SERS 2023 Board Retreat
Friday, February 17, 2023

Join Zoom Meeting
https://ohsers.zoom.us/j/99344200226?pwd=VWh2RXZiVFhKV1V3aVM3eW1Dbmxkdz09

Meeting ID: 993 4420 0226 **Password:** 951644

To Join by Phone, Dial: **(929) 205-6099** and enter the **Meeting ID:** 993 4420 0226 and **Password:** 951644 when prompted.

8:30 a.m. – 8:35 a.m.	**Introduction/Overview**	**Richard Stensrud,** **SERS Executive Director**
8:35 a.m. – 9:45 a.m.	**Show Me the Money (Supply) Educational Session under R.C. 171.50 and 3309.051**	**Dr. Anirban Basu - Chairman & CEO Sage Policy Group, Inc.**
9:45 a.m. – 10:00 a.m.	**Break**	
10:00 a.m. – Noon	**Pension Sustainability Update Session Educational Session under R.C. 171.50 and 3309.051**	**Cavanaugh Macdonald** **SERS Actuaries**
Noon – 12:45 p.m.	**Lunch**	
12:45 p.m. – 1:45 p.m.	**Investment Presentation Market Snapshot – Point Break Educational Session under R.C. 171.50 and 3309.051**	**Candice Tse - Goldman Sachs**
1:45 p.m. – 2:00 p.m.	**Break**	
2:00 p.m. – 3:15 p.m.	**SERS Strategic Plan Update Session**	**Richard Stensrud** **SERS Executive Director** **&** **Karen Roggenkamp** **SERS Deputy Executive Director**
3:15 p.m. – 3:30 p.m.	**Closing Remarks**	**Richard Stensrud, SERS Executive Director**

FY2023 SERS Board Roll Call

Jeffrey DeLeone	_____
Frank Weglarz	_____
Hugh Garside	_____
James Haller	_____
Matthew King	_____
Catherine Moss	_____
Barbra Phillips	_____
James Rossler	_____
Daniel Wilson	_____

Anirban Basu, MPP, MA, JD, Ph.D.

Chairman & Chief Executive Officer

Sage Policy Group, Inc.

575 South Charles Street Suite 505

Baltimore, MD 21201

410-522-7243

email: abasu@sagepolicy.com

Career Brief

Anirban Basu is Chairman & CEO of Sage Policy Group, Inc., an economic and policy consulting firm headquartered in Baltimore, Maryland with an office in Orlando, Florida. The firm provides strategic analytical services to energy suppliers, law firms, medical systems, government agencies, and real estate developers among others.

In 2014, Maryland Governor Larry Hogan appointed him Chair of the Maryland Economic Development Commission (2014-2021). He serves as Chairman of the Baltimore County Economic Advisory Committee. He also serves the chief economist function for Associated Builders and Contractors, the Construction Financial Management Association, the Modular Building Institute, the Maryland Bankers Association, and several others.

He has taught at several universities, most frequently at the Johns Hopkins University. He currently teaches History of Economic Thought at Goucher College as their Distinguished Economist in Residence.

In 2007, 2016, and 2022, the *Daily Record* newspaper selected Dr. Basu as one of Maryland's 50 most influential people. The Baltimore Business Journal named him one of the region's 20 most powerful business leaders in 2010.

Dr. Basu is currently on the boards of the University of Maryland School of Law, St. Mary's College, the University of Maryland Medical Center, the University System of Maryland Foundation, the Lyric Opera House and the Archdiocese of Baltimore School System. He is also on Truist Bank's advisory board.

Dr. Basu earned his B.S. in Foreign Service at Georgetown University. He earned his Master's in Public Policy from Harvard University's John F. Kennedy School of Government, and his Master's in Economics from the University of Maryland, College Park. He acquired his Juris Doctor at the University of Maryland School of Law. He completed his doctoral work at UMBC with a concentration in health economics.

Show Me the Money (Supply)

By: Anirban Basu

MPP, MA, JD, PHD

Sage Policy Group, Inc.

On Behalf of

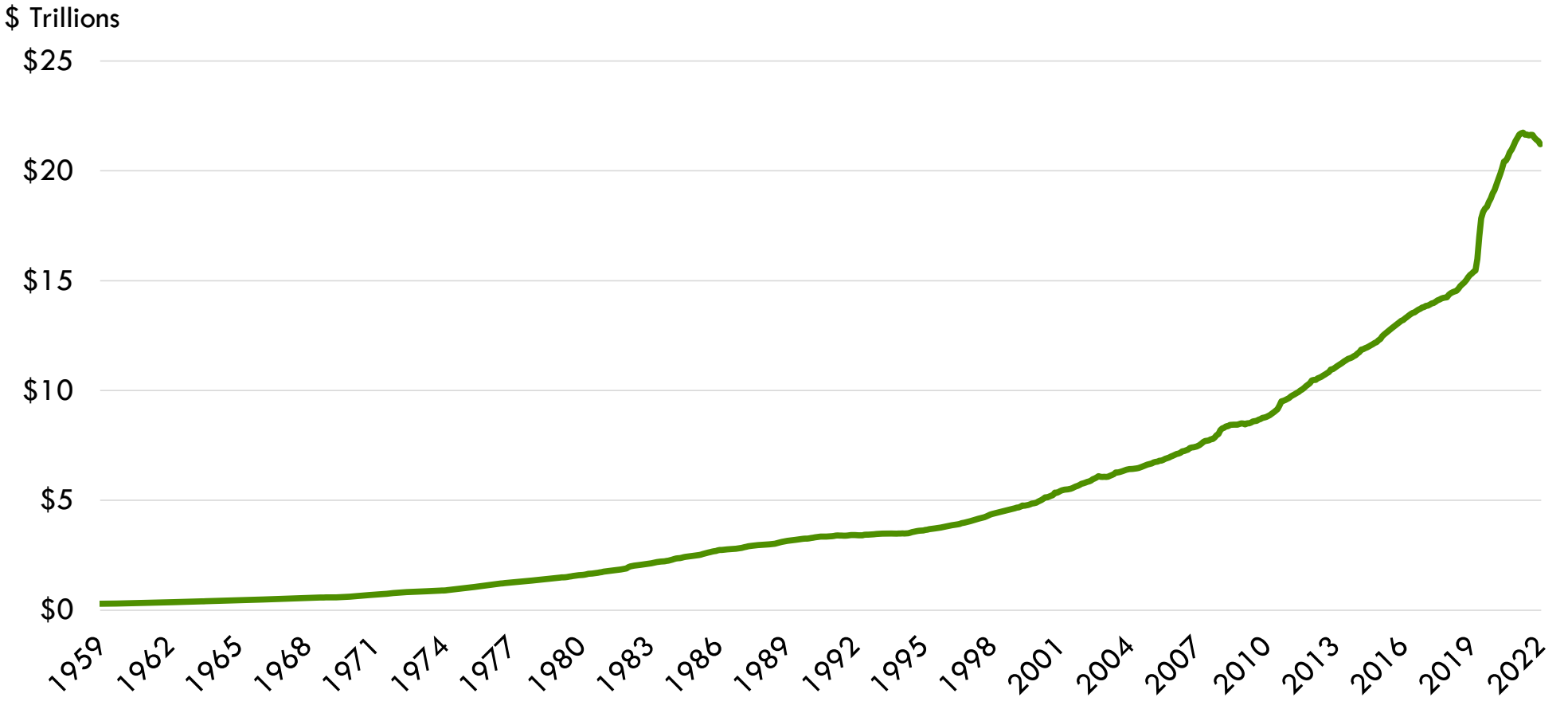
School Employees Retirement System of Ohio

2023 Annual Board Retreat

February 17, 2023

The Color of Money

U.S. Money Supply, 1959 – December 2022



Source: Federal Reserve

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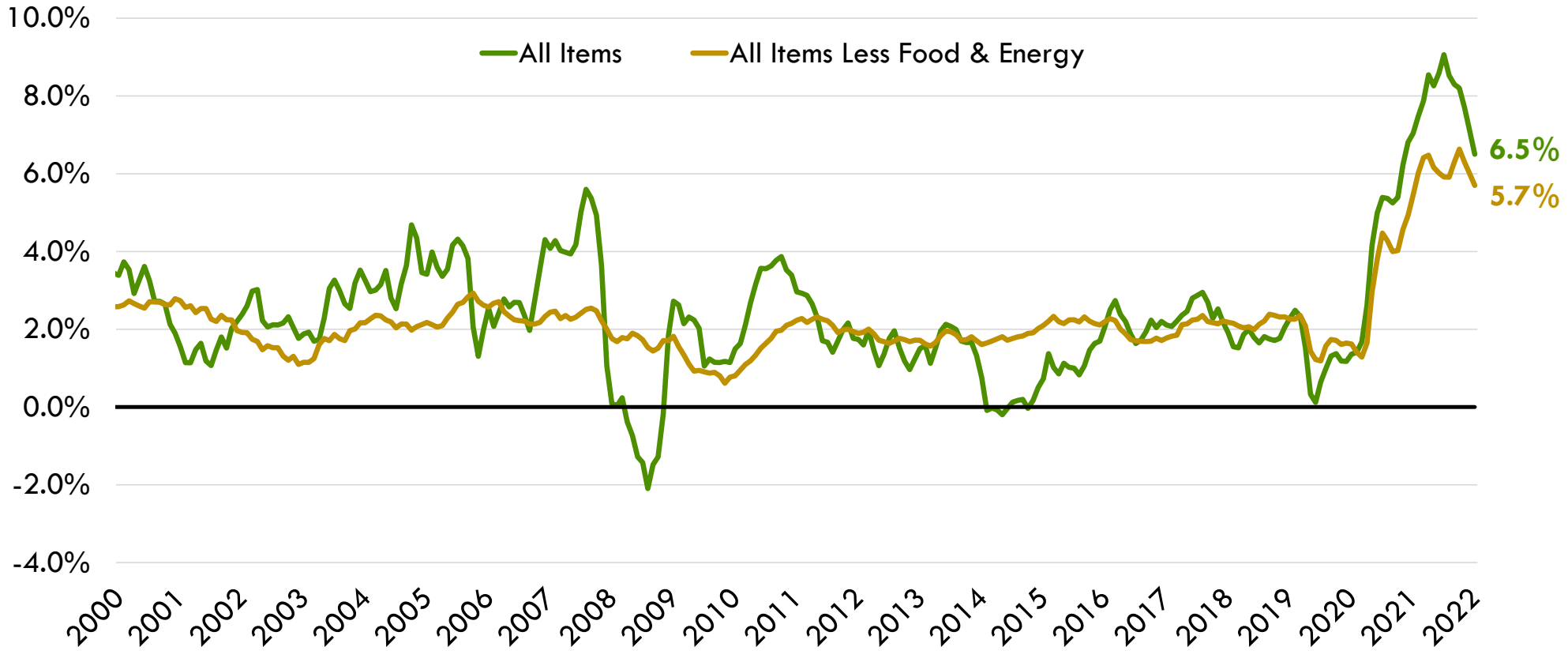
Risky
Business
(1983)

U.S. Consumer Price Index (NSA)

12-Month % Change, 2000 – December 2022



Source: U.S. Bureau of Labor Statistics

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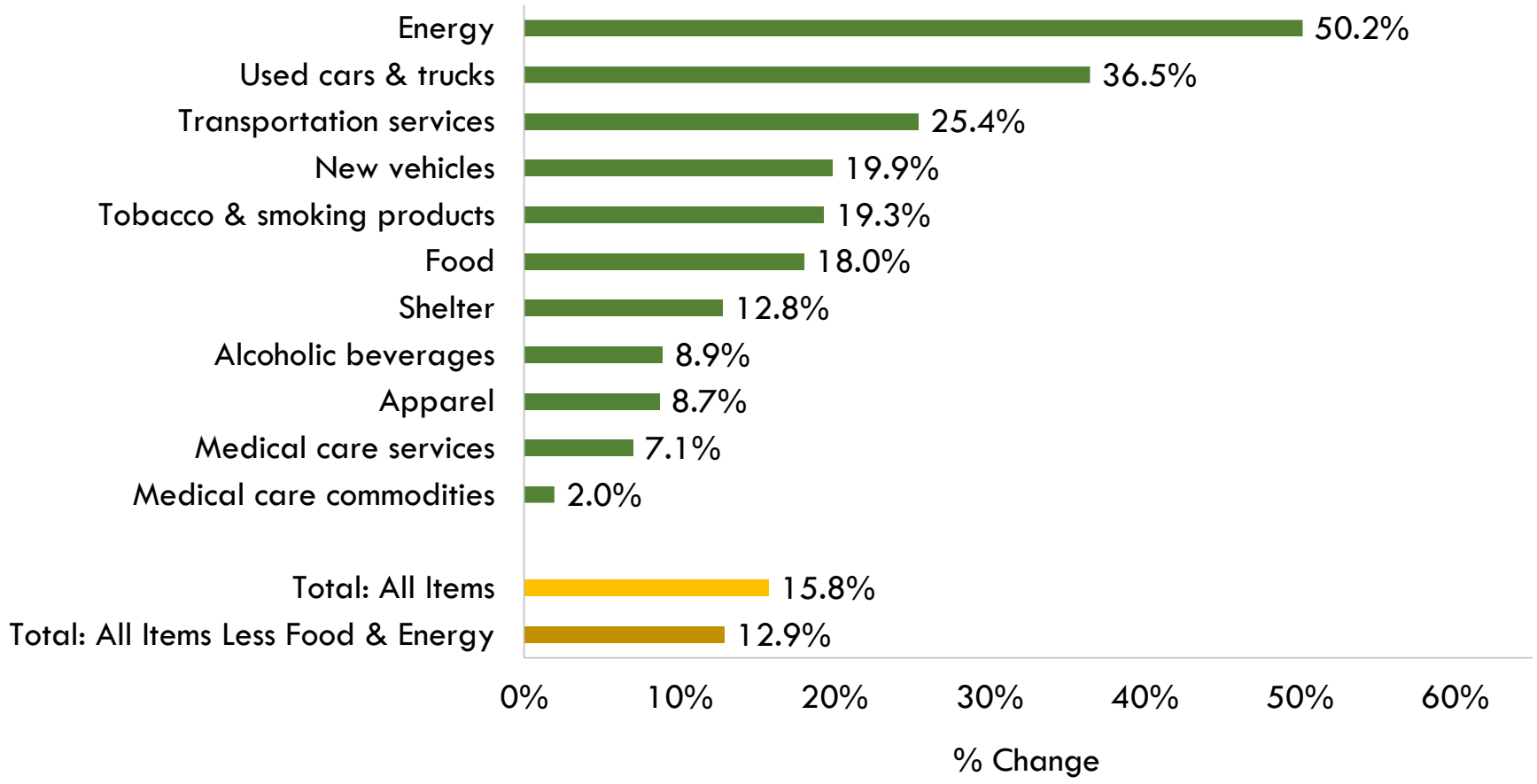
U.S. Consumer Price Index, Select Categories (NSA)

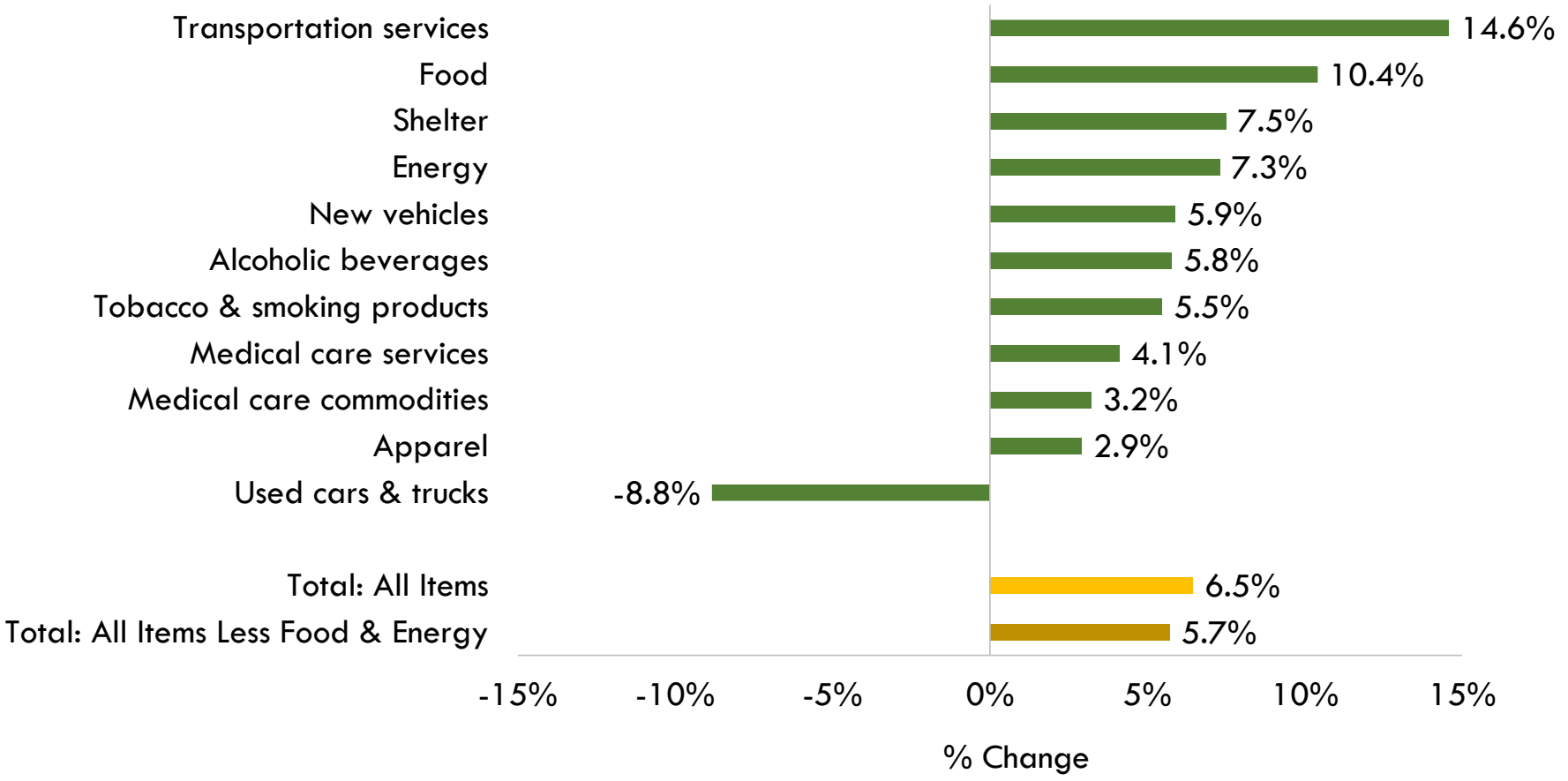
May 2020 v. December 2022 % Change



Source: U.S. Bureau of Labor Statistics

U.S. Consumer Price Index, Select Categories (NSA)

December 2021 v. December 2022 % Change

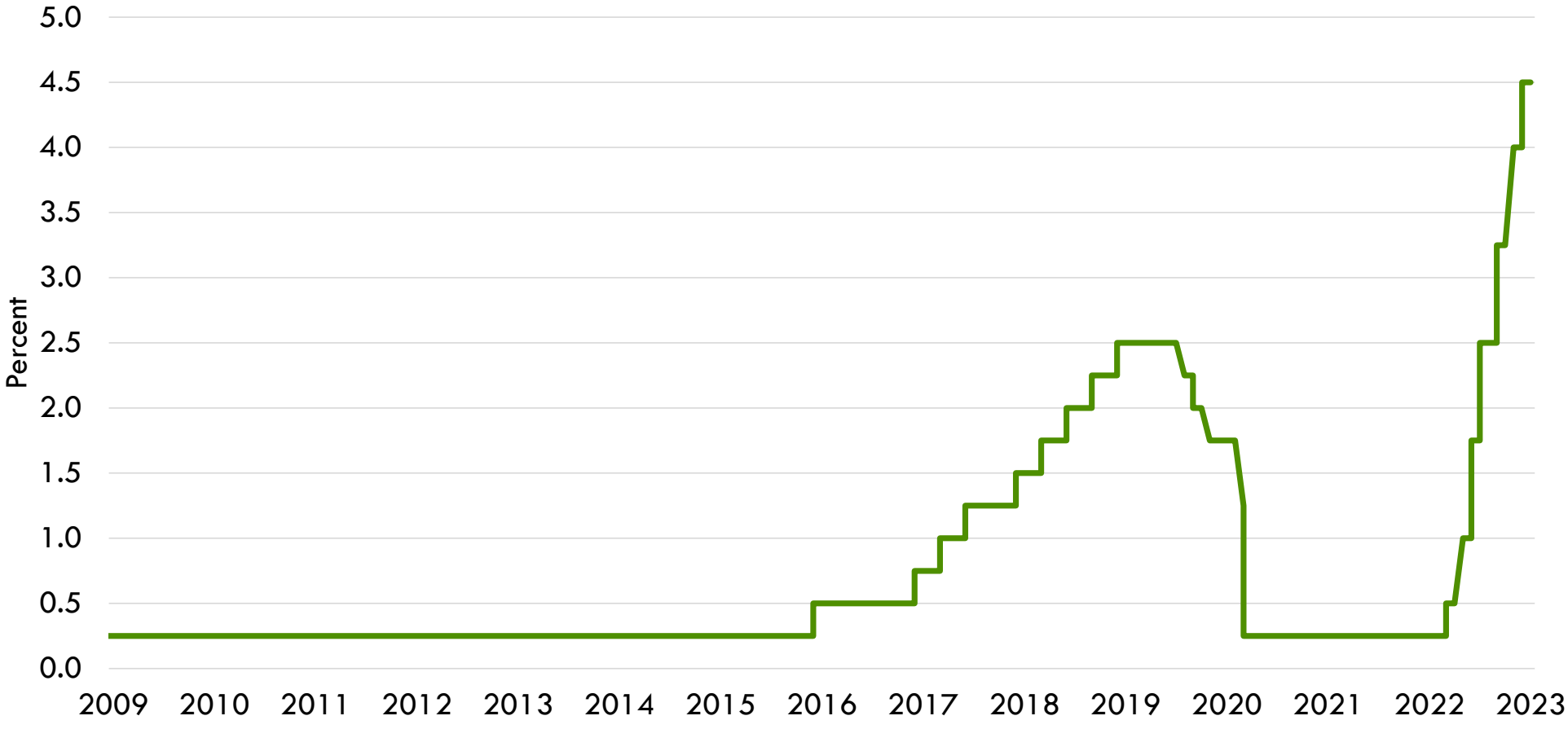


Source: U.S. Bureau of Labor Statistics

How Inflation Hurts

- Less purchasing power
  - If prices go up more than wages, standard of living goes down.
- Less savings
  - If the price of essentials is higher, people can't save as much (or need to draw on savings).
  - And inflation makes existing savings worth less.
  - As savings are reduced this can lead to less investment, reduced productivity, lower growth.
- Raises borrowing costs
  - When inflation exceeds the Fed's target, they raise interest rates to reduce demand, which makes getting a loan more expensive (house, car, etc.).
- Disproportionately hurts the poor
  - Lower income people are hurt more because essentials make up a larger portion of their budget, leaving less room to make adjustment to reduce costs.
  - Seniors and other people living on fixed incomes are particularly vulnerable to price increases.

