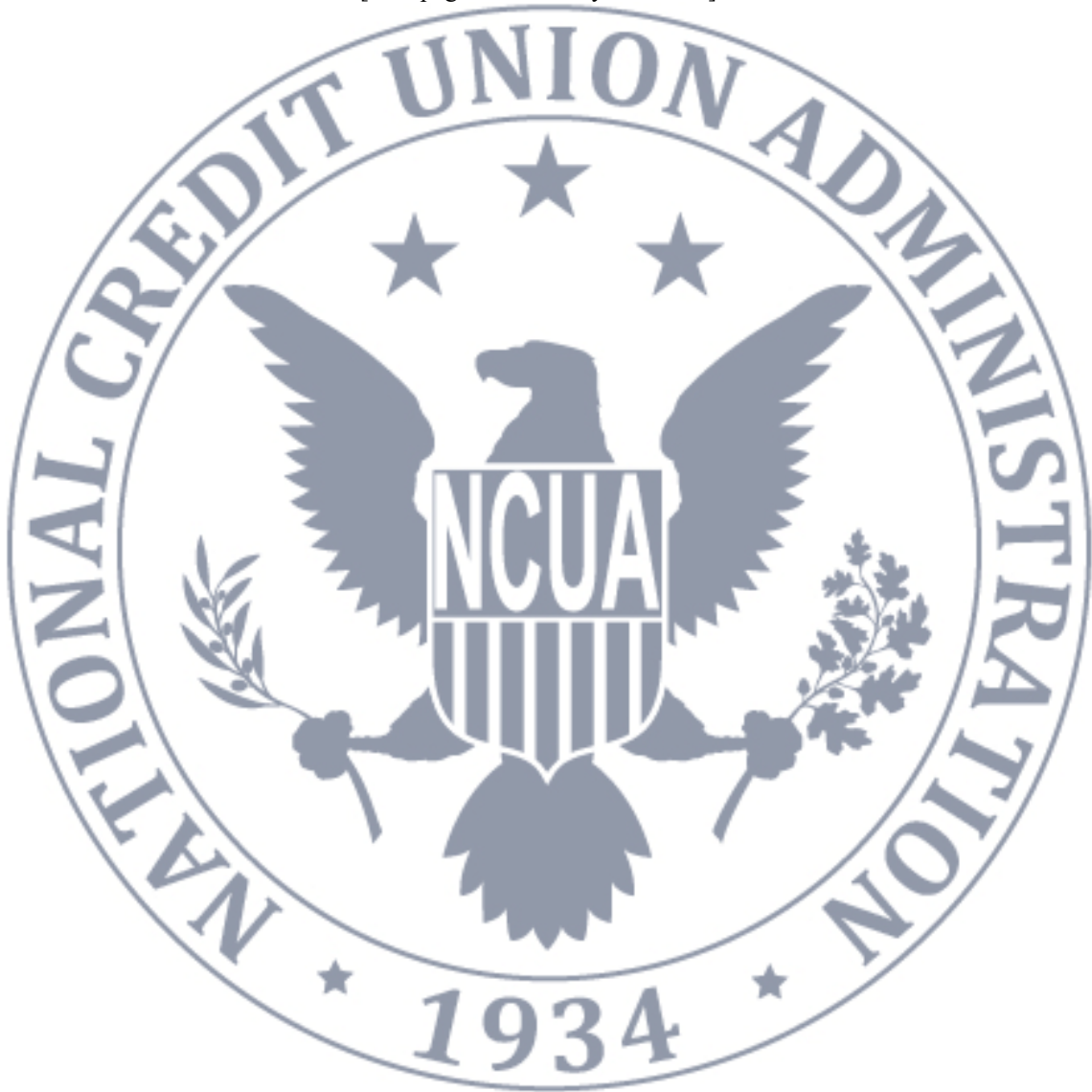


**NCUA**  
National Credit Union Administration

## Normal Operating Level Calculation: Projecting Drivers of the Equity Ratio during a “Moderate Recession”

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## Normal Operating Level Calculation

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### Overview

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In accordance with the Board-approval policy, staff must calculate the impact of a moderate recession on the Share Insurance Fund (SIF) equity ratio to determine the recommended normal operating level.

This requires two general elements: assumptions about the moderate recession—the “stress scenario”—and models that translate the stress scenario into industry financial outcomes. For the stress scenario, consistent with prior years’ practice, the Office of the Chief Economist (OCE) uses scenarios constructed by the Board of Governors of the Federal Reserve System (Federal Reserve). The Federal Reserve’s scenarios—which are formed to enable implementation of the Comprehensive Capital Analysis and Review and Dodd-Frank Stress Testing (CCAR/DFAST) protocols—are hypothetical economic developments and not forecasts. They are widely used by depositories in stress testing.

As in prior years, for the purpose of translating economic stress indicators into financial indicators relevant to SIF performance, OCE focuses on the three primary drivers of the SIF equity ratio. The three focus variables are insurance losses, insured share growth, and investment yield. As discussed below, OCE employs econometric models to convert changes in unemployment rates and other macroeconomic indicators into estimates for insured share growth and insurance losses. The modeled yield on the SIF investment portfolio can be derived directly from the CCAR/DFAST scenarios.

### Macroeconomic Scenario: Forming the Moderate Recession

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The starting point for development of the moderate recession scenarios is the Federal Reserve’s CCAR/DFAST economic scenarios. After appropriate timing-related adjustments are made, the moderate recession is formed as the midpoint between the Federal Reserve’s “Baseline” and “Severely Adverse” scenarios.<sup>1</sup>

As in prior years, the Federal Reserve publicly released “Baseline” and “Severely Adverse” scenarios in February 2022. For the two scenarios, the Federal Reserve provides a time series for a small number of economic variables, including international conditions variables. The scenarios extend for 13 quarters, which is appropriate for analyzing depository institution capital positions.

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<sup>1</sup> Prior to 2020, the Federal Reserve also released an “Adverse” scenario. That scenario resembled a moderate recession and thus could be used directly.



Because NCUA has adopted a 5-year forecast horizon when calculating the equity ratio decline,<sup>2</sup> the first necessary timing adjustment is to lengthen the scenarios from 13 quarters to 5 years. Since the Federal Reserve begins its stress scenarios at the beginning of 2022, it is also necessary to “time shift” the beginning of the stress period for use in the NCUA model.

For timing adjustments, NCUA used data supplied by Macroeconomic Advisers, LLC (MA) in October 2022. MA takes the Federal Reserve stress scenarios and shifts the beginning of the stress to 2022Q4. It then lengthens the scenario time horizon, filling in projections through 2027.

MA’s scenarios are designed to match the Federal Reserve’s scenarios in all critical respects. Importantly, for macroeconomic variables not provided by the Federal Reserve, MA uses its proprietary model to develop estimates consistent with the Federal Reserve scenarios. This is useful because the extra variables could have closer relationships with credit union industry outcomes than just the variables the Federal Reserve provides.<sup>3</sup>

Using MA’s data production, OCE shifts the Federal Reserve scenarios forward by one more quarter so that the stress begins in 2023Q1. It then forms the moderate recession as the mid-point of the (time-adjusted) “Baseline” and “Severely Adverse” scenarios. The average of growth rates and other variables across the two scenarios are calculated to form estimates for the moderate recession.

The tables and graphs below show the characteristics of the moderate recession. The moderate recession is described as an “Adverse” scenario in the various figures.

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<sup>2</sup> The five-year time window ensures that the SIF impact is measured over a full economic cycle.

<sup>3</sup> For example, MA estimates include a full yield constant maturity Treasury yield curve.