Federal Funds Target Range, Upper Limit, 2009 – 2023



Source: Board of Governors of the Federal Reserve System

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Mission
Impossible
(8 films, 1996-2024)

War of the Words

"While higher interest rates, slower growth, and softer labor market conditions will bring down inflation, they will also bring some pain to households and businesses. These are the unfortunate costs of reducing inflation. But a failure to restore price stability would mean far greater pain."

(FOMC Chair Powell, August 2022)

"Let me say this, it is very premature to be thinking about pausing. So people, when they hear lags, they think about a pause. It's very premature in my view to think about or be talking about pausing our rate hike."

(FOMC Chair Powell, November 2022)

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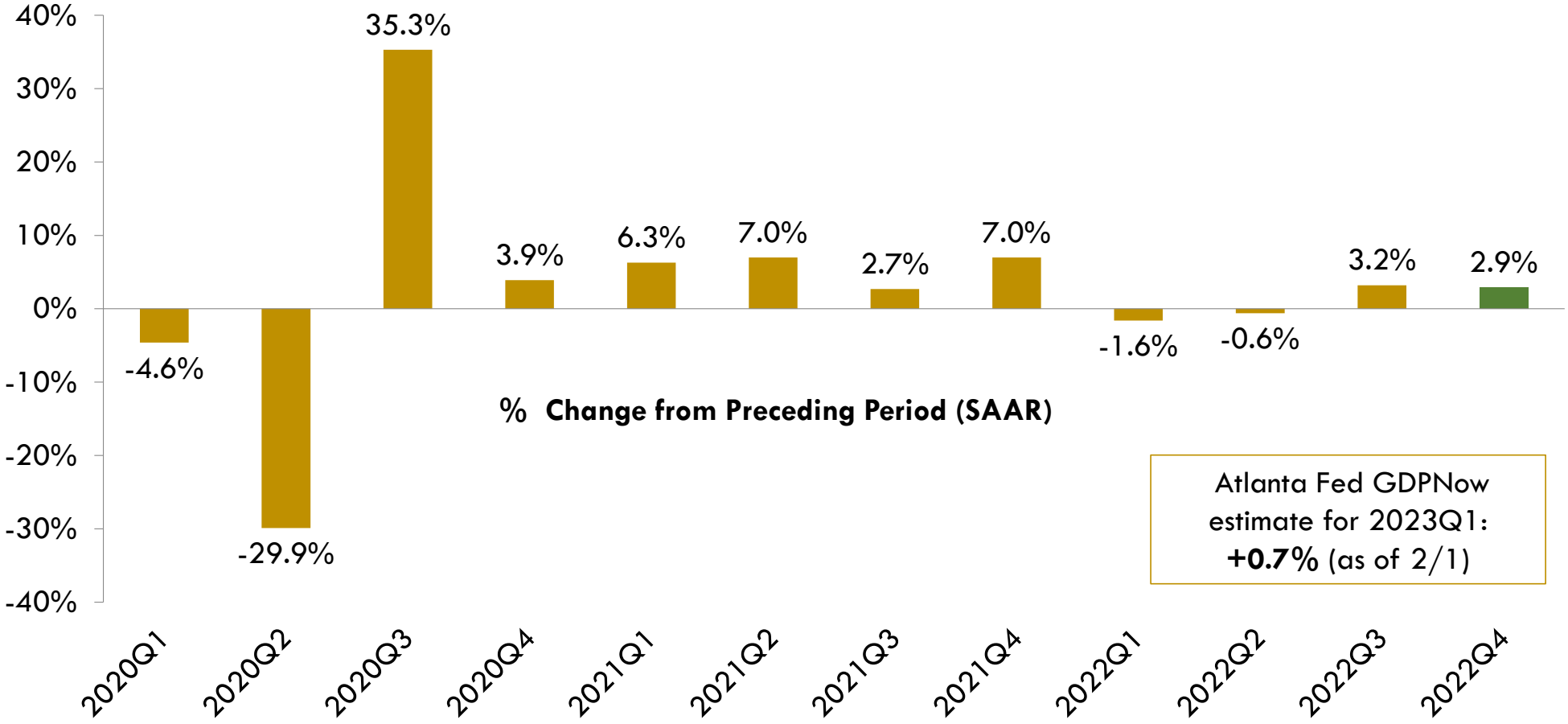
Source: Federal Reserve

Born on the 4th of July

U.S. Gross Domestic Product Growth, 2020 – 2022Q4



Atlanta Fed GDPNow estimate for 2023Q1: **+0.7%** (as of 2/1)

Source: U.S. Bureau of Economic Analysis *2022Q4: 1st (advance) estimate

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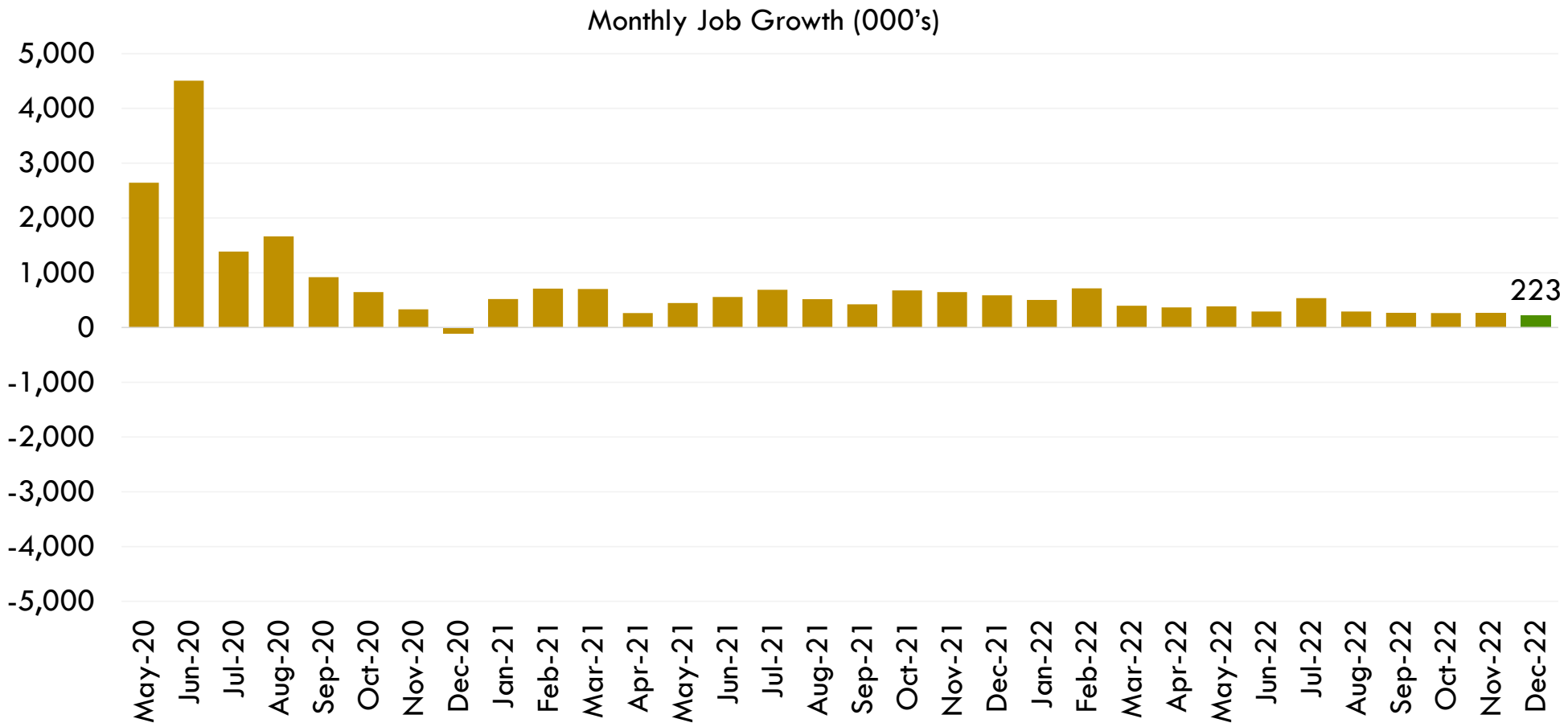
Net Change in U.S. Jobs

May 2020 – December 2022



Source: U.S. Bureau of Labor Statistics

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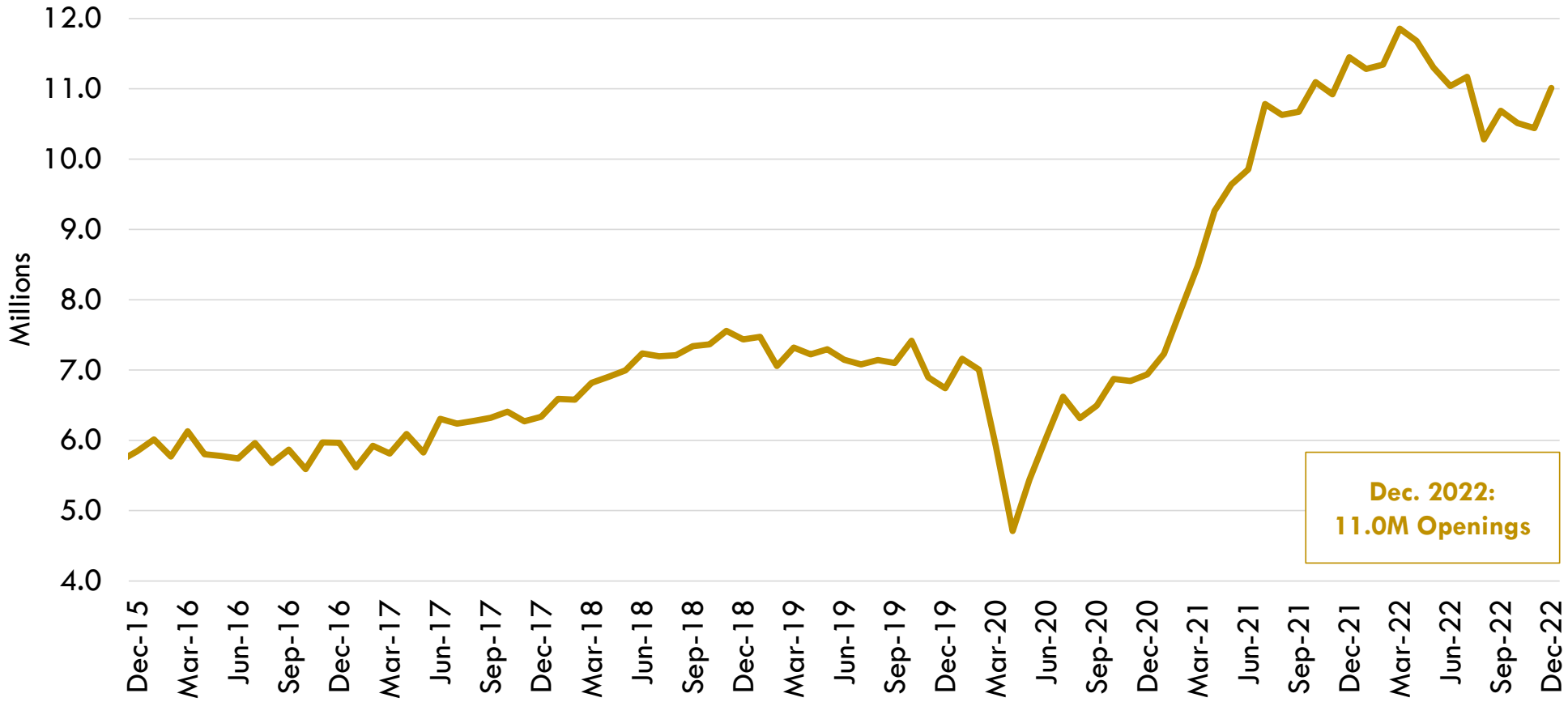
U.S. Job Openings, 2015 – December 2022



Source: U.S. Bureau of Labor Statistics

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Change in LF Participation Rate by Age, Gender 1980 v. 2022

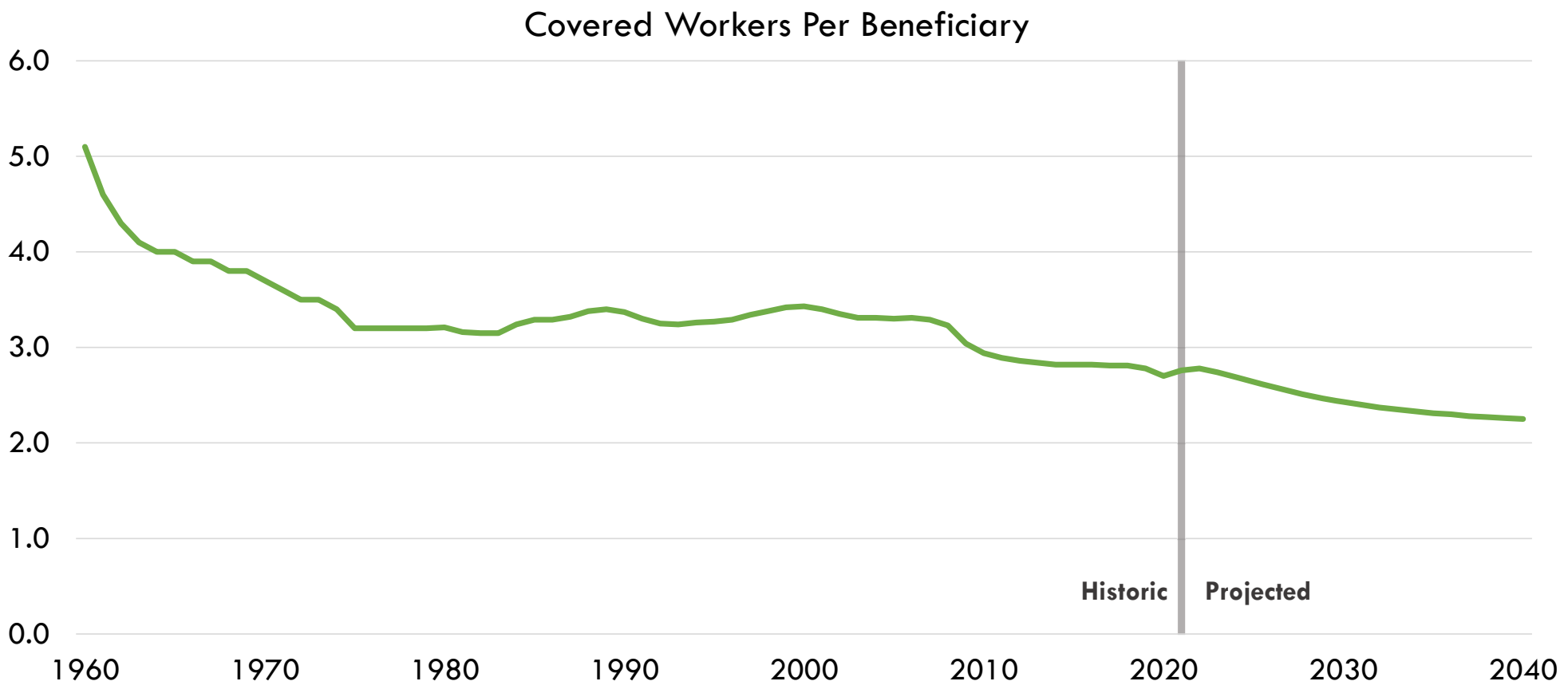
Change in LF Participation Rate, 1980 v. 2022 (percentage points)			
Age Group	Total	Men	Women
16+ years	**-1.5**	**-9.5**	**+5.3**
16-19 years	-19.9	-24.1	-15.7
20-24 years	-6.3	-12.8	-0.2
25-34 years	+3.2	-6.5	+12.2
35-44 years	+2.9	-5.8	+10.8
45-54 years	+6.2	-4.1	+15.4
55-64 years	+9.5	-1.1	+18.2

If the labor force participation rate were what it was in 1980, there would be 12.2 million more men and 7.2 million fewer women in the labor force (ages 16+).

Source: Bureau of Labor Statistics

U.S. Workers Per Social Security Beneficiary

1960 – 2040 Projected



Source: Social Security Administration, "The 2022 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds".
Beneficiaries: beneficiaries of Old-Age, Survivors Insurance, and Federal Disability Insurance (OASDI).