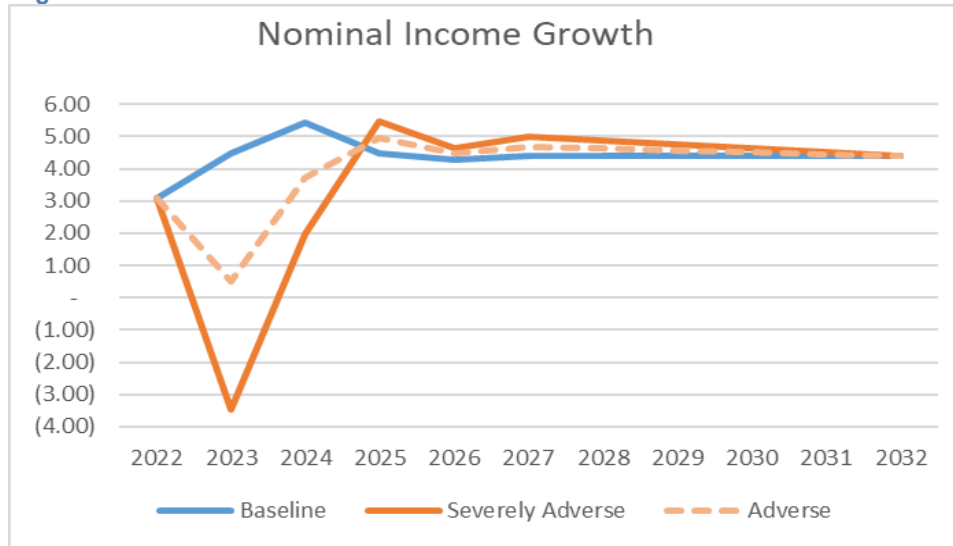


**Table 1: Nominal Disposable Income Growth and Unemployment Rate**

| Year | Nominal Disposable Income Growth (%) |         |                  | Unemployment Rate (%) |         |                  |
|------|--------------------------------------|---------|------------------|-----------------------|---------|------------------|
|      | Baseline                             | Adverse | Severely Adverse | Baseline              | Adverse | Severely Adverse |
| 2019 | 4.28                                 |         |                  | 3.67                  |         |                  |
| 2020 | 6.93                                 |         |                  | 8.10                  |         |                  |
| 2021 | 9.19                                 |         |                  | 5.35                  |         |                  |
| 2022 | 3.08                                 |         |                  | 3.69                  |         |                  |
| 2023 | 4.50                                 | 0.51    | -3.48            | 4.32                  | 6.32    | 8.32             |
| 2024 | 5.45                                 | 3.72    | 1.98             | 4.58                  | 7.18    | 9.77             |
| 2025 | 4.47                                 | 4.97    | 5.48             | 4.44                  | 6.36    | 8.28             |
| 2026 | 4.28                                 | 4.46    | 4.65             | 4.24                  | 5.58    | 6.92             |
| 2027 | 4.39                                 | 4.68    | 4.98             | 4.05                  | 4.88    | 5.71             |
| 2028 | 4.39                                 | 4.62    | 4.86             | 4.05                  | 4.71    | 5.38             |
| 2029 | 4.39                                 | 4.57    | 4.74             | 4.05                  | 4.55    | 5.05             |
| 2030 | 4.39                                 | 4.51    | 4.62             | 4.05                  | 4.38    | 4.71             |
| 2031 | 4.39                                 | 4.45    | 4.51             | 4.05                  | 4.22    | 4.38             |
| 2032 | 4.39                                 | 4.39    | 4.39             | 4.05                  | 4.05    | 4.05             |

Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

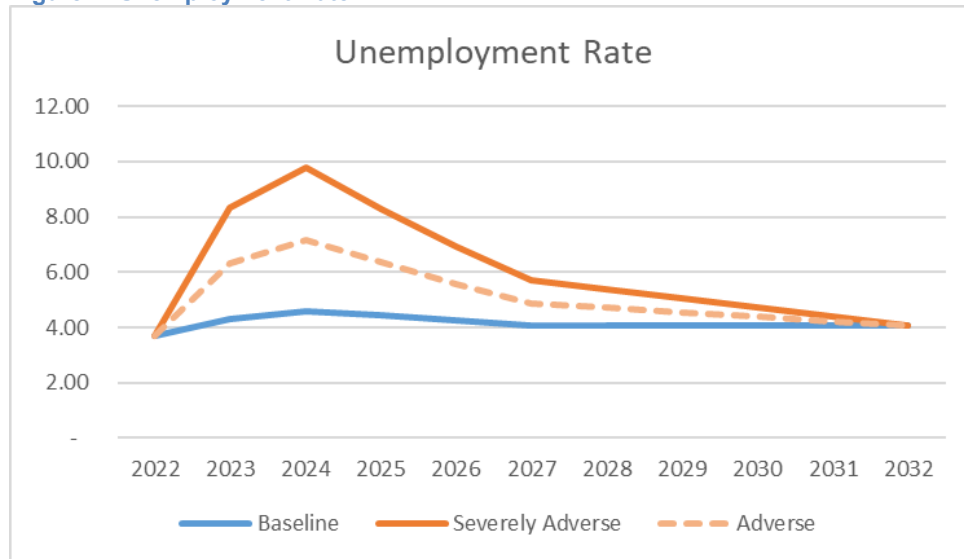
**Figure 1: Nominal Income Growth**



Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations



**Figure 2: Unemployment Rate**



Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

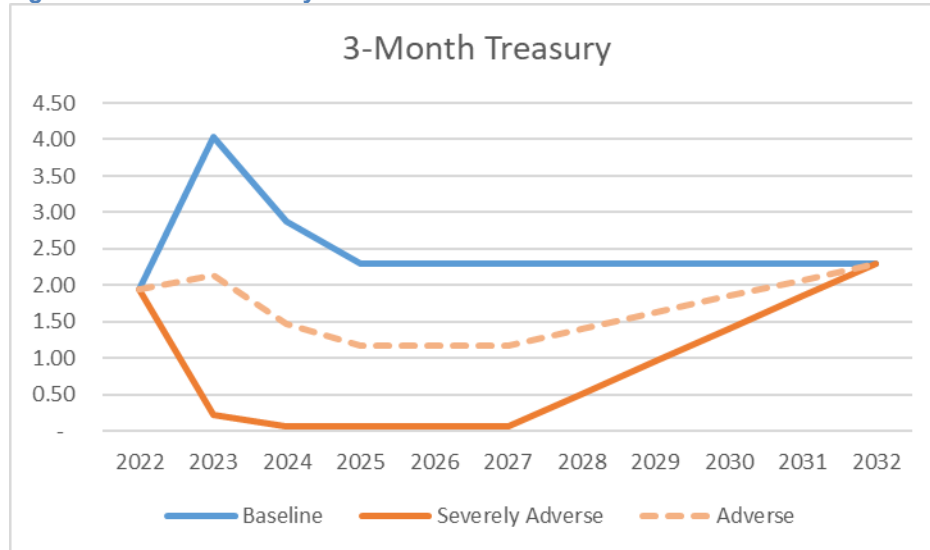
**Table 2: Treasury Rates**

| Year | 3-Month Treasury Rate (%) |         |                  | 7-Year Treasury Rate (%) |         |                  |
|------|---------------------------|---------|------------------|--------------------------|---------|------------------|
|      | Baseline                  | Adverse | Severely Adverse | Baseline                 | Adverse | Severely Adverse |
| 2019 | 2.06                      |         |                  | 2.05                     |         |                  |
| 2020 | 0.36                      |         |                  | 0.73                     |         |                  |
| 2021 | 0.04                      |         |                  | 1.19                     |         |                  |
| 2022 | 1.94                      |         |                  | 2.97                     |         |                  |
| 2023 | 4.03                      | 2.13    | 0.23             | 3.56                     | 2.07    | 0.57             |
| 2024 | 2.88                      | 1.47    | 0.06             | 3.05                     | 1.77    | 0.49             |
| 2025 | 2.30                      | 1.18    | 0.06             | 2.90                     | 1.87    | 0.85             |
| 2026 | 2.30                      | 1.18    | 0.06             | 2.85                     | 2.02    | 1.19             |
| 2027 | 2.30                      | 1.18    | 0.06             | 2.84                     | 2.20    | 1.56             |
| 2028 | 2.30                      | 1.40    | 0.51             | 2.84                     | 2.33    | 1.82             |
| 2029 | 2.30                      | 1.63    | 0.95             | 2.84                     | 2.46    | 2.08             |
| 2030 | 2.30                      | 1.85    | 1.40             | 2.84                     | 2.59    | 2.33             |
| 2031 | 2.30                      | 2.07    | 1.85             | 2.84                     | 2.72    | 2.59             |
| 2032 | 2.30                      | 2.30    | 2.30             | 2.84                     | 2.84    | 2.84             |

Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

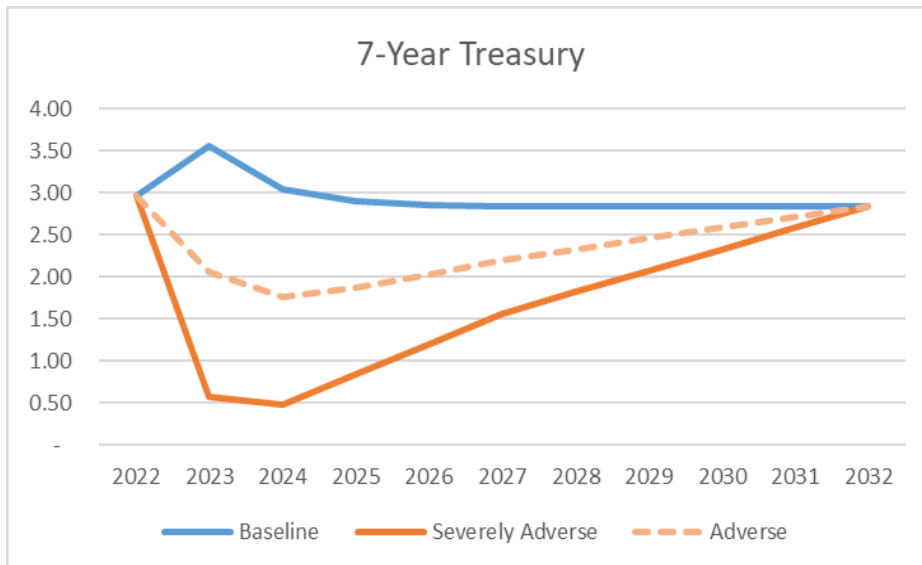


Figure 3: 3-Month Treasury Rate



Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

Figure 4: 7-Year Treasury Rate



Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

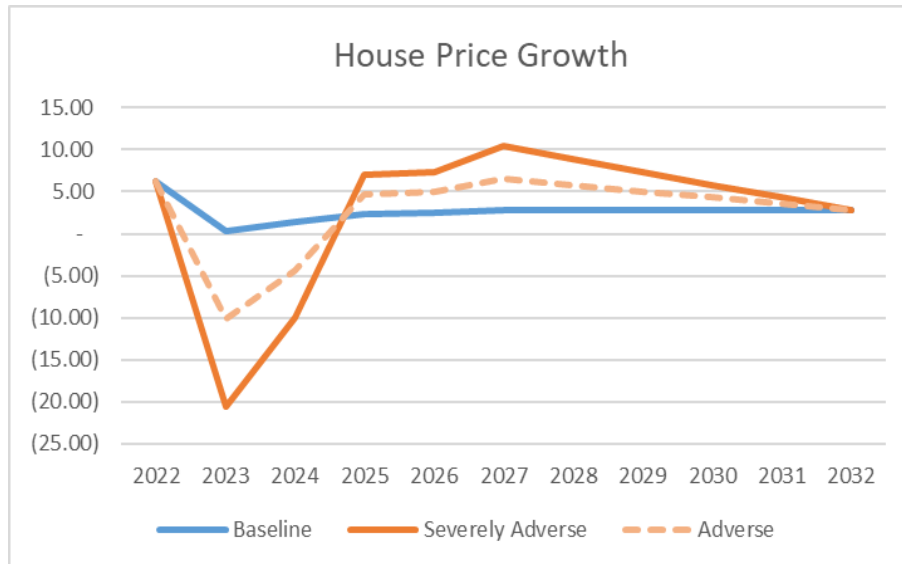


**Table 3: House Price Growth**

| Year | CoreLogic House Price Growth (%) |         |                  |
|------|----------------------------------|---------|------------------|
|      | Baseline                         | Adverse | Severely Adverse |
| 2019 | 4.49                             |         |                  |
| 2020 | 9.19                             |         |                  |
| 2021 | 17.95                            |         |                  |
| 2022 | 6.23                             |         |                  |
| 2023 | 0.26                             | -10.18  | -20.62           |
| 2024 | 1.36                             | -4.33   | -10.02           |
| 2025 | 2.34                             | 4.65    | 6.96             |
| 2026 | 2.57                             | 4.94    | 7.31             |
| 2027 | 2.78                             | 6.59    | 10.40            |
| 2028 | 2.78                             | 5.83    | 8.87             |
| 2029 | 2.78                             | 5.07    | 7.35             |
| 2030 | 2.78                             | 4.31    | 5.83             |
| 2031 | 2.78                             | 3.55    | 4.31             |
| 2032 | 2.78                             | 2.78    | 2.78             |

Note: Growth Rates are calculated using CoreLogic House Price Index. January 2020 is the base of this Index (100).  
 Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations

**Figure 5: House Price Growth**



Source: Macroeconomic Advisors LLC (October 21, 2022); OCE Calculations





## Modeling Specifics

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The three primary drivers of the equity ratio are:

- (1) Yield on investment portfolio,
- (2) Insurance losses, and
- (3) Insured share growth.