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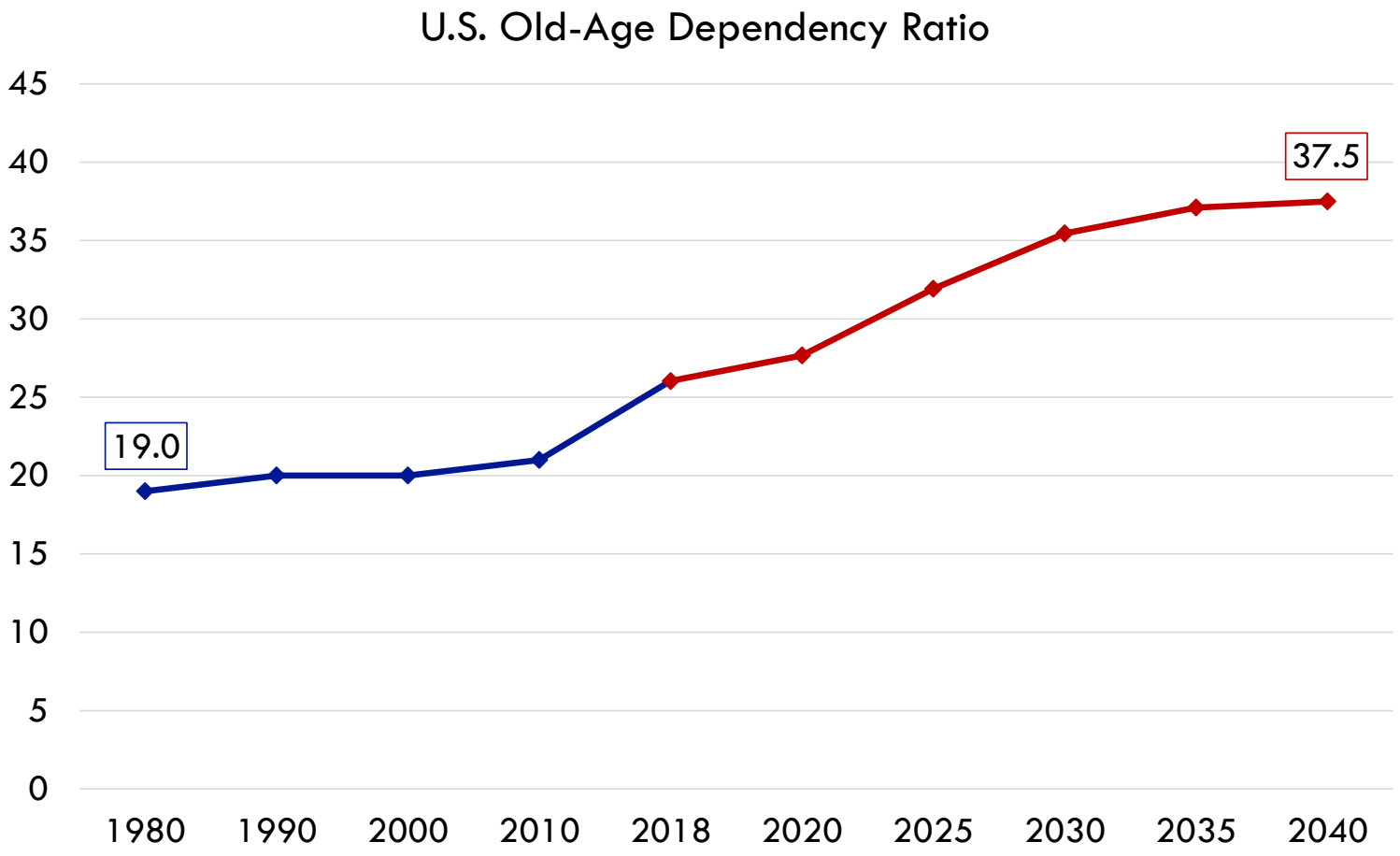
U.S. Old-Age Dependency Ratio, 1980 – 2040 Projected



- In 1980 there were 19 retirement age adults (age 65+) for every 100 working age Americans (ages of 18-64).
- The Census Bureau projects that that number will rise to almost 38 retirement aged adults for every 100 Americans of working age by 2040.

Source: U.S. Census Bureau. Note. Old age dependency ratio: A measure derived by dividing the population 65 years and over by the 18 to 64 years population and multiplying by 100.

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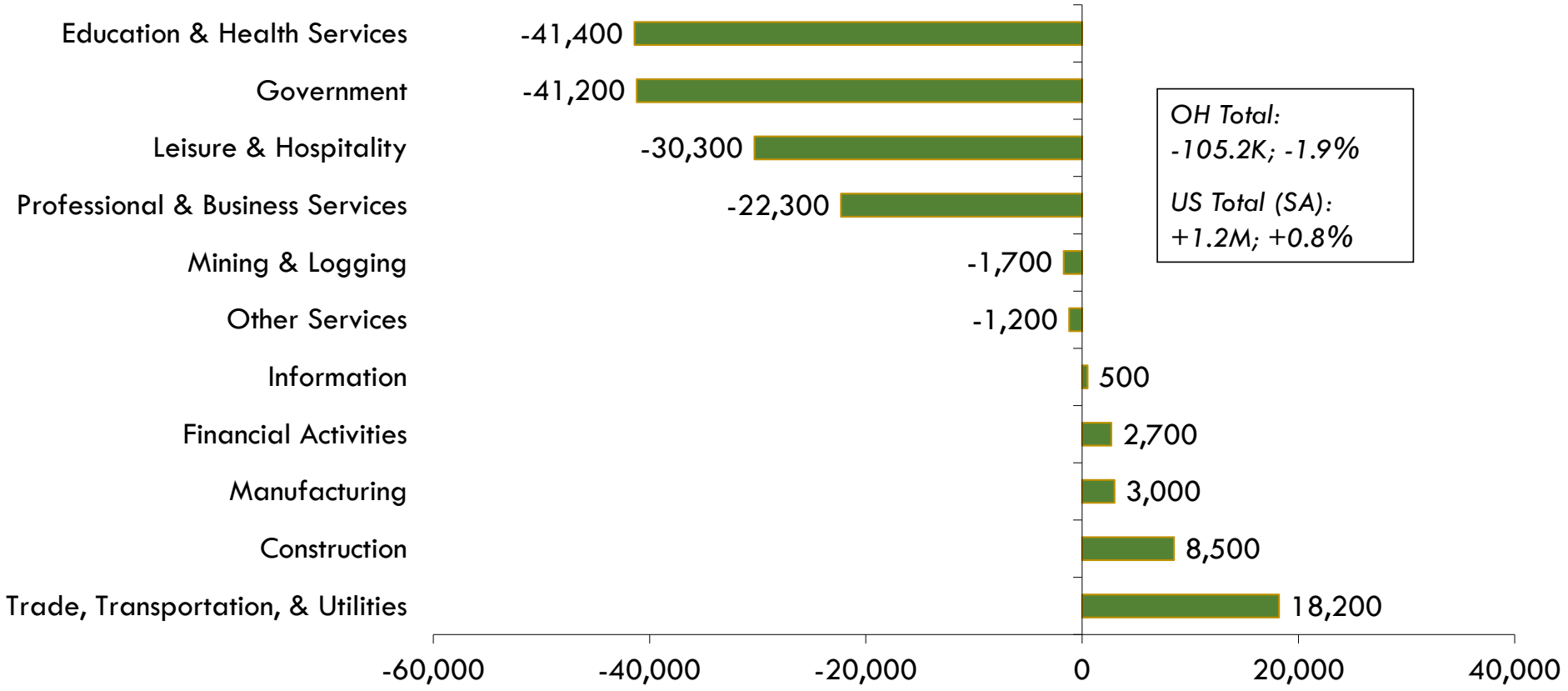
Ohio Nonfarm Employment by Sector (SA)

February 2020 v. December 2022 Absolute Change



*According to the Local Area Unemployment Statistics (LAUS) program
OH lost 139,553 jobs between February 2020 and December 2022.

Source: U.S. Bureau of Labor Statistics

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Employment Growth, 25 Largest Metros

February 2020 v. December 2022 Percent Change

Rank	MSA	%
1	Dallas-Fort Worth-Arlington, TX	10.3%
2	Riverside-San Bernardino-Ontario, CA	7.5%
3	Tampa-St. Petersburg-Clearwater, FL	7.1%
4	Charlotte-Concord-Gastonia, NC-SC	6.9%
5	Atlanta-Sandy Springs-Roswell, GA	6.1%
6	Phoenix-Mesa-Scottsdale, AZ	5.7%
7	Houston-The Woodlands-Sugar Land, TX	5.1%
7	San Antonio-New Braunfels, TX	5.1%
9	Denver-Aurora-Lakewood, CO	4.8%
10	Miami-Fort Lauderdale-West Palm Beach, FL	3.8%
11	Orlando-Kissimmee-Sanford, FL	3.4%
12	Portland-Vancouver-Hillsboro, OR-WA	3.0%
13	San Diego-Carlsbad, CA	2.2%

Rank	MSA	%
13	Seattle-Tacoma-Bellevue, WA	2.2%
15	Chicago-Naperville-Elgin, IL-IN-WI	1.9%
15	Philadelphia-Camden-Wilm., PA-NJ-DE-MD	1.9%
17	Boston-Cambridge-Nashua, MA-NH	1.5%
18	Baltimore-Columbia-Towson, MD	1.0%
19	New York-Newark-Jersey City, NY-NJ-PA	0.5%
20	Los Angeles-Long Beach-Anaheim, CA	0.4%
21	Detroit-Warren-Dearborn, MI	0.2%
21	Minneapolis-St. Paul-Bloomington, MN-WI	0.2%
23	St. Louis, MO-IL	0.1%
24	San Francisco-Oakland-Hayward, CA	0.0%
25	Washington-Arlington-Alexandria, DC-VA-MD-WV	-0.1%

Source: Bureau of Labor Statistics

Current Employment Statistics (CES) Survey. Note: data are not seasonally adjusted.

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U.S. % Change 2/2020 v. 12/2022: +0.8%

Unemployment Rates, 25 Largest Metros

December 2022

Rank	MSA	%
1	Miami-Fort Lauderdale-West Palm Beach, FL	1.9
2	Tampa-St. Petersburg-Clearwater, FL	2.2
3	Orlando-Kissimmee-Sanford, FL	2.3
4	San Francisco-Oakland-Hayward, CA	2.4
5	St. Louis, MO-IL	2.5
6	Atlanta-Sandy Springs-Roswell, GA	2.6
6	Minneapolis-St. Paul-Bloomington, MN-WI	2.6
7	Phoenix-Mesa-Scottsdale, AZ	2.7
8	Denver-Aurora-Lakewood, CO	2.8
8	Washington-Arlington-Alexandria, DC-VA-MD-WV	2.8
10	Boston-Cambridge-Nashua, MA-NH	2.9
10	San Diego-Carlsbad, CA	2.9

Rank	MSA	%
12	Baltimore-Columbia-Towson, MD	3.1
12	Charlotte-Concord-Gastonia, NC-SC	3.1
14	Dallas-Fort Worth-Arlington, TX	3.2
15	Detroit-Warren-Dearborn, MI	3.3
15	San Antonio-New Braunfels, TX	3.3
17	Philadelphia-Camden-Wilm., PA-NJ-DE-MD	3.4
17	Seattle-Tacoma-Bellevue, WA	3.4
19	Riverside-San Bernardino-Ontario, CA	3.6
20	New York-Newark-Jersey City, NY-NJ-PA	3.8
21	Houston-The Woodlands-Sugar Land, TX	3.9
21	Los Angeles-Long Beach-Anaheim, CA	3.9
23	Portland-Vancouver-Hillsboro, OR-WA	4.1
24	Chicago-Naperville-Elgin, IL-IN-WI	4.2

Source: Bureau of Labor Statistics
Local Area Unemployment Statistics (LAUS) program. Note: data are not seasonally adjusted

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U.S. Unemployment Rate: 3.5%


You Had Me
at Recession
(Jerry Maguire, 1996)

Defining Recession: Eyes Wide Shut

- The National Bureau of Economic Research (NBER)'s Business Cycle Dating Committee is the official recession scorekeeper – it maintains a chronology of U.S. business cycles.
- NBER's traditional definition of recession is "a significant decline in economic activity that is spread across the economy and that lasts more than a few months."
- There is no fixed rule about which indicators contribute information to the process or how they are weighted in the determination of recession.
- Because the government statistics NBER relies on are published at various lags, the NBER Committee cannot officially designate a recession until after it starts (and often not until it's over).

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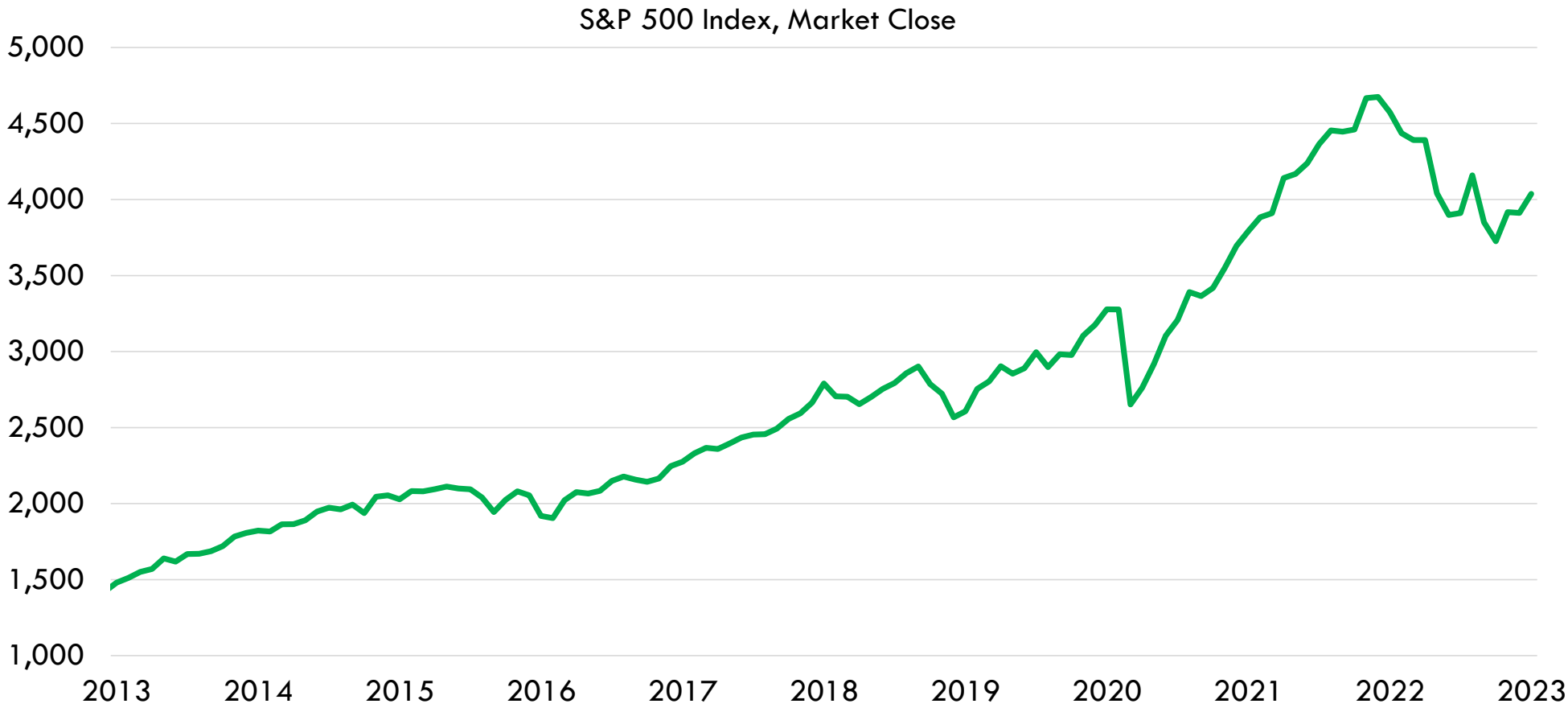
Source: National Bureau of Economic Research

S&P 500 Index, 2013 – January 2023



Source: S&P Dow Jones Indices LLC, S&P 500 [SP500], retrieved from FRED, Federal Reserve Bank of St. Louis

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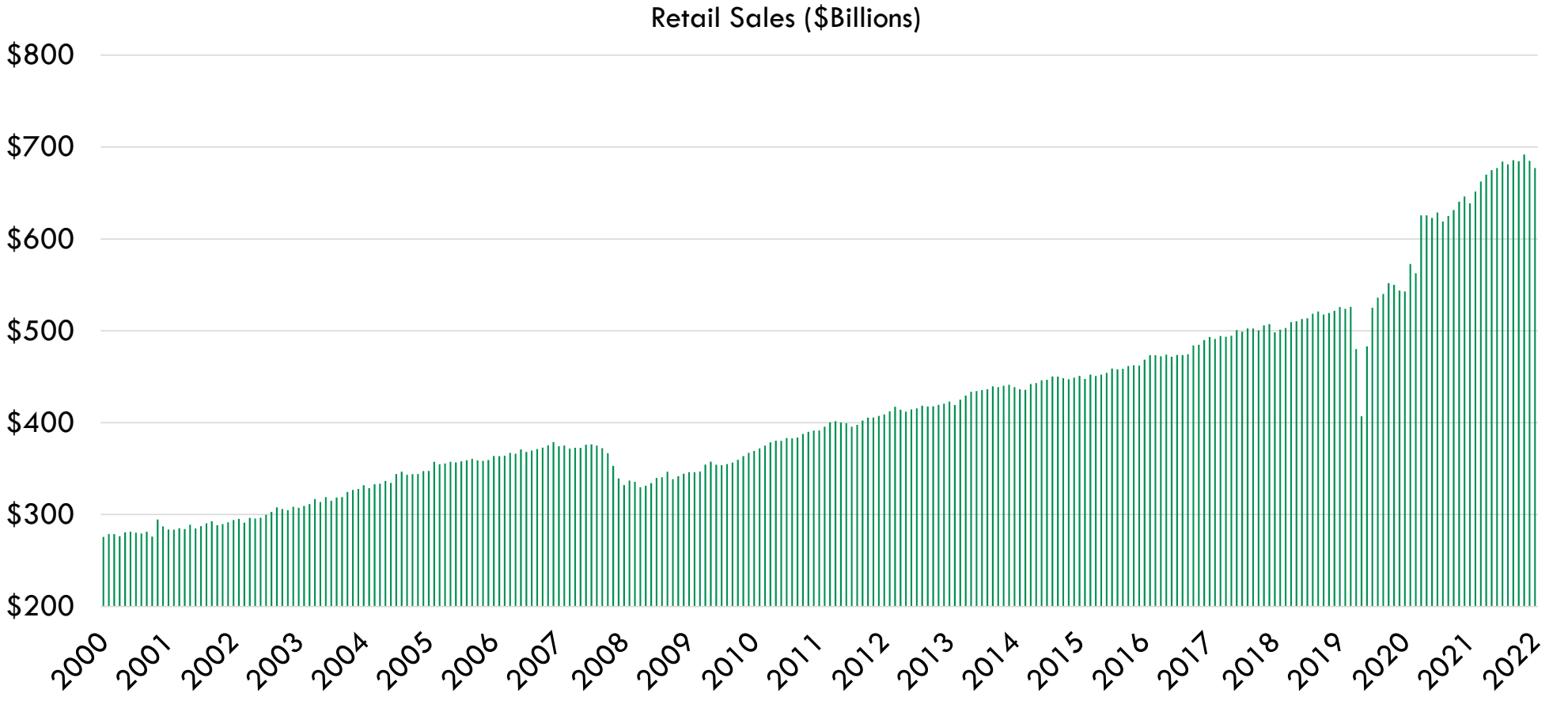
U.S. Retail Sales, 2000 – December 2022



Source: U.S. Census Bureau

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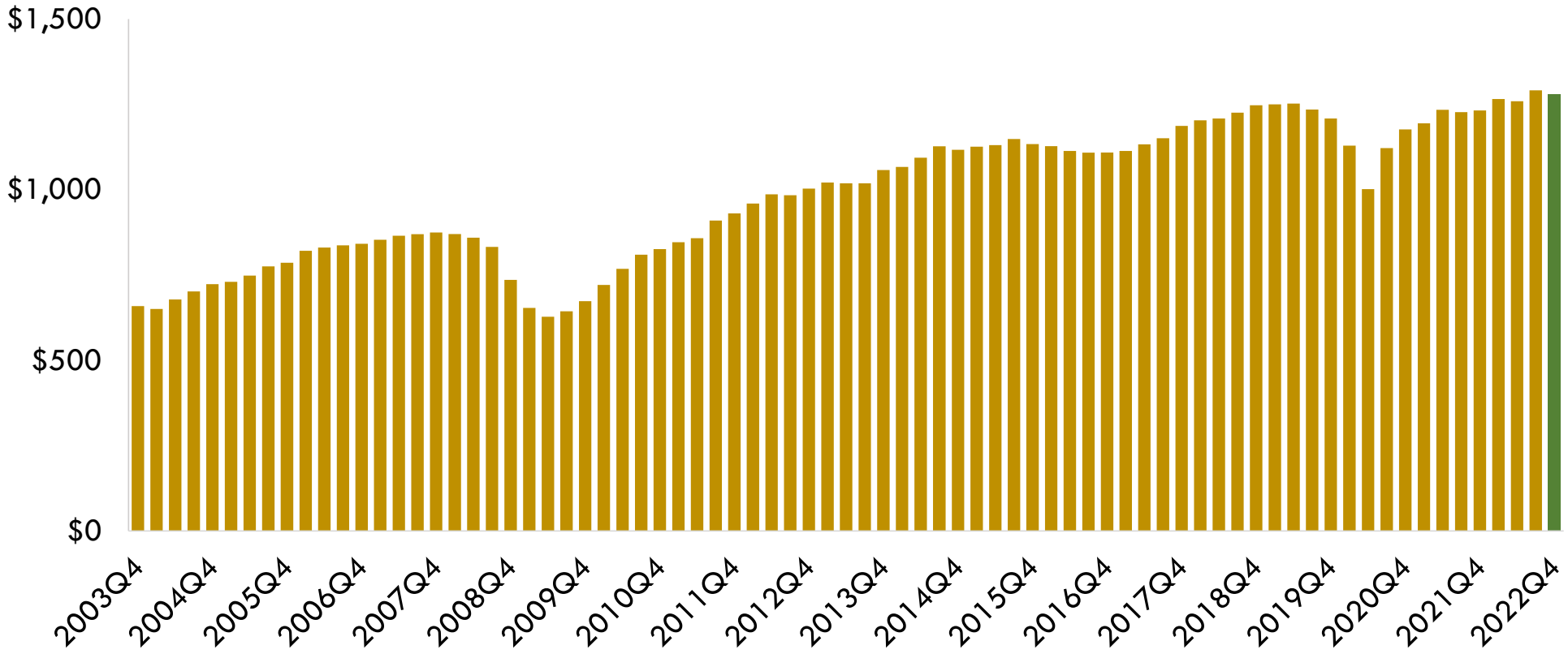
U.S. GDP: Nonresidential Fixed Investment in Equipment, 2003 – 2022Q4

$ Billions of chained 2012 dollars, seasonally adjusted annual rate



Source: U.S. Bureau of Economic Analysis *2022Q4: 1st (advance) estimate

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The Firm

- Facing economic headwinds, many large companies have missed earnings estimates recently.
- According to a November 2022 PwC survey of U.S. executives, 26% of firms are planning to reduce the number of full-time employees over the next 12-18 months.
  - In August 2022, 50% of firms said they already had or had a plan in place to reduce overall headcount.
- Four out of five executives surveyed by PwC in November 2022 said a recession is coming within the next six months.

Source: News reports; PwC Pulse Survey

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Noteworthy Layoffs Since May 2022

Company	Workforce Before Layoffs	Estimated Layoffs	Percent Laid Off
Twitter	7,500	3,700	50%
Kraken	3,600	1,100	30%
Snap	6,446	1,300	20%
Stripe	8,100	1,100	14%
Meta	87,314	11,000	13%
Lyft	5,064	700	13%
Vimeo	1,270	140	11%
Shopify	10,000	1,000	10%
Salesforce	79,000	8,000	10%
Goldman Sachs	49,000	3,200	7%
Spotify	9,800	600	6%
Alphabet	187,000	12,000	6%
Microsoft	221,000	10,000	5%
Netflix	11,300	450	4%
3M	90,000	2,500	3%
Amazon	1,544,000	18,000	1%

Source: Washington Post; company announcements & government filings
*Size of workforce prior to layoffs is as of end of Q2 2022 for Snap, Q3 2022 for Meta, Lyft and Amazon and Q4 2021 for Twitter and Netflix.

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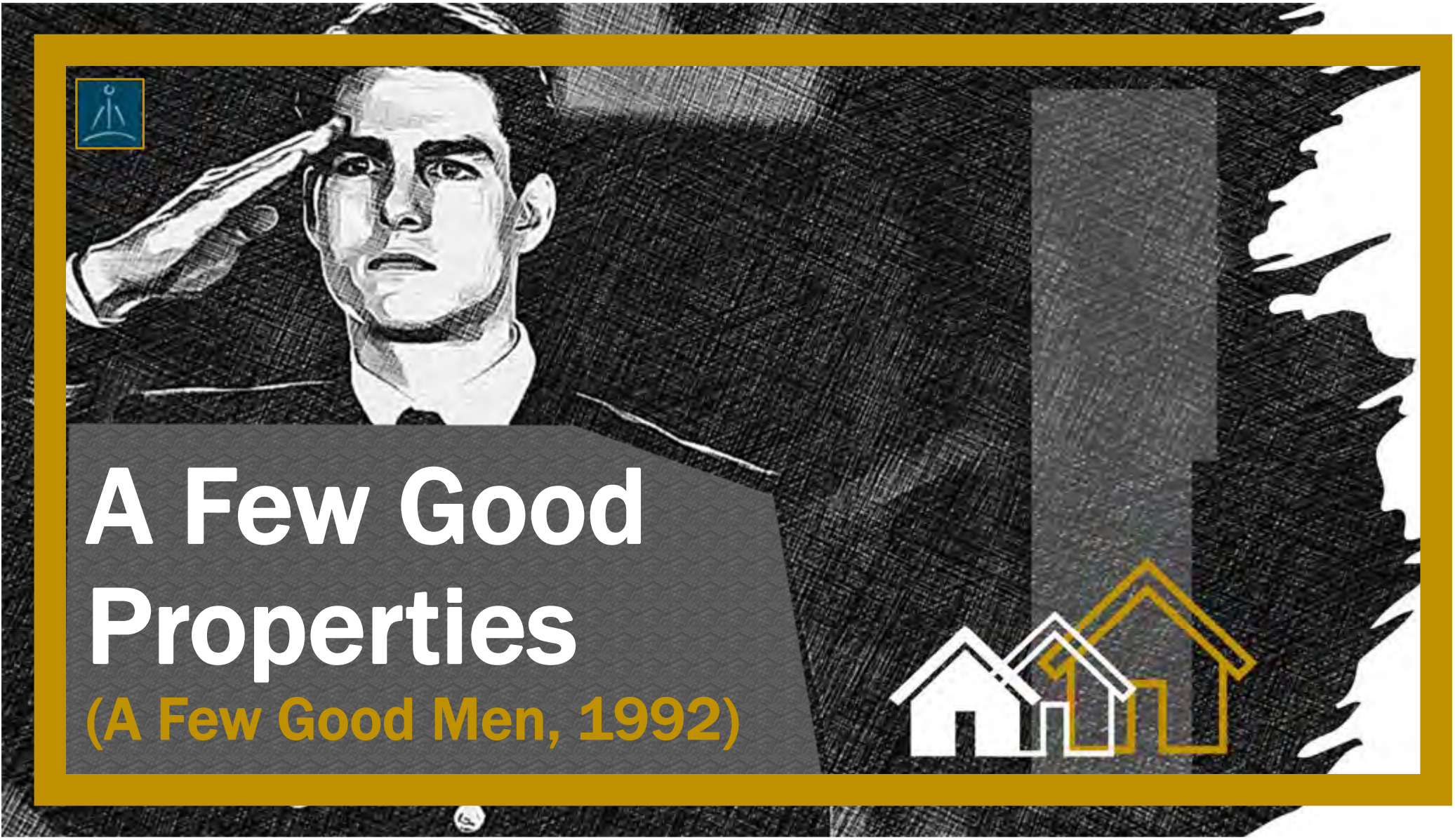
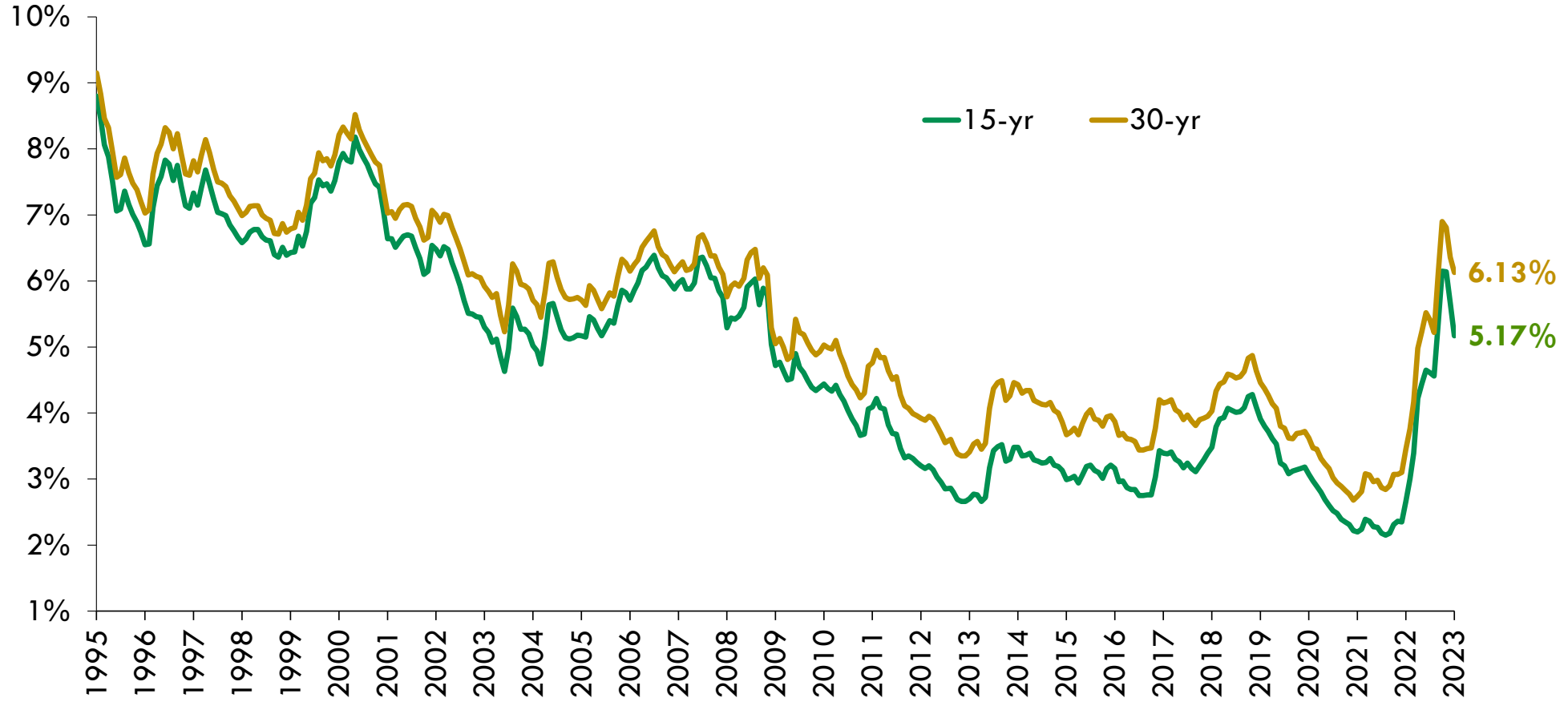

A Few Good Properties
(A Few Good Men, 1992)

U.S. 15-Year & 30-Year Fixed Mortgage Rates

1995 – January 2023*



Source: Freddie Mac *Week ending 1/26/2023

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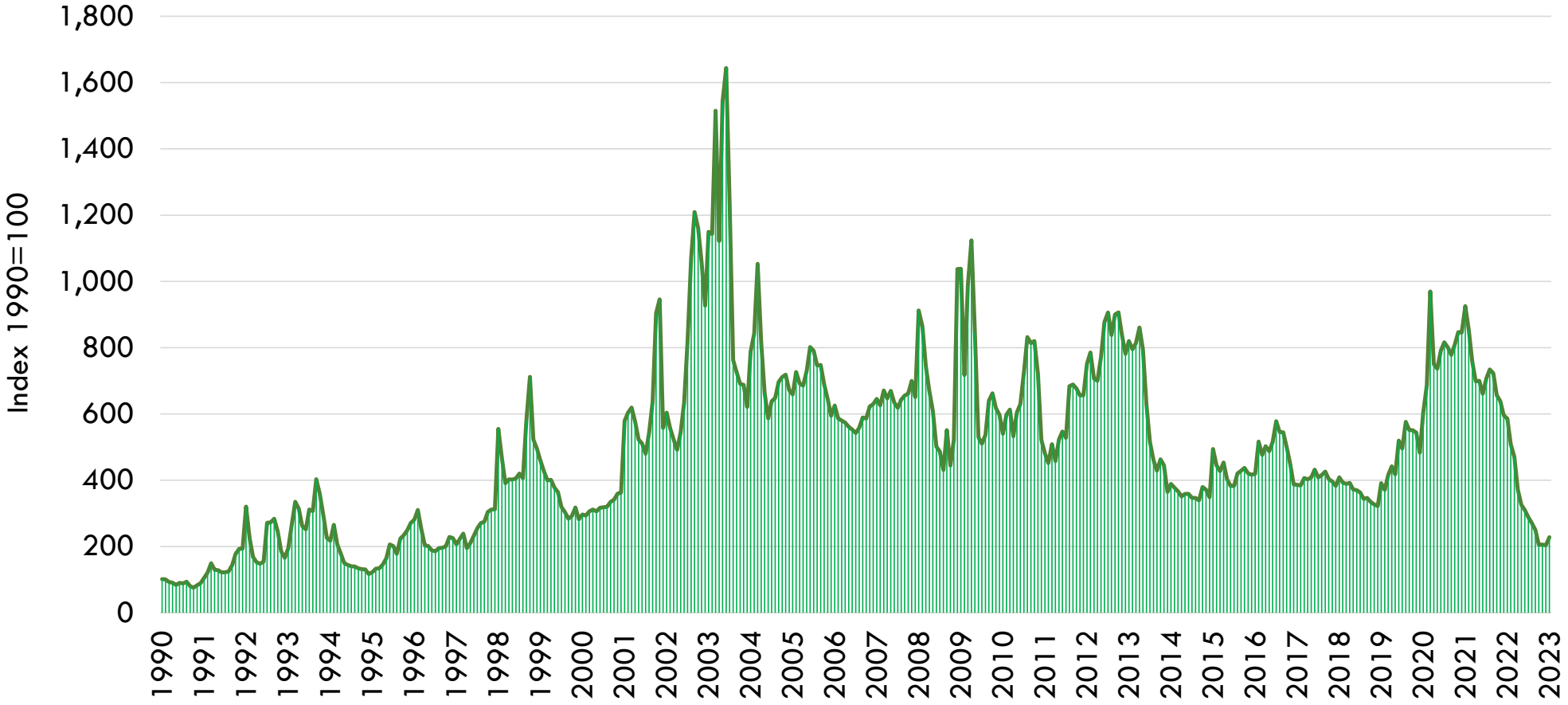
U.S. Mortgage Loan Applications Composite Index

1990 – January 2023



Source: Mortgage Bankers Association (MBA)

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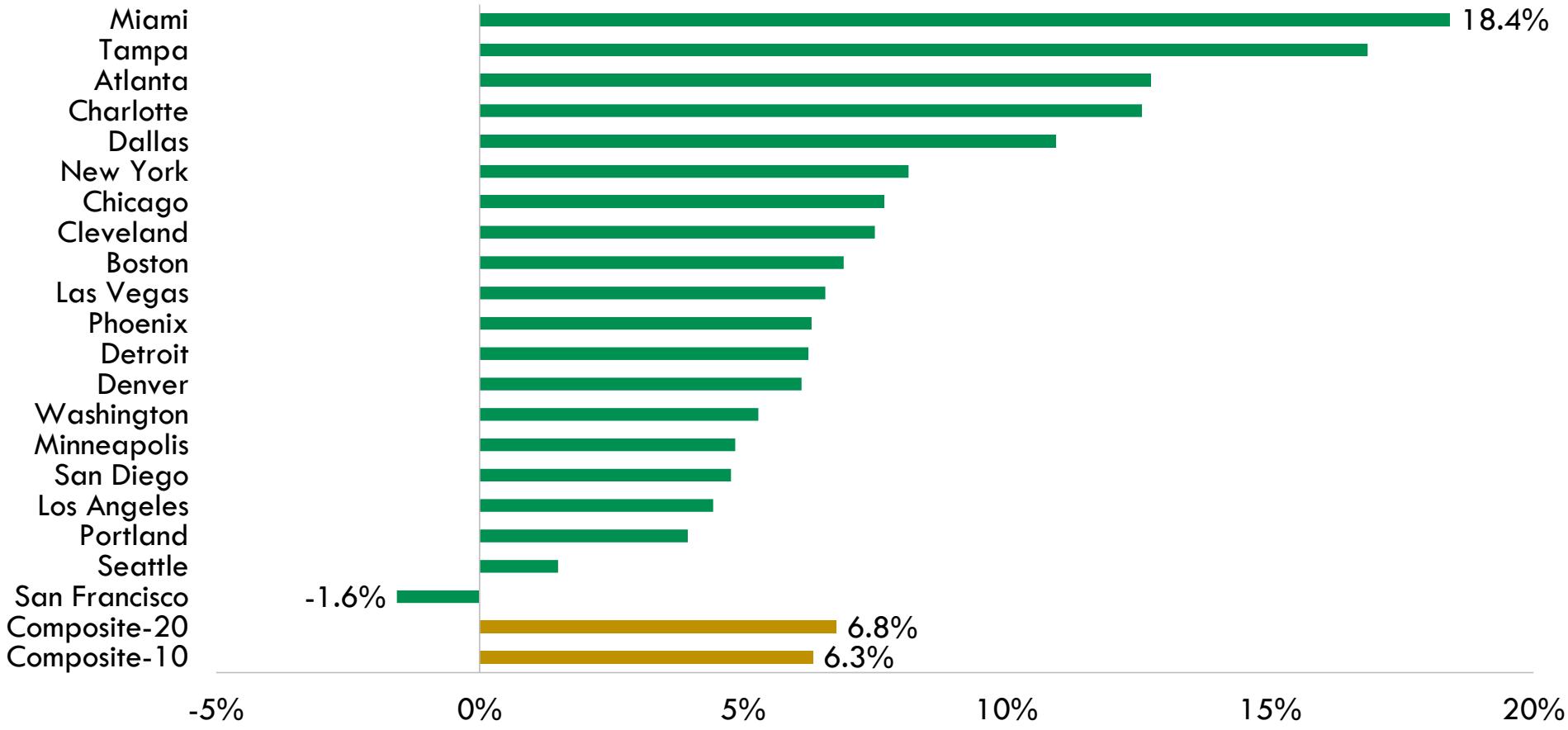
S&P Case-Shiller Home Price Index by Metro Area

12-Month % Change, November 2022



Source: Standard & Poor's

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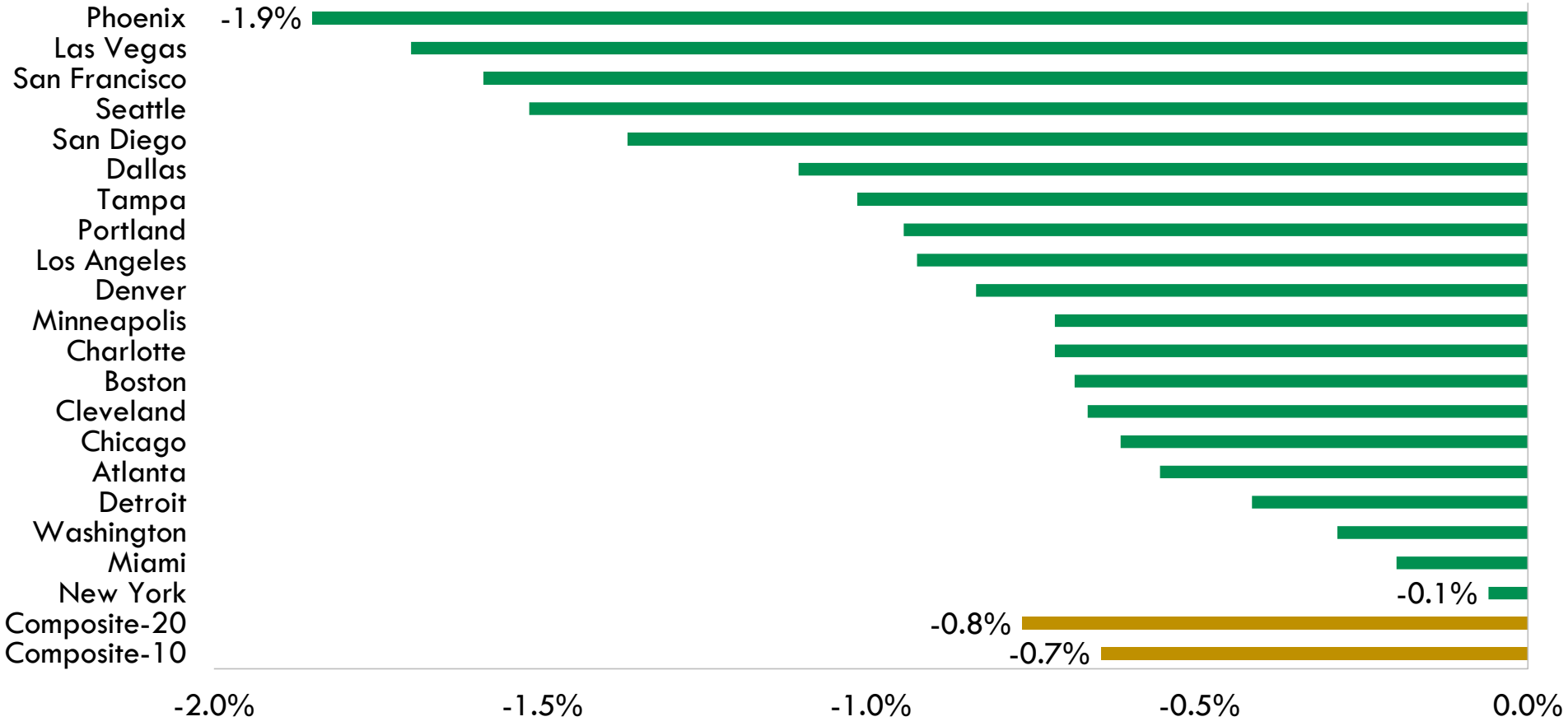
S&P Case-Shiller Home Price Index by Metro Area