Values for the first (yields) are taken directly from the MA-augmented scenarios, while OCE uses econometric models to project share growth and insurance losses. Using historical call report and macroeconomic data, the econometric models (described below) estimate the relationship between the variables of interest and various macroeconomic indicators. This allows OCE to project how share growth and insurance losses evolve during the hypothetical moderate recession.

### Insurance Losses

A four-step process is used to estimate insurance losses.

1. Using historical call report data from 1996 to 2021, econometrically estimate the relationship between the proportion of total insured deposits held at CAMELS 4/5-rated credit unions<sup>4</sup> and various macroeconomic indicators. The specific variables employed are:
  - Unemployment rate: Captures general credit risk; a higher unemployment rate increases the percentage of CAMELS 4/5-rated share deposits relative to total insured deposits. A separate variable showing the change in the unemployment rate (versus the prior year) allows for the possibility that CAMELS 4/5 shares may be impacted by where the economy is in macroeconomic cycle.
  - House price growth: Captures homeowner credit risk; faster house price growth lowers the proportion of CAMELS 4/5 credit union share deposits.

The resulting regression coefficients and other model statistics are shown below:

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<sup>4</sup> The analysis looks at Federally Insured Credit Unions (FICUs).



**Table 4: Share of Aggregate Deposits in CAMELS 4/5 FICUS, %, 1996-2021**

| Variable                                | Coefficient | Standard Error | t-statistic |
|---|-------------|----------------|-------------|
| Unemployment Rate, %                    | 0.49        | 0.08           | 5.78        |
| Change in the Unemployment Rate, ppts   | -0.10       | 0.11           | -0.89       |
| CoreLogic House Price Growth, %         | -0.08       | 0.02           | -3.87       |
| Constant                                | -1.14       | 0.53           | -2.13       |
| Adjusted R <sup>2</sup> (fit)           |             | 0.74           |             |
| Number of Observations                  |             | 26             |             |
| Standard Error (or F statistic)         |             | 24.25          |             |
| Average of 4/5 Deposit Share, 1996-2021 |             | 1.29           |             |