1-Month % Change, November 2022



Source: Standard & Poor's

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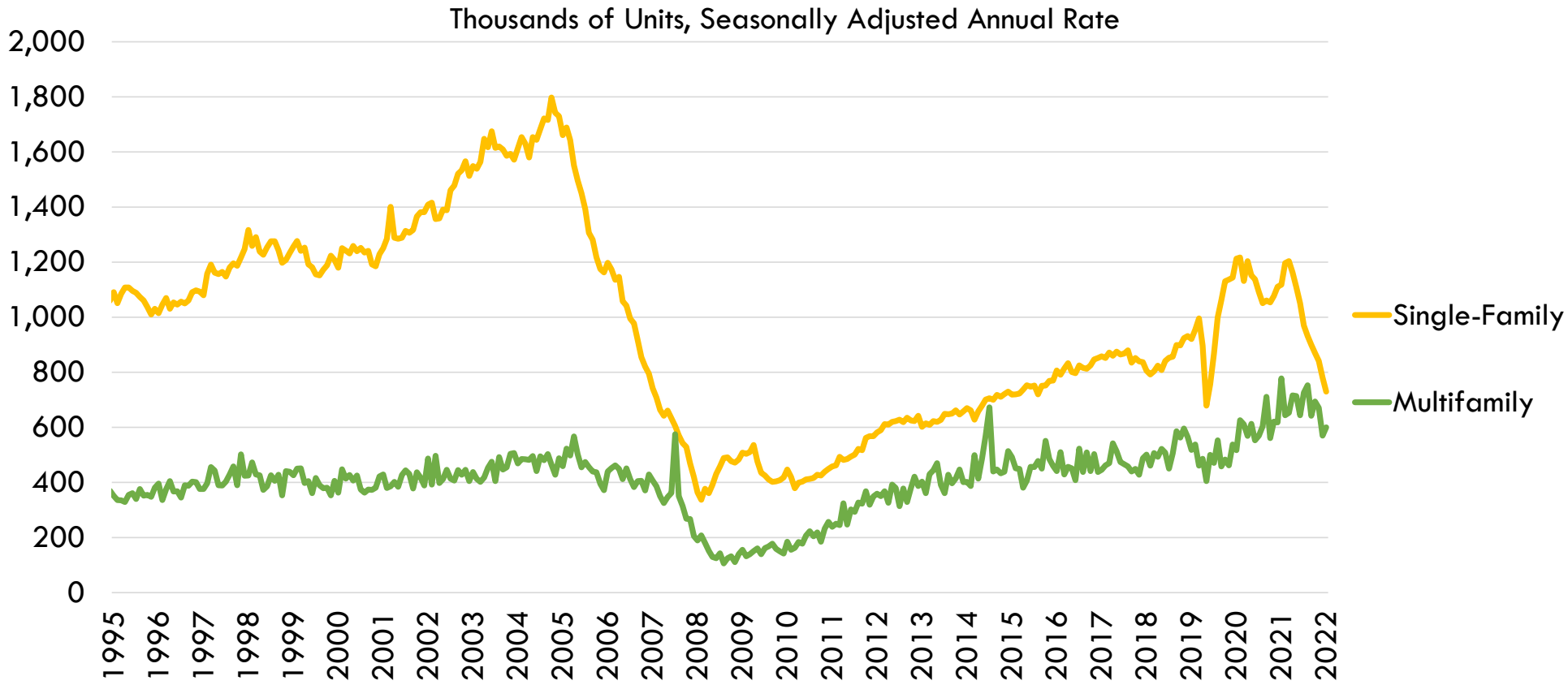
U.S. Residential Building Permits

1995 – December 2022



Source: U.S. Census Bureau

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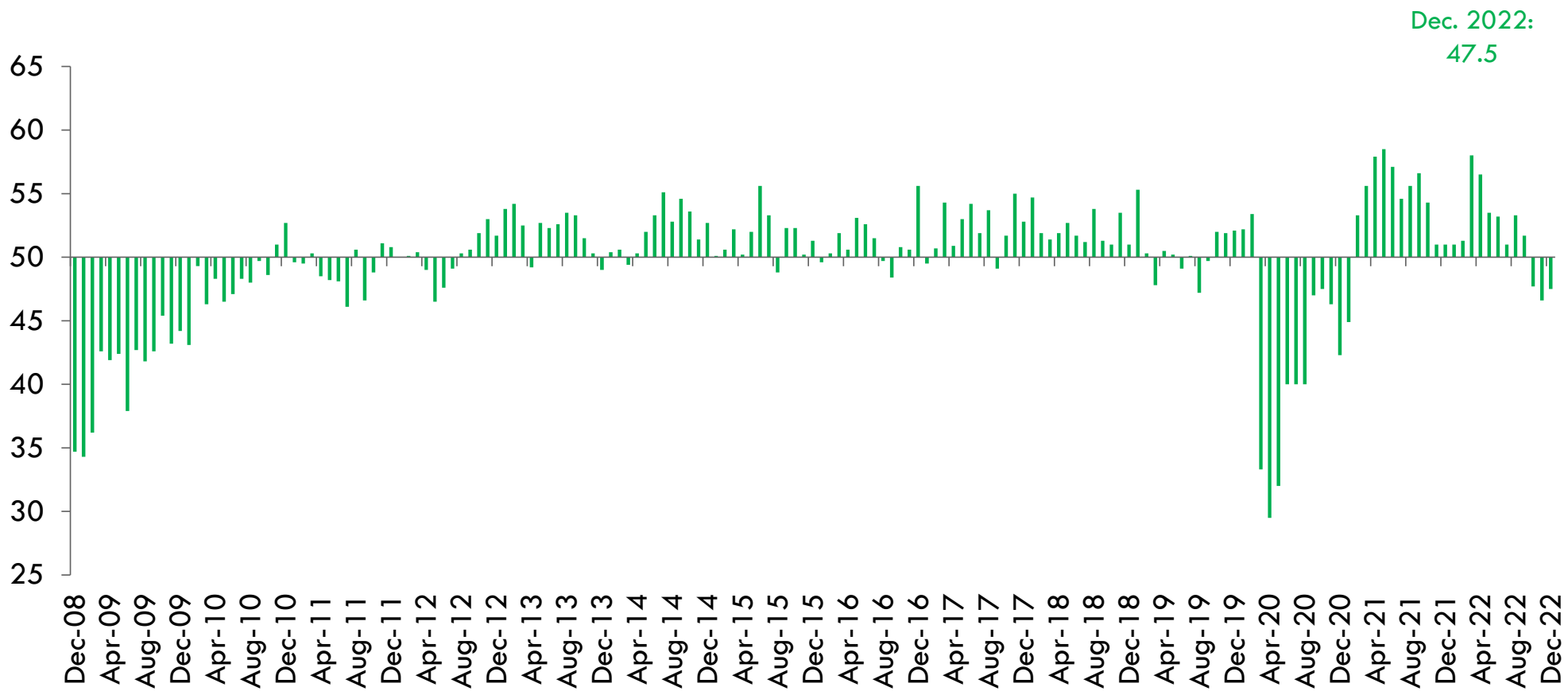
Architecture Billings Index

2008 – December 2022



Source: The American Institute of Architects

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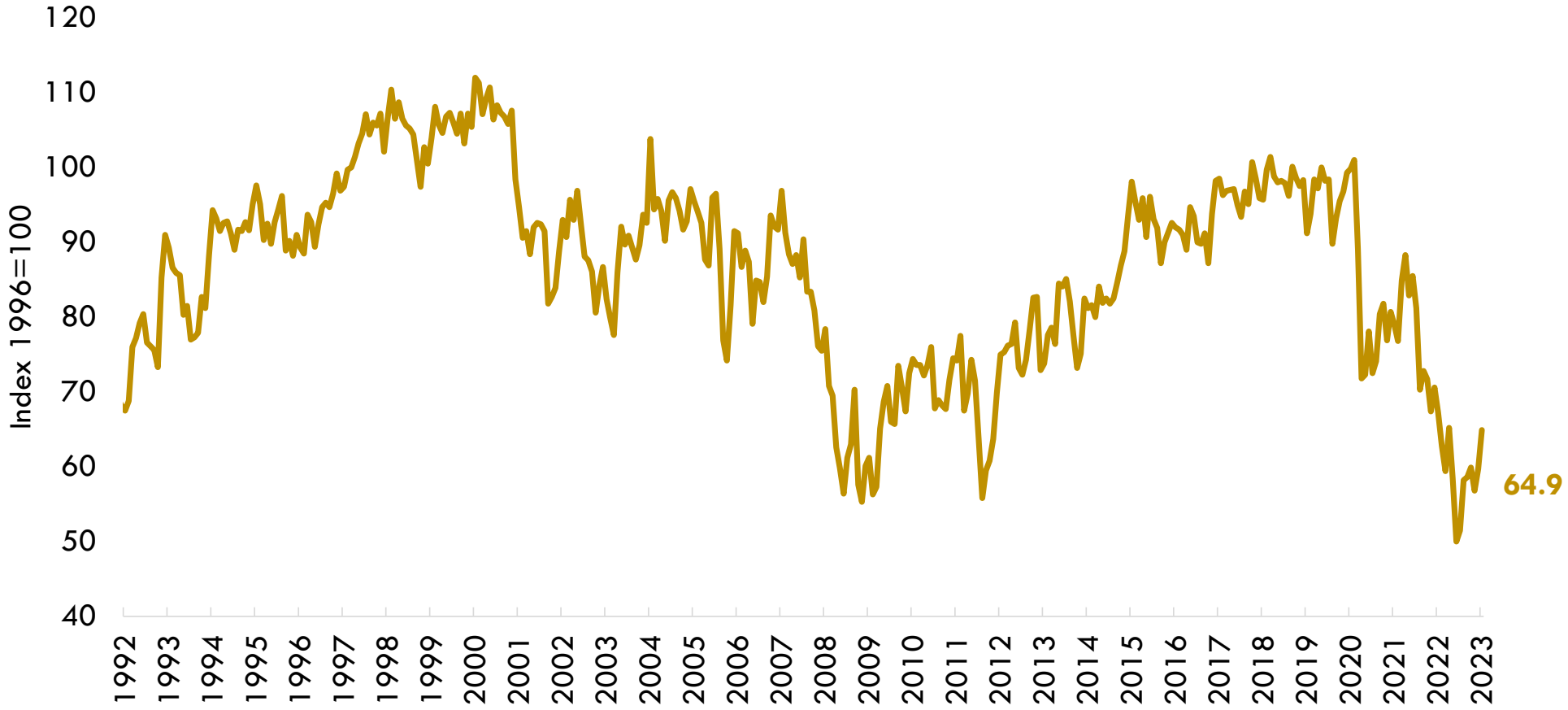
Top Gun:
Forecaster

University of Michigan Index of Consumer Sentiment

1992 – January 2023



Source: University of Michigan

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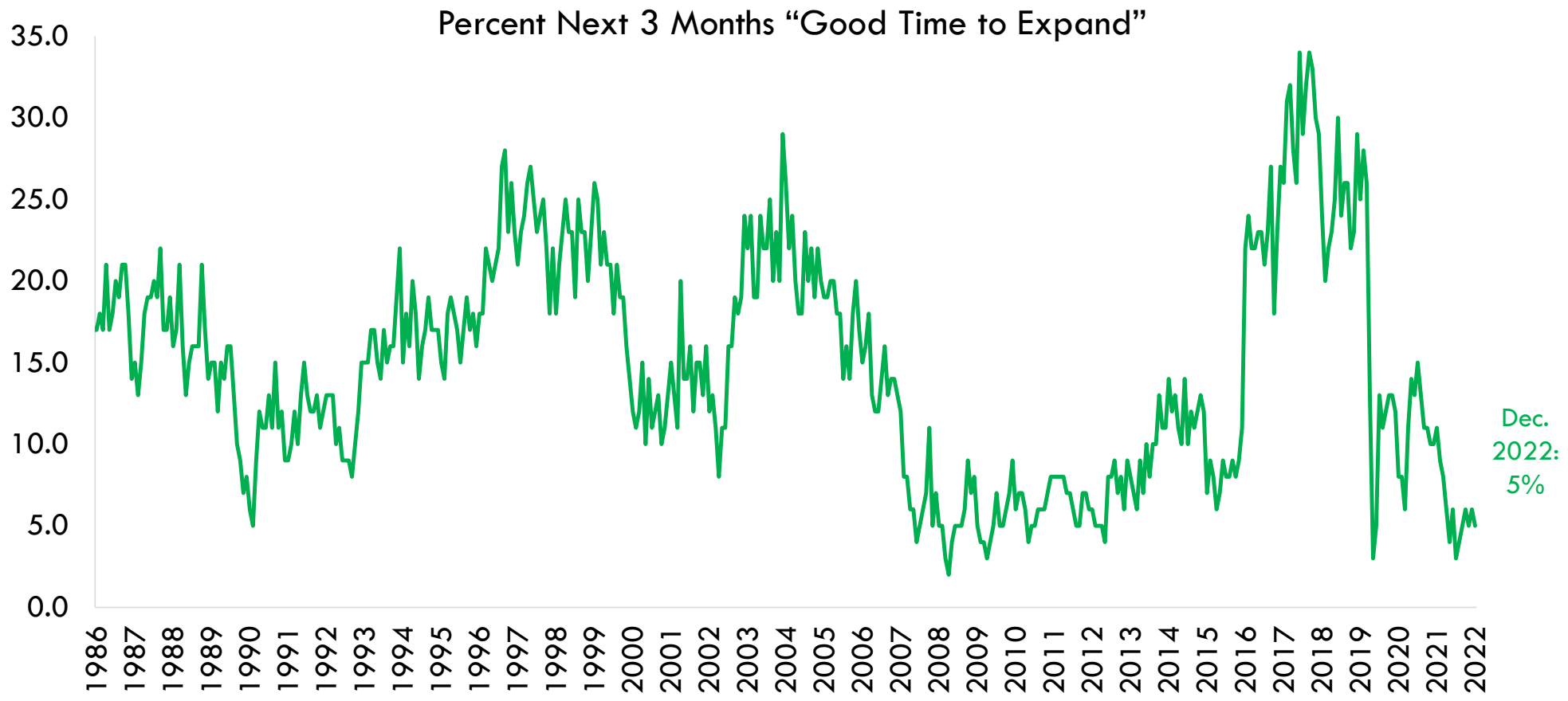
NFIB Index of Small Business Optimism: Good Time to Expand

1986 – December 2022



Source: National Federation of Independent Business (NFIB)

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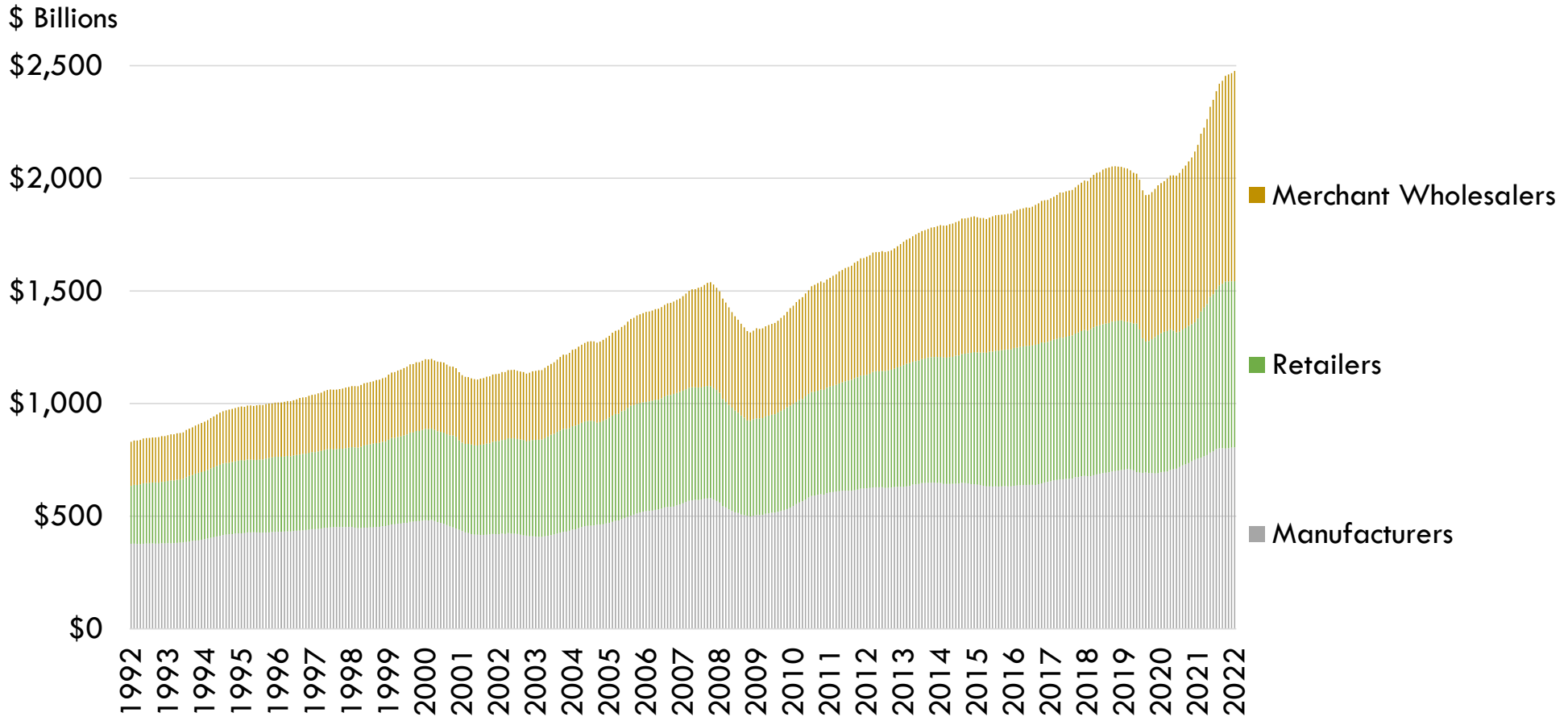
Business Inventories

1965 – November 2022



Source: U.S. Census Bureau

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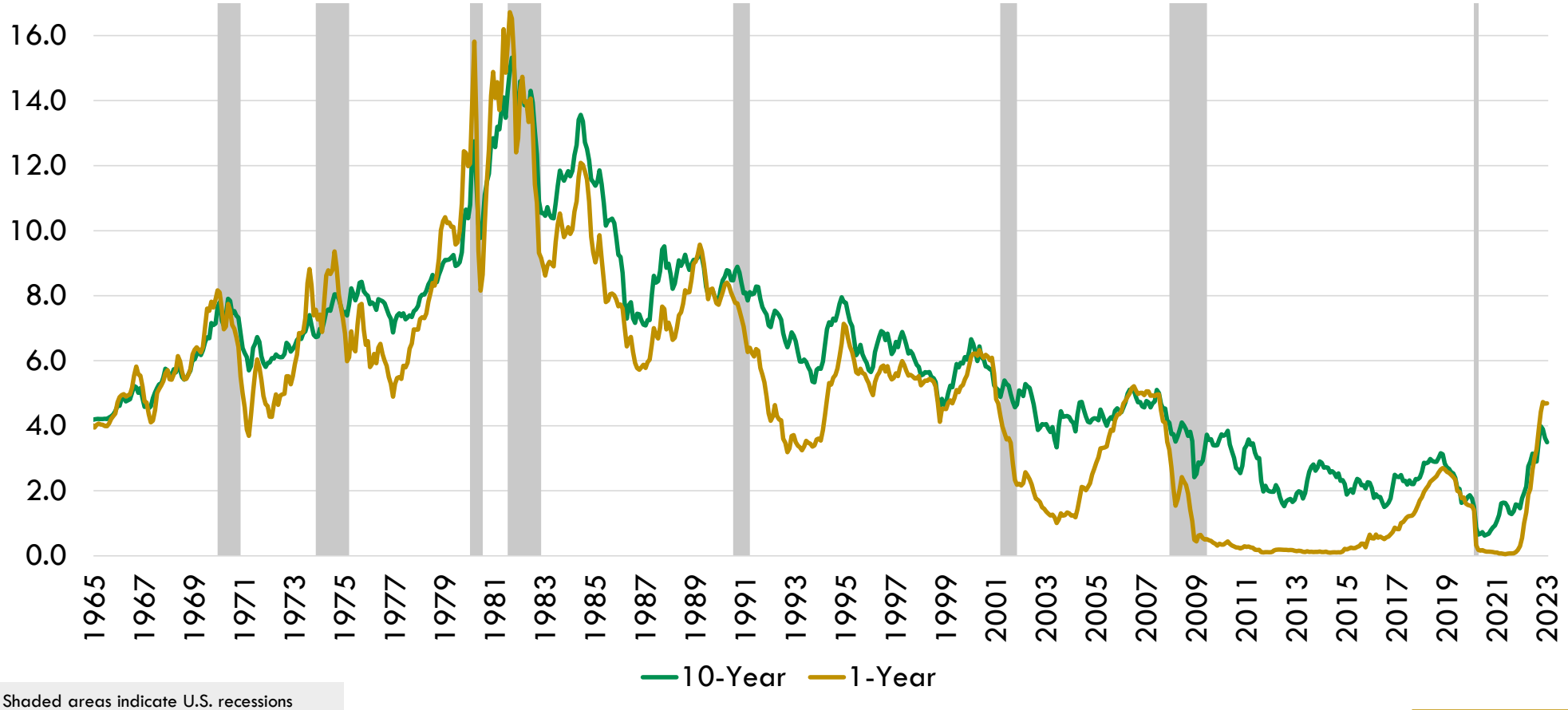
U.S. Treasury Yields : 10-Year v. 1-Year