2. Using share growth estimates (see share growth model discussion below) and forecasted values from Step 1 above, produce preliminary estimates of actual dollar losses during the 5-year forecast period. This is done by multiplying the estimated dollar volume of insured shares in CAMELS 4/5 credit unions by a rule-of-thumb loss rate.<sup>5</sup> Estimates are produced for each of the three scenarios: “Baseline”, “Adverse” (Moderate Recession), and “Severely Adverse”.
3. Calculate a calibration factor that compares model-estimated losses during the Baseline scenario to the 5-year average (historical) SIF losses. Compute the ratio of model-estimated losses during the 5-year period to average losses.
4. Multiply the preliminary estimates from Step 2 by the calibration ratios determined in Step 3.

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<sup>5</sup> The rule-of-thumb loss rate used – 2.5 percent – ultimately does not have a material impact on estimated losses because of the “calibration” employed in subsequent steps.



## Share Growth

Quarterly changes in insured shares are computed using estimates derived from a historical regression relating growth in insured shares to key macroeconomic variables. Data from 2005Q1 to 2022Q2 are used in the estimation process.

The regression specification includes the following variables:

- Seasonal Dummy Variables. Captures the pronounced seasonality in share growth.
- Nominal Income Growth (lagged by 3 quarters). Higher income, all else equal, should spur higher share growth.
- Change in unemployment rate in most recent quarter. Due to flight-to-quality effect, higher unemployment rates produce higher share growth.
- Change in the 3-month Treasury bill. Negative effect, rising rates reduce deposit growth, potentially an opportunity-cost effect.
- Dummy variable to capture increase in insurance limit that occurred in 2008Q4.

The coefficient estimates and various regression statistics are provided below:

**Table 5: Quarterly Share Growth, %, 2005Q1-2022Q2**

| Variable  | Coefficient | Standard Error | t-statistic |
|---|-------------|----------------|-------------|
| Nominal Income Growth (t-3), %                  | 0.02        | 0.01           | 1.84        |
| Change in Unemployment Rate (t-(t-1)), ppts     | 0.44        | 0.11           | 4.14        |
| Change in 3-month Treasury Rate (t-(t-1)), ppts | -1.11       | 0.44           | -2.54       |
| Indicator for Quarter 2 (t)                     | -3.35       | 0.36           | -9.42       |
| Indicator for Quarter 3 (t)                     | -3.65       | 0.35           | -10.31      |
| Indicator for Quarter 4 (t)                     | -2.85       | 0.35           | -8.05       |
| Indicator for 2008Q4                            | 7.22        | 1.15           | 6.29        |
| Constant  | 4.02        | 0.26           | 15.75       |
| Adjusted R <sup>2</sup> (fit)                   |             | 0.79           |             |
| Number of Observations                          |             | 67             |             |
| Standard Error (or F statistic)                 |             | 35.84          |             |



OCE estimates share growth using the coefficients shown above and the forecasted values for the macroeconomic variables during the moderate recession (and other scenarios).

## Final Projections

The table below shows the final estimates for the key drivers of the Equity Ratio during the “Baseline”, “Adverse” (Moderate Recession), and “Severely Adverse” scenarios. Note that values are shown for semi-annual periods (half year).<sup>6</sup>