1965 – January 2023



Shaded areas indicate U.S. recessions

Source: Federal Reserve Bank of St. Louis

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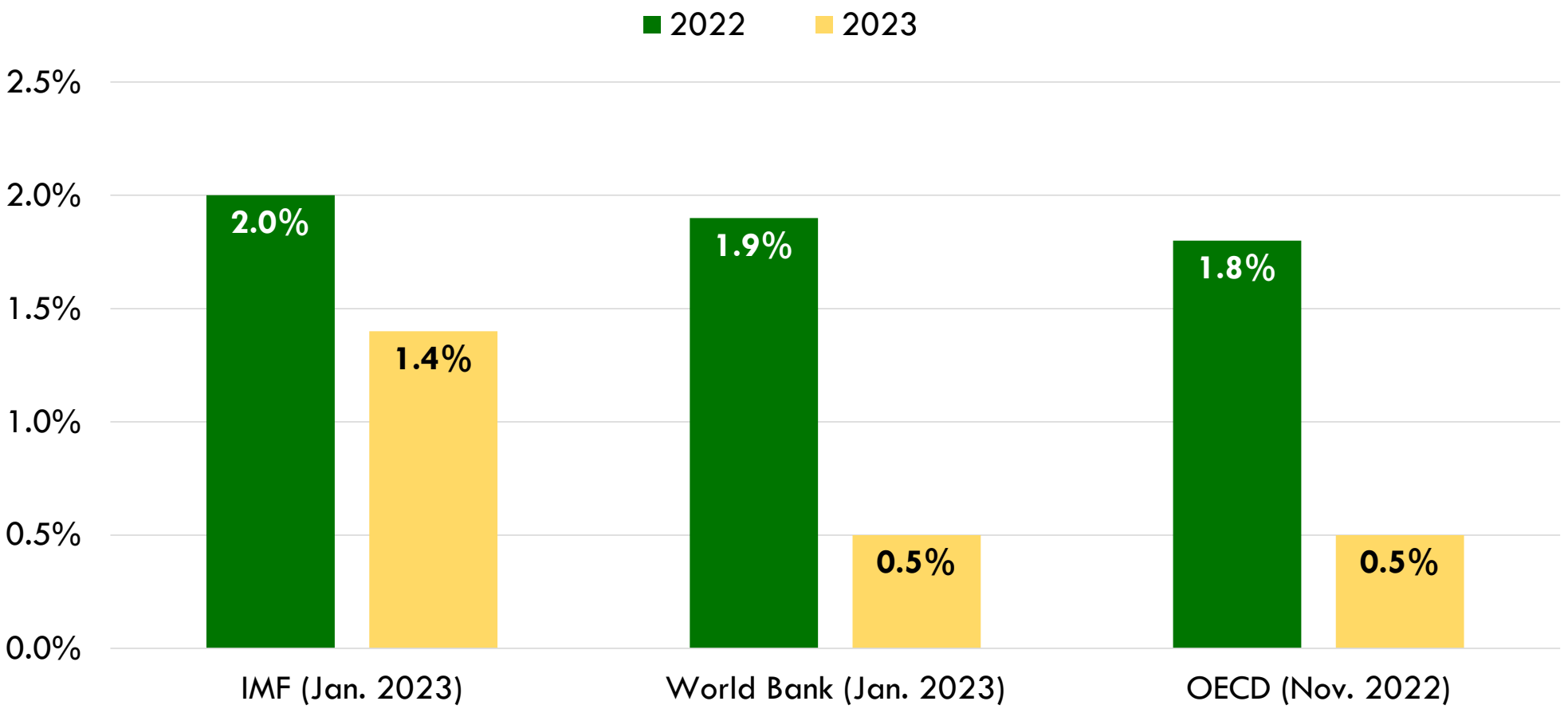
Major Economic Forecasts for U.S. GDP Growth



Source: IMF; OECD; World Bank

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You Can't Handle the Truth!

- It's going to get worse before it gets better.
- The global economy is weakening, the national economy is weakening, borrowing costs are higher, and excess inflation persists.
- Some segments stand to hold up better than others, including public construction, grocery stores, and multifamily housing.
- At some point, the Federal Reserve will stop raising rates – that will represent a key inflection point for the economy.
- But until then, recessionary conditions will prevail.

Sage Policy Group, Inc.

Thank You

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Q&A

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

Ohio School Employees Retirement System
Risk Assessment

February 17, 2023

Todd Green, ASA, EA, FCA, MAAA
John Garrett, ASA, FCA, MAAA

www.CavMacConsulting.com

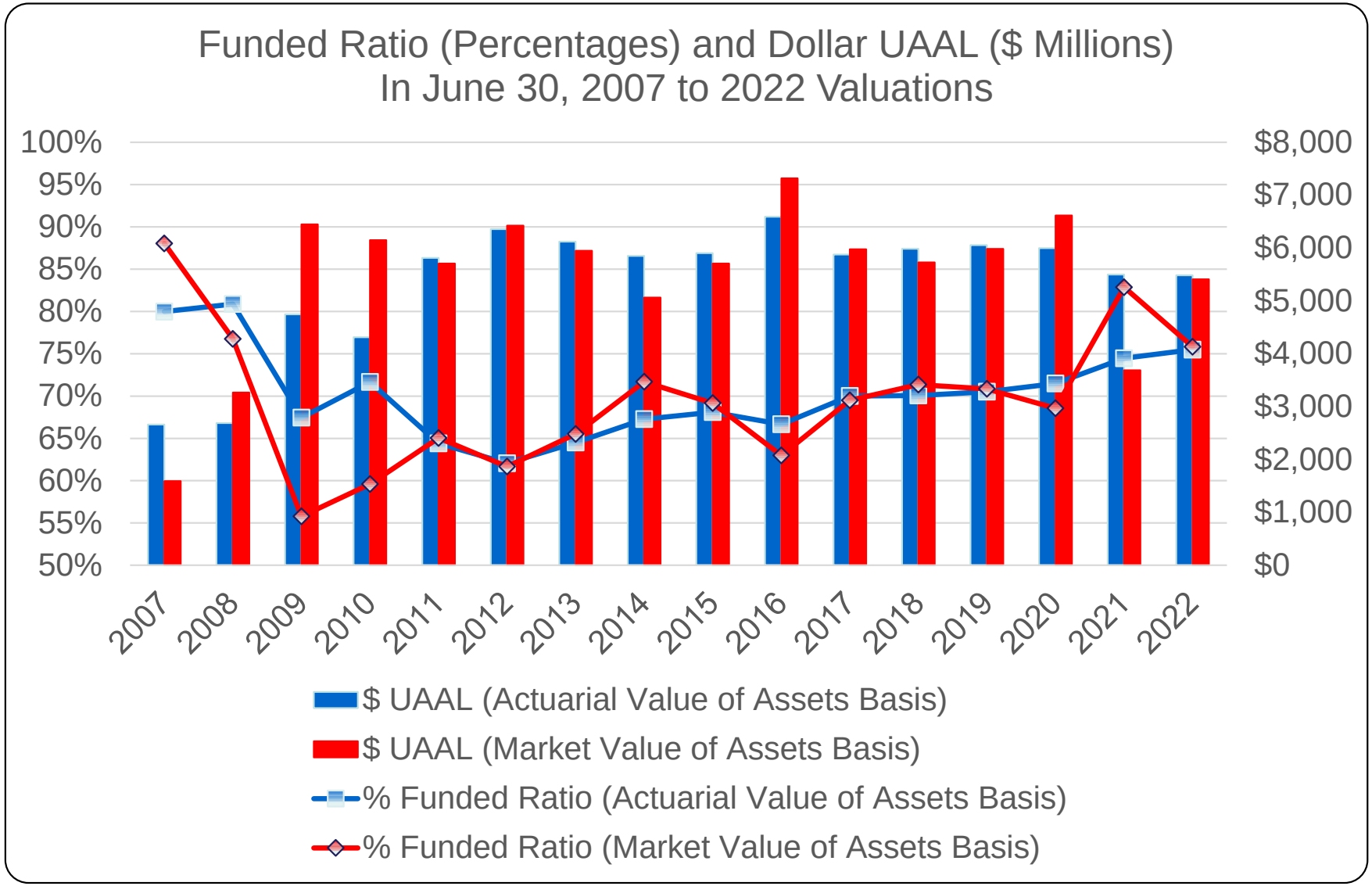
Examples of Risk

- Actuary is to identify risks that may affect the Plan's future financial condition
- Examples that are relevant for most public plans
  - ***Investment risk***: potential that return will be different than expected
  - ***Longevity risk***: potential that mortality experience will be different than expected
  - ***Covered payroll risk***: potential that covered payroll will not increase as assumed (especially important if UAL is amortized as level percent of payroll)
  - ***Active population risk***: potential for number of active members to decline or plan closed to new entrants
  - ***Contribution rate risk***: potential for contribution rates to be too high for the plan sponsor/employer to pay

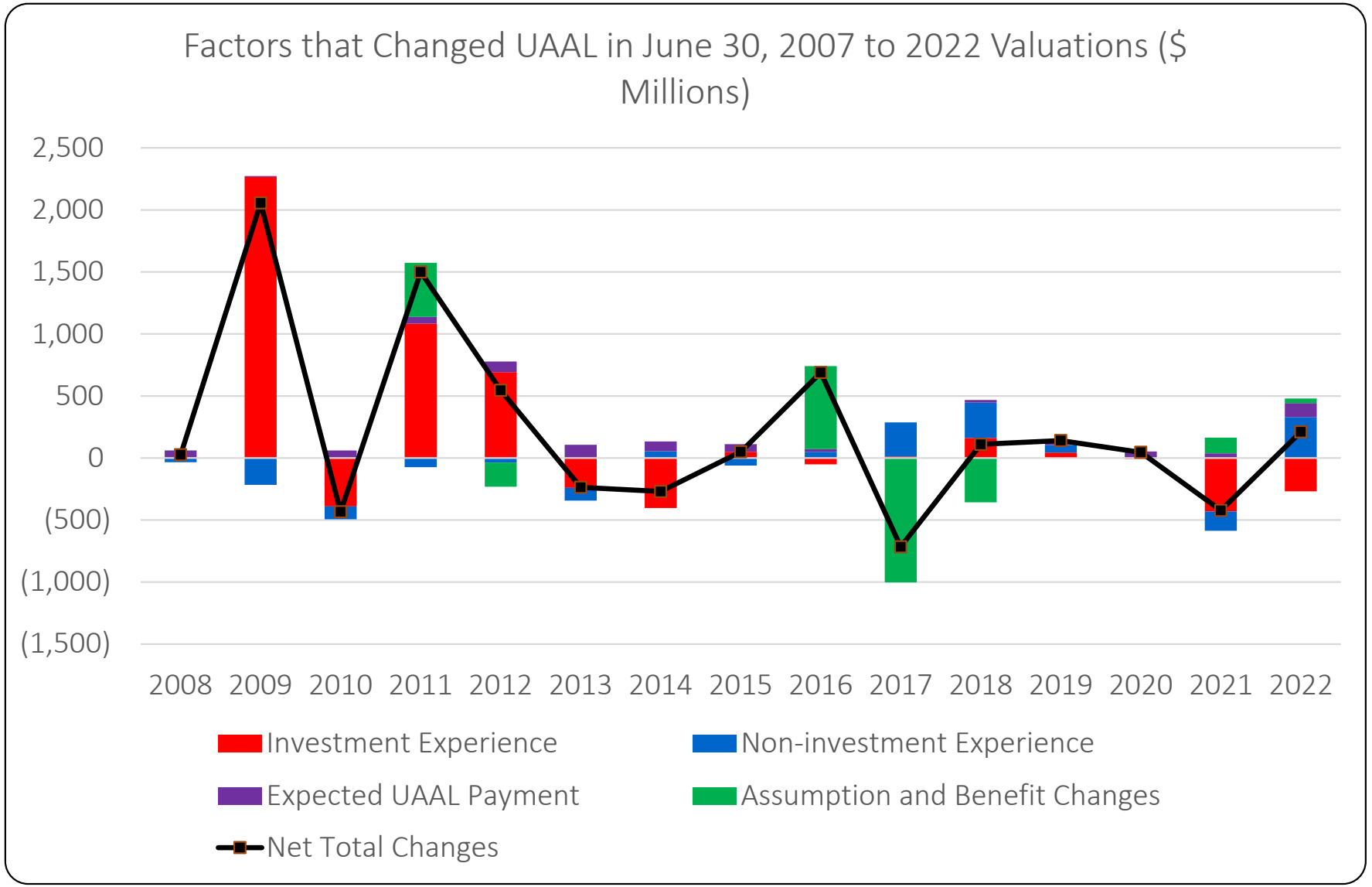
Examples of Risk Measurements

- Plan maturity measurements – actuary should calculate and disclose plan maturity measures, *which in the actuary's professional judgment*, are significant to understanding the risks associated with the Plan
- These are important, and have previously been discussed in the valuation report
  - Ratio of market value of assets to payroll (called the asset volatility ratio)
  - Ratio of net cash flow to market value of assets
  - Ratio of retired liability to total liability
  - Ratio of actives to retirees

Experience Look-Back



Experience Look-Back



Qualitative Assessment

- Amortization policy
- Size of active membership and growth in total covered payroll

Qualitative Assessment

- Funding Policy
  - The statute sets a contribution cap of 24% of payroll: 14% from employers and 10% from employees. Employer contributions in excess of those required to support the basic benefits may be allocated to retiree health care funding.
  - Effective June 30, 2015, changes were made to funding policy to meet the competing goals of providing Healthcare and improving SERS' long term funding as quickly as possible.
- Funding policy is a positive factor.
- For the risk analysis, we assumed the minimum employer contribution allocated to Basic Benefits is 10% of covered payroll.

Qualitative Assessment

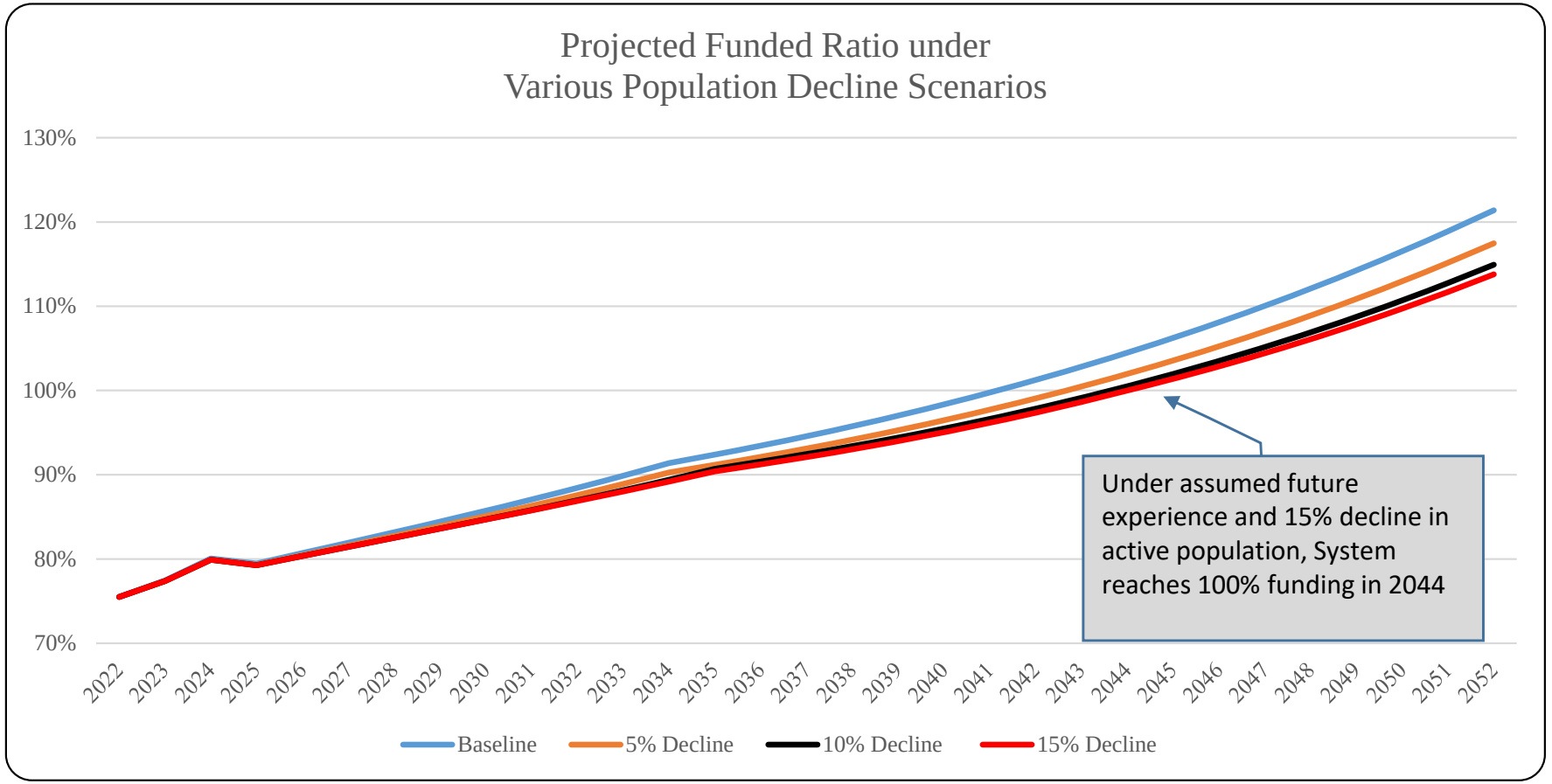
- Amortization policy
  - The SERS Board shall establish a period of not more than thirty years to amortize the SERS unfunded actuarial accrued pension liability. If in any year the period necessary to amortize the unfunded actuarial accrued pension liability exceeds thirty years, as determined by the annual actuarial valuation required by section 3309.21 of the Revised Code, the board, not later than ninety days after receipt of the valuation, shall prepare and submit to the Ohio Retirement Study Commission and the standing committees of the Ohio House of Representatives and the Ohio Senate with primary responsibility for retirement legislation a report that includes the following information:
    - The number of years needed to amortize the unfunded actuarial accrued pension liability as determined by the annual actuarial valuation;
    - A plan approved by the board that indicates how the board will reduce the amortization period of the unfunded actuarial accrued pension liability to not more than thirty years;
    - Whether the board has made any progress in meeting the thirty-year amortization period.
- Amortization Policy is a positive factor

Qualitative Assessment

- Size of active membership and growth in total covered payroll
  - UAL amortized as level percent of payroll so an assumption is used to anticipate future changes in payroll
  - If active membership decreases or salary increases are less than assumed, covered payroll may not increase as assumed
  - Forces the UAL contribution **rate** to increase
  - Last experience reduced the payroll growth assumption which improves the risk profile of the System
- Limited risk to SERS due decreased active membership

Stress Testing: Population Decline

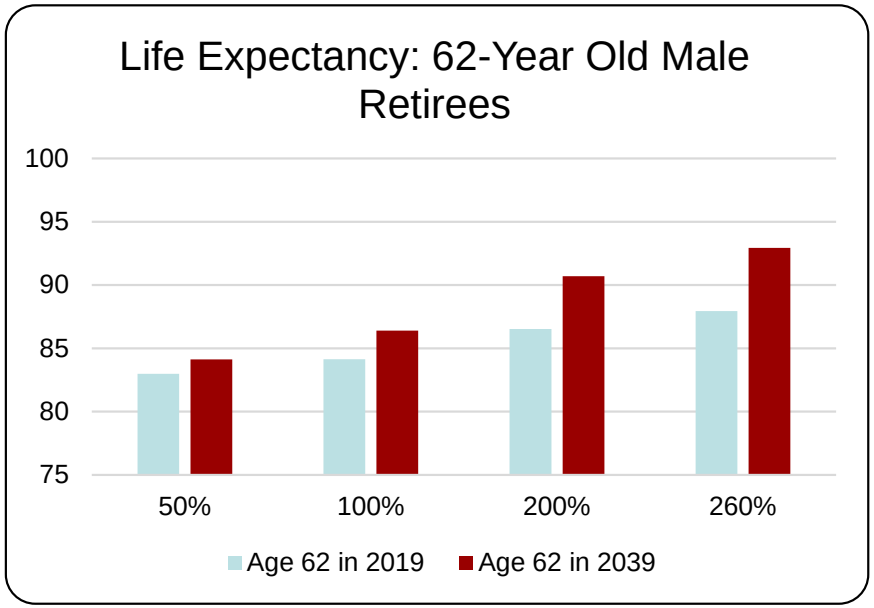
A reduction in population will result in a reduction in covered payroll which will reduce the funding available to the System since employer contributions are limited to 14% of payroll which will ultimately increase the amount of time necessary to completely amortize the unfunded liability



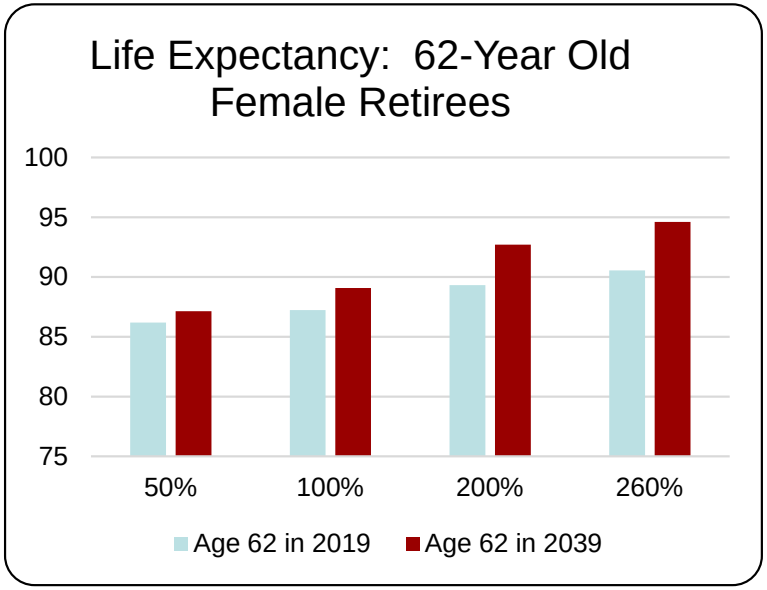
Quantitative Analysis

- Mortality Risk: changes in longevity
  - Valuation assumption anticipates small, continuous improvements in mortality each year in the future (generational mortality)
  - This assumption is reviewed and evaluated in each experience study
  - Risk is the possibility of a sudden shift and longer life expectancy
  - Recent experience represents about 1% improvement per year

Mortality Improvement Scale
Life Expectancy at Age 62



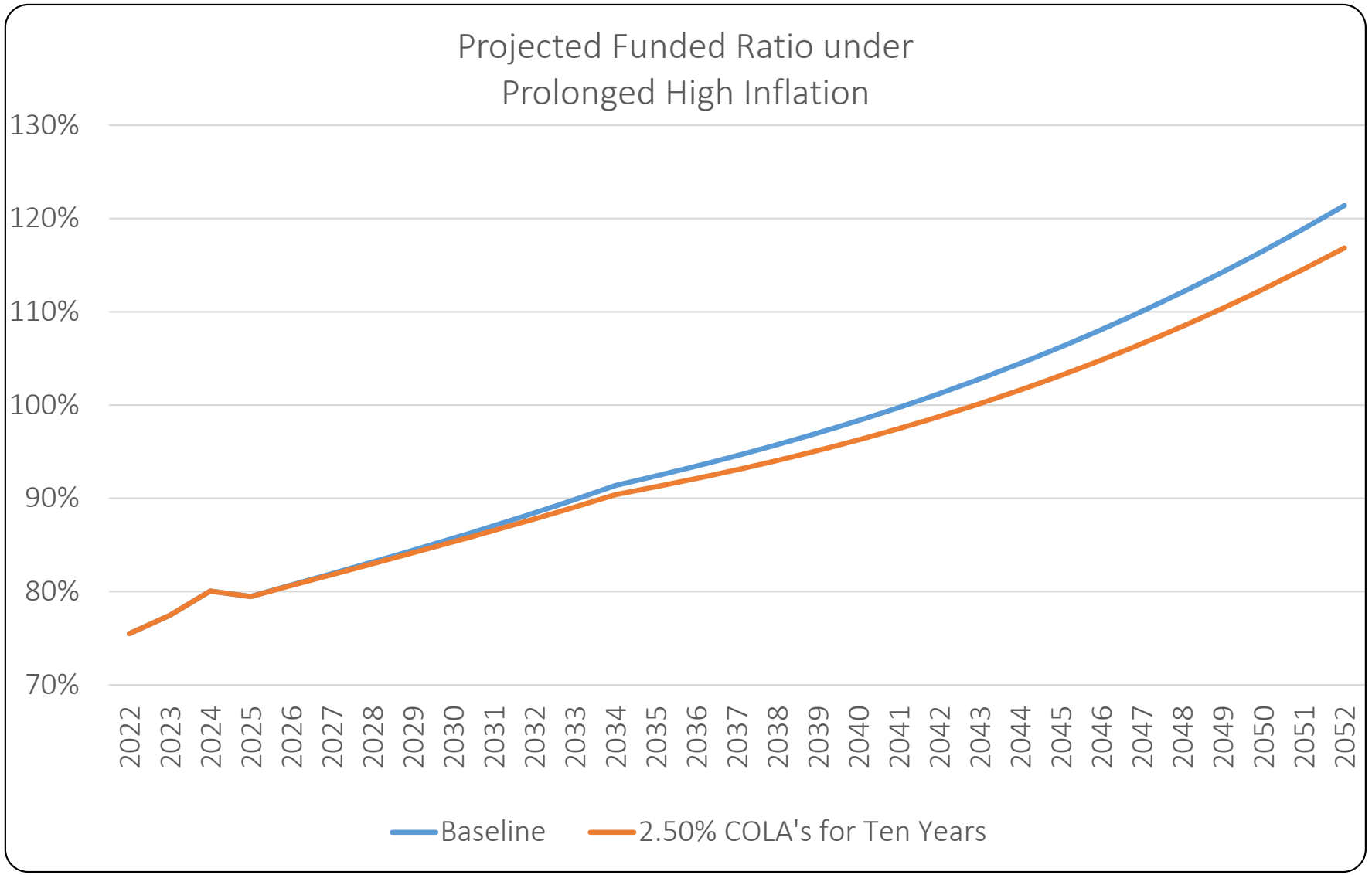
These charts show the effect on life expectancy if future mortality improvement is halved or doubled.



Qualitative Assessment

- Cost of Living Adjustments
  - Before granting a cost of living increase, the Board may adjust the percentage of any increase if the board's actuary, in its annual actuarial valuation, or in other evaluations, determines that an adjustment does not materially impair the fiscal integrity of the retirement system or is necessary to preserve the fiscal integrity of the retirement system.
  - The enactment of SB 8 granted authority to the Board to decide how many anniversaries a new benefit recipient must achieve before they become eligible to receive a COLA.
  - The authority granted to SERS in regard to cost of living adjustments is considered a positive factor in this risk assessment. Granting the Board this authority allows SERS to act proactively rather than rely on the legislative process to address an issue and mitigate a portion of the risk.

Qualitative Assessment



Usefulness of Models In Risk Assessment

- "Prediction" is not the goal of modeling. Models are beneficial for:
  - Identifying interactions between inputs that are not self-evident
  - Communicating uncertainties using simple examples or graphs
  - Answering "what if" or comparative questions
  - Identifying sensitivities of outputs to particular inputs, providing guidance on areas that require additional analysis
  - Revealing inconsistencies, discrepancies, or limitations in other types of analysis
- Models are useful as a tool for analyzing the system's objectives and strategies as well as effective as a decision-making tool

Limitations of Modeling

- All models are simplifications of how experience will unfold in the real world
- Actual experience will almost certainly be different and more complex than any scenarios modeled
- Be careful to understand what a model is intended to communicate

Sensitivity Analysis

- **Sensitivity analysis**: an analysis or simulation designed to illustrate the range of potential results when actual experience is different than expected, based on assumptions
  - Vary the rate of return incrementally over specified time period (heat map)
  - Compare results under better/worse than expected scenarios, e.g., current investment return assumption plus scenarios of +1% and -1% returns
  - Compare results under different sets of assumptions

Sensitivity Analysis

Note: investment return assumption is not changed. Actual returns are assumed to be the rate shown over the 10 year period.

Funded Ratio at June 30 Valuation

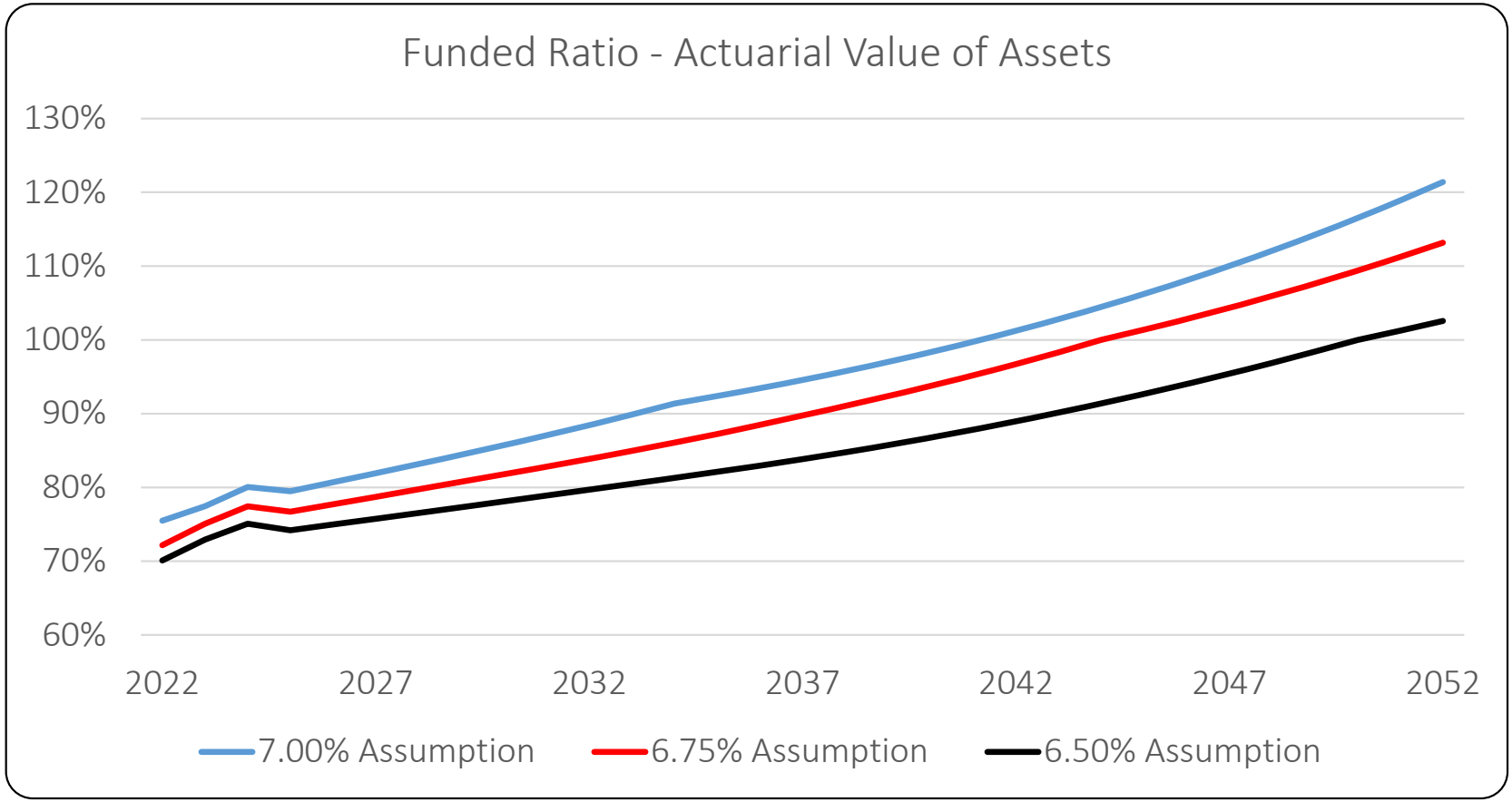
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
5.00%	75%	77%	79%	77%	77%	76%	76%	75%	75%	74%	73%
5.25%	75%	77%	79%	77%	77%	77%	77%	76%	76%	75%	75%
5.50%	75%	77%	79%	78%	78%	78%	77%	77%	77%	77%	77%
5.75%	75%	77%	79%	78%	78%	78%	78%	79%	79%	79%	79%
6.00%	75%	77%	79%	78%	79%	79%	79%	80%	80%	80%	81%
6.25%	75%	77%	80%	79%	79%	80%	80%	81%	81%	82%	82%
6.50%	75%	77%	80%	79%	80%	81%	81%	82%	83%	84%	84%
6.75%	75%	77%	80%	79%	80%	81%	82%	83%	84%	85%	86%
7.00%	75%	77%	80%	79%	81%	82%	83%	84%	86%	87%	88%
7.25%	75%	77%	80%	80%	81%	83%	84%	86%	87%	89%	91%
7.50%	75%	78%	80%	80%	82%	83%	85%	87%	89%	91%	92%
7.75%	75%	78%	81%	80%	82%	84%	86%	88%	90%	92%	94%
8.00%	75%	78%	81%	81%	83%	85%	87%	89%	92%	94%	96%

Uses actuarial value of assets so smoothing of returns is reflected.

Investment Risk: Sensitivity Analysis

Change in Investment Return Assumption

The 7.0% assumption (green line) has the highest funded ratio because liabilities/costs are lowest and assets grow more quickly than in the other two scenarios.



Stress Testing

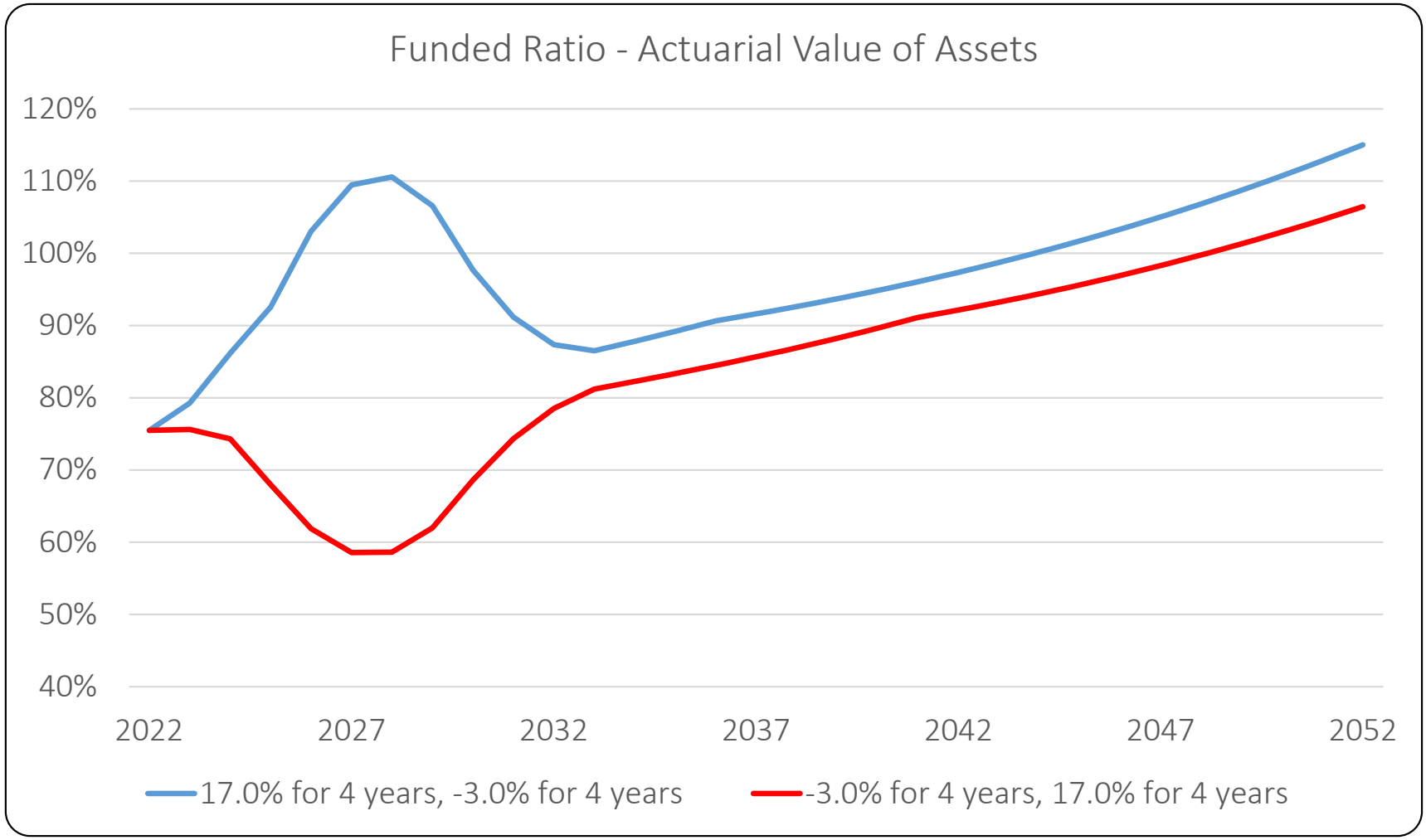
- **Stress test**: an analysis or simulation designed to determine the ability of a financial institution to manage an economic crisis or certain stressors

- **Purpose** is to **identify the stressors** to the System and **optimize policies and procedures** (assumptions, funding policy, and perhaps benefits) in order to **improve sustainability** and **educate stakeholders** of potential risks
  - Focus should be on the decisions to be considered based on the outcomes of the test

Typical Procedure for Stress Test

- Project historical crisis data into the future and simulate what would happen to system's funding
- Deterministic projections using one set of assumed returns
- Take several sets of economic scenarios and project and compare key actuarial metrics

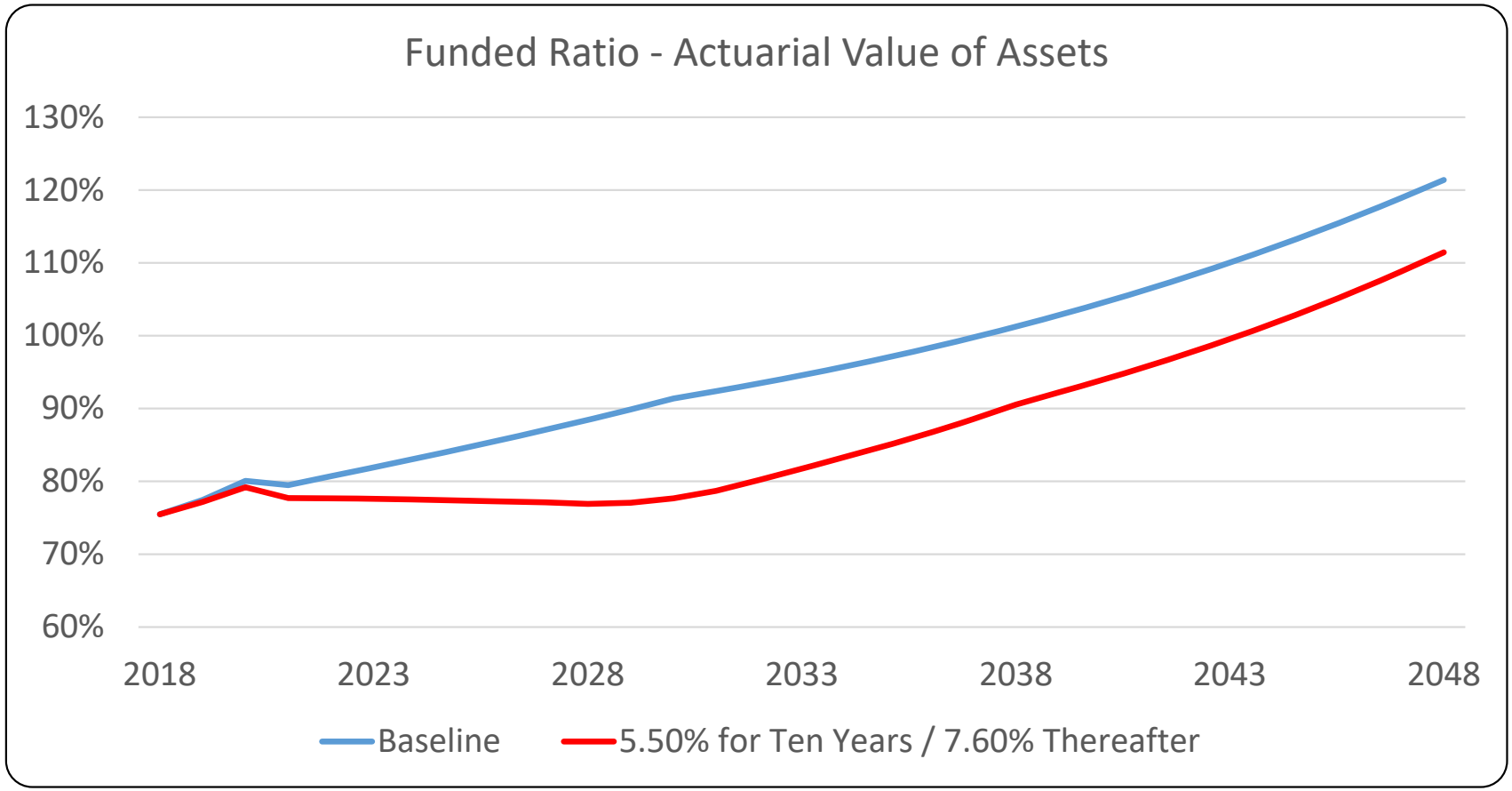
Stress Testing: Order of Returns



The same geometric return occurs over this period, but when low returns occur first, it results in a difference of $3.3 billion in asset value.