**Table 6: Baseline Projections**

|                                      | <b>3-Month<br/>Treasury Rate</b> | <b>7-Year<br/>Treasury Rate</b> | <b>Insured Share<br/>Growth</b> | <b>Insured<br/>Losses</b> |
|--------------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------|
| 2022H2                               | 3.19                             | 3.49                            | -1.31                           | \$ 25.35                  |
| 2023H1                               | 4.03                             | 3.56                            | 3.59                            | \$ 25.35                  |
| 2023H2                               | 4.03                             | 3.56                            | 3.59                            | \$ 25.35                  |
| 2024H1                               | 2.88                             | 3.05                            | 4.26                            | \$ 25.35                  |
| 2024H2                               | 2.88                             | 3.05                            | 4.26                            | \$ 25.35                  |
| 2025H1                               | 2.30                             | 2.90                            | 3.37                            | \$ 25.35                  |
| 2025H2                               | 2.30                             | 2.90                            | 3.37                            | \$ 25.35                  |
| 2026H1                               | 2.30                             | 2.85                            | 3.31                            | \$ 25.35                  |
| 2026H2                               | 2.30                             | 2.85                            | 3.31                            | \$ 25.35                  |
| 2027H1                               | 2.30                             | 2.84                            | 3.34                            | \$ 25.35                  |
| 2027H2                               | 2.30                             | 2.84                            | 3.34                            | \$ 25.35                  |
| <b>5 Year Losses (2023H1-2027H2)</b> |                                  |                                 |                                 | <b>\$253.52</b>           |

<sup>6</sup> In forming half-year estimates, annual values (including annual growth rates) are simply divided by two.



**Table 7: Adverse (Moderate Recession) Projections**

|                                      | <b>3-Month<br/>Treasury Rate</b> | <b>7-Year<br/>Treasury Rate</b> | <b>Insured Share<br/>Growth</b> | <b>Insured<br/>Losses</b> |
|--------------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------|
| 2022H2                               | 3.19                             | 3.49                            | -1.31                           | \$ 25.35                  |
| 2023H1                               | 2.13                             | 2.07                            | 5.20                            | \$ 73.41                  |
| 2023H2                               | 2.13                             | 2.07                            | 5.20                            | \$ 73.41                  |
| 2024H1                               | 1.47                             | 1.77                            | 3.64                            | \$ 70.23                  |
| 2024H2                               | 1.47                             | 1.77                            | 3.64                            | \$ 70.23                  |
| 2025H1                               | 1.18                             | 1.87                            | 3.15                            | \$ 50.28                  |
| 2025H2                               | 1.18                             | 1.87                            | 3.15                            | \$ 50.28                  |
| 2026H1                               | 1.18                             | 2.02                            | 3.21                            | \$ 43.66                  |
| 2026H2                               | 1.18                             | 2.02                            | 3.21                            | \$ 43.66                  |
| 2027H1                               | 1.18                             | 2.20                            | 3.22                            | \$ 31.73                  |
| 2027H2                               | 1.18                             | 2.20                            | 3.22                            | \$ 31.73                  |
| <b>5 Year Losses (2023H1-2027H2)</b> |                                  |                                 |                                 | <b>\$538.62</b>           |

**Table 8: Severely Adverse Projections**

|                                      | <b>3-Month<br/>Treasury Rate</b> | <b>7-Year<br/>Treasury Rate</b> | <b>Insured Share<br/>Growth</b> | <b>Insured<br/>Losses</b> |
|--------------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------|
| 2022H2                               | 3.19                             | 3.49                            | -1.31                           | \$ 25.35                  |
| 2023H1                               | 0.23                             | 0.57                            | 6.81                            | \$124.24                  |
| 2023H2                               | 0.23                             | 0.57                            | 6.81                            | \$124.24                  |
| 2024H1                               | 0.06                             | 0.49                            | 3.02                            | \$116.66                  |
| 2024H2                               | 0.06                             | 0.49                            | 3.02                            | \$116.66                  |
| 2025H1                               | 0.06                             | 0.85                            | 2.93                            | \$ 75.84                  |
| 2025H2                               | 0.06                             | 0.85                            | 2.93                            | \$ 75.84                  |
| 2026H1                               | 0.06                             | 1.19                            | 3.12                            | \$ 62.38                  |
| 2026H2                               | 0.06                             | 1.19                            | 3.12                            | \$ 62.38                  |
| 2027H1                               | 0.06                             | 1.56                            | 3.10                            | \$ 38.21                  |
| 2027H2                               | 0.06                             | 1.56                            | 3.10                            | \$ 38.21                  |
| <b>5 Year Losses (2023H1-2027H2)</b> |                                  |                                 |                                 | <b>\$834.66</b>           |