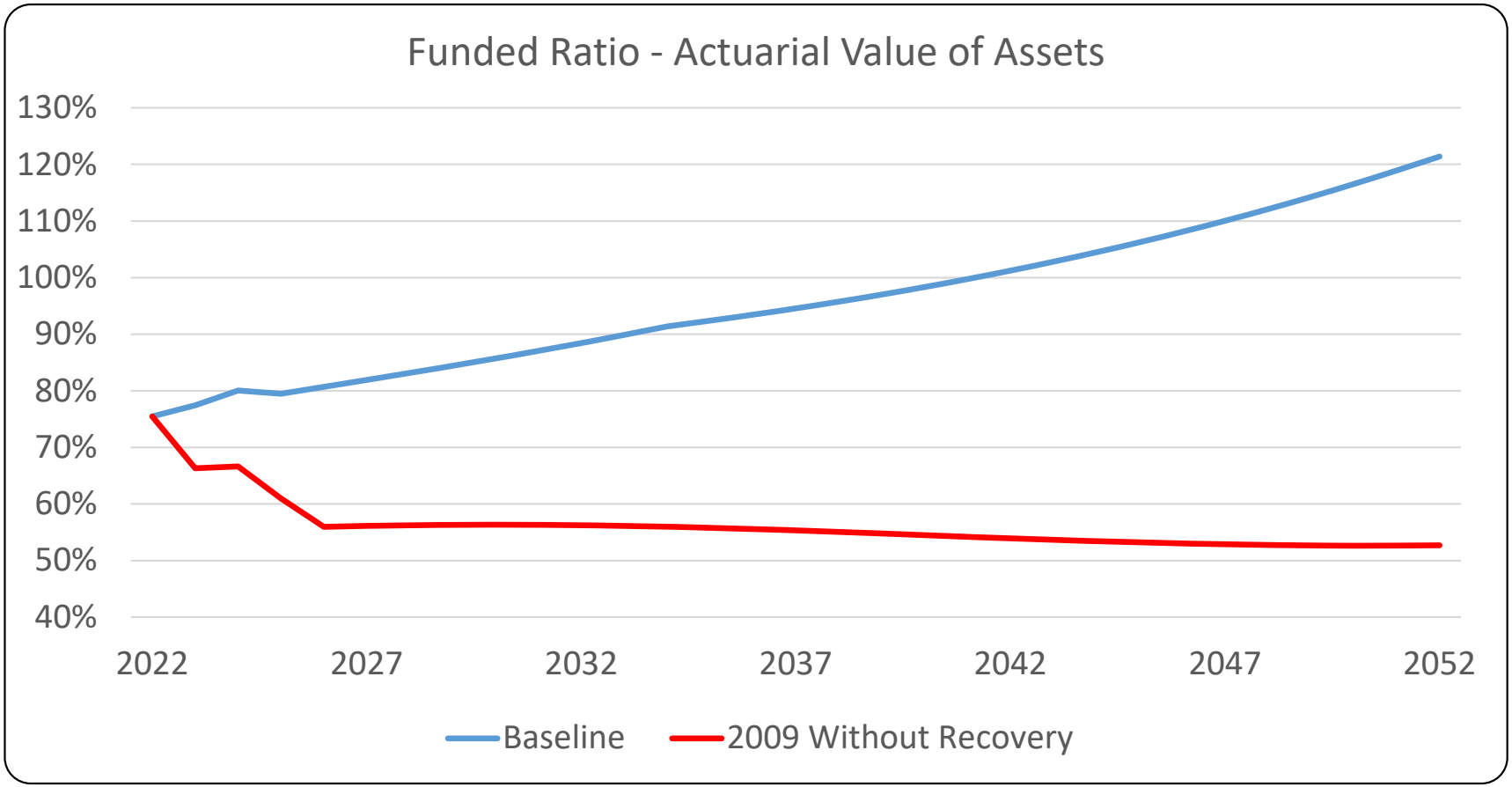
Stress Testing
Low Returns for Sustained Period

Low returns over the next 10 years reduce the funded ratio until 2029. Ultimately, the difference is eliminated and reversed as the higher investment returns result in a higher funded ratio at the end of the period.



Stress Testing: Shock Return

Under a scenario that the plan suffers a -22.9% return in 2023 without a subsequent market recovery, the funded ratio drops for the entire projection period.



Stochastic Analysis

- Stochastic modeling is the most sophisticated analysis available for investment return impact and provides the Board better information on likelihood of future actuarial outcomes.

- This analysis produces a distribution of possible future valuation results, directly reflecting the impact of investment return volatility on funding over time.

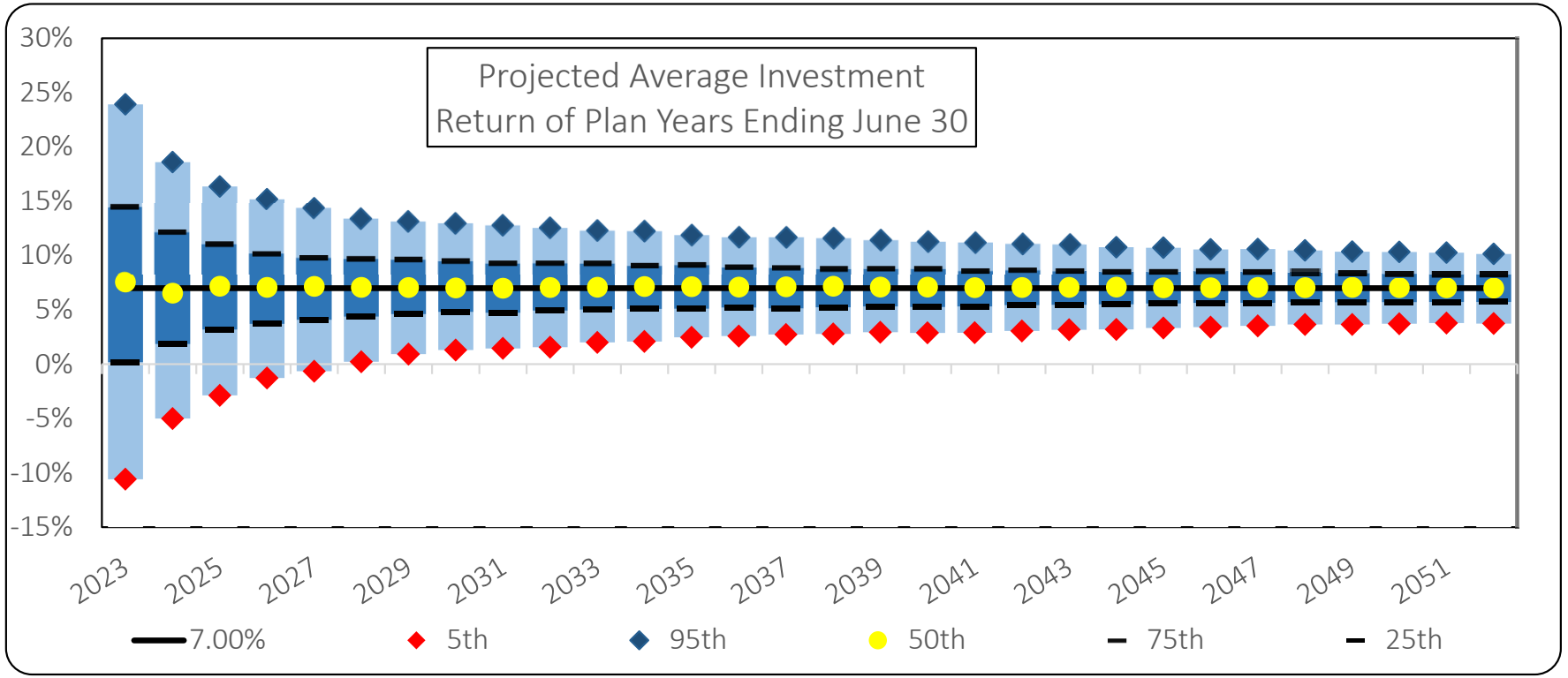
Stochastic Analysis

Probability of funded ratio being lower than a certain threshold at any time during the projection period.

	Ratio <40%	Ratio <50%	Ratio <60%	Ratio <70%	Ratio <80%
2022 – 2027	0%	0%	2%	8%	64%
2022 – 2032	0%	1%	5%	14%	53%
2022 – 2037	1%	3%	8%	17%	47%

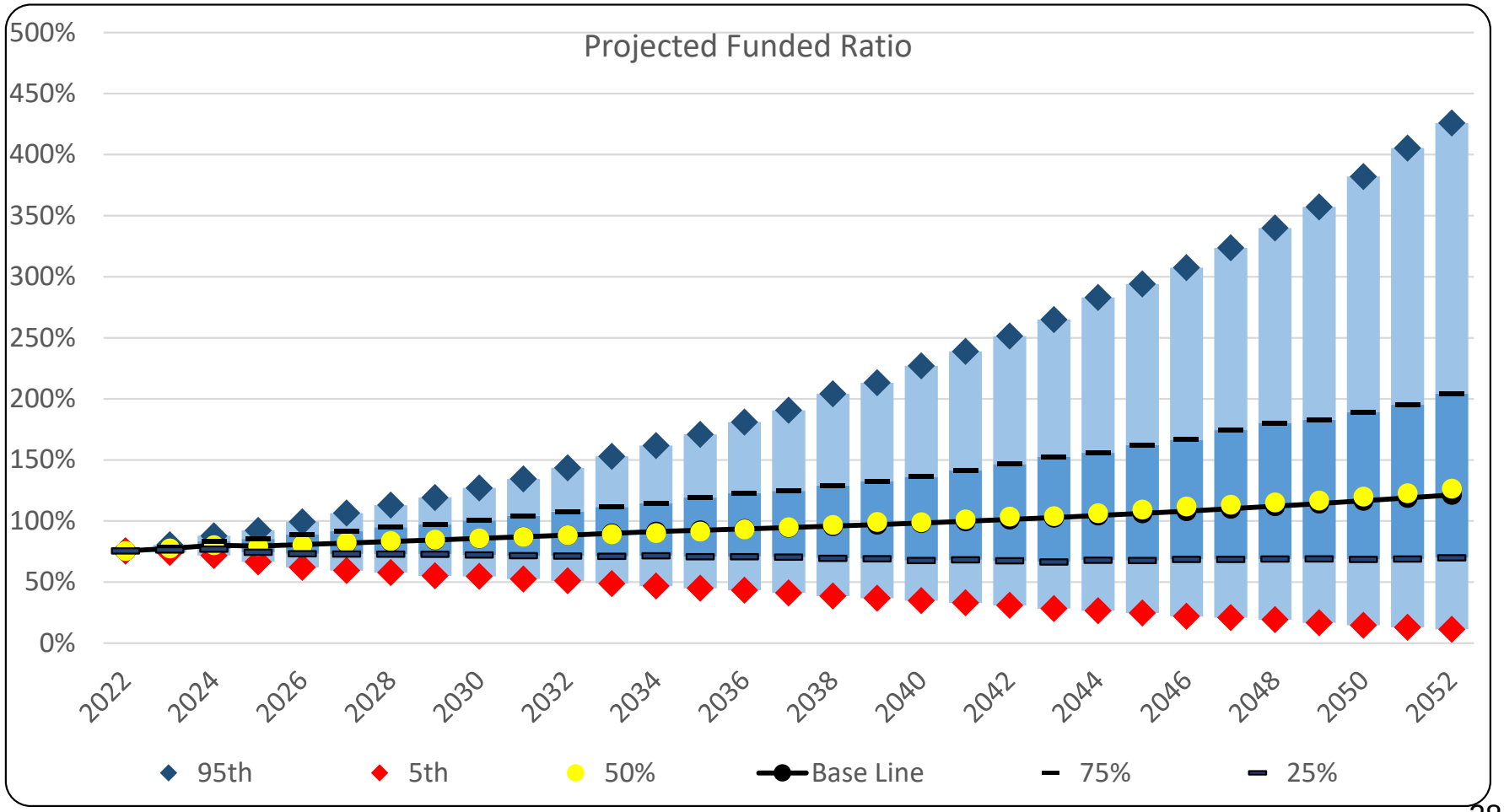
Stochastic Analysis

The chart below is based on the 7.00% expected return with a 10.67% standard deviation. We utilize those assumptions to produce the percentile ranks of expected returns over 30 years. The analysis indicates that over the next 30 years there is a 50% chance the cumulative market returns over the next 30 years will be between 5.73% and 8.29%. The 50th percentile cumulative investment return over the next 30 years is 7.00%.



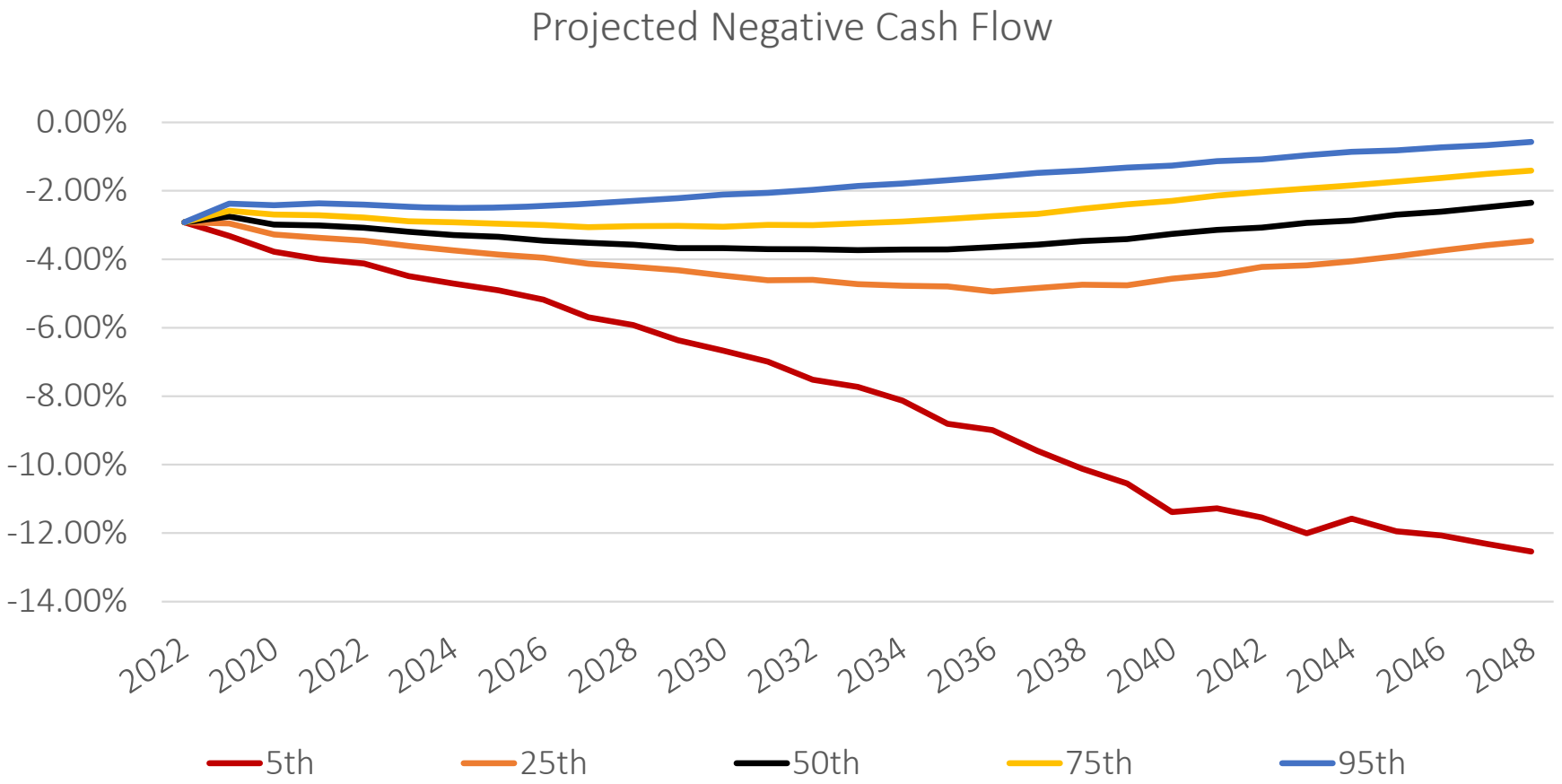
Stochastic Analysis

This graph indicates that in 10 years, the middle 50% of possible outcomes are between 71% and 108% funded. There is a 5% chance of being more than 144% funded, and a 5% chance of being less than 51% funded.



Stochastic Analysis

The median negative cash flow tends to -2.4% over the next 30 years. This is a contributing factor to the fact that the median funded ratio is 80% in the projected funded ratio chart on the previous page.



Summary Comments

- Findings
  - Improved risk profile since the June 30, 2018 Assessment due to:
    - Investment performance since June 30, 2018
    - The Board's funding policy has accelerated funding of Basic Benefits by $600 million.
  - Sustained higher than anticipated COLA's does have a long-term impact to expected funding levels.
  - SERS can sustain a single "shock" return like the one experienced in fiscal year ended 2009 but would likely require Board action to maintain sustainability of SERS.
  - Funding Policy and the authority granted to SERS regarding cost-of-living adjustments are two significant tools to assist the Board in mitigating risk.
  - SERS needs to continue monitor risks.

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SCHOOL EMPLOYEES RETIREMENT SYSTEM OF OHIO

Risk Analysis Report
February, 2023

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Section **Page**

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February 7, 2023

Board of Trustees
School Employees Retirement System of Ohio
300 East Broad Street, Suite 100
Columbus, OH 43215-3746

Re: Risk Analysis Report

Dear Members of the Board:

At your request, we have performed a study of the actuarial-related risks faced by the School Employees Retirement System of Ohio (SERS). This report is designed to support and expand on the latest actuarial valuation report that we prepare annually for basic benefits valuation for SERS. While the exhibits and graphs shown in this report are based on the June 30, 2022, SERS actuarial valuation, the analysis of the results and the discussion of the implications for SERS and its stakeholders are expected to remain substantially unchanged for the next few years.

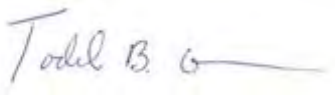
The primary objective of this report is to provide the analysis of risk, as required under Actuarial Standard of Practice Number 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*. There are other risks that SERS faces, including issues such as cyber security, a catastrophe to the physical location, embezzlement, and many others. These are outside the scope of our analysis, which focuses only on those risks relating to the variance in the measurement of the benefit obligations as well as the contribution rates. There is no specific action by the SERS Board either required or expected in response to this report, although it is possible that a deeper understanding of the risks faced by SERS may prompt some additional discussion or study.

In preparing our report, we utilized the data, methods, assumptions, and benefit provisions described in the June 30, 2022, actuarial valuation of SERS. That report should be consulted for a complete description of how our work was performed. Some of the results in this report are based upon modifying one or more of the valuation assumptions as noted in the discussion of the analysis being performed. In particular, the minimum employer contribution, regardless of funded status in the projections presented in this report is 10% of annual payroll .

The consultants who worked on this assignment are pension actuaries with significant public plan experience. In addition, the signing actuaries are independent of the System and the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate. The valuation, on which this analysis was based, was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board. Furthermore, the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonable based on the actual experience of the System. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We respectfully submit the following report and look forward to discussing it with you.



Todd B. Green, ASA, EA, FCA, MAAA
President

John J. Garrett, ASA, FCA, MAAA
Principal and Consulting Actuary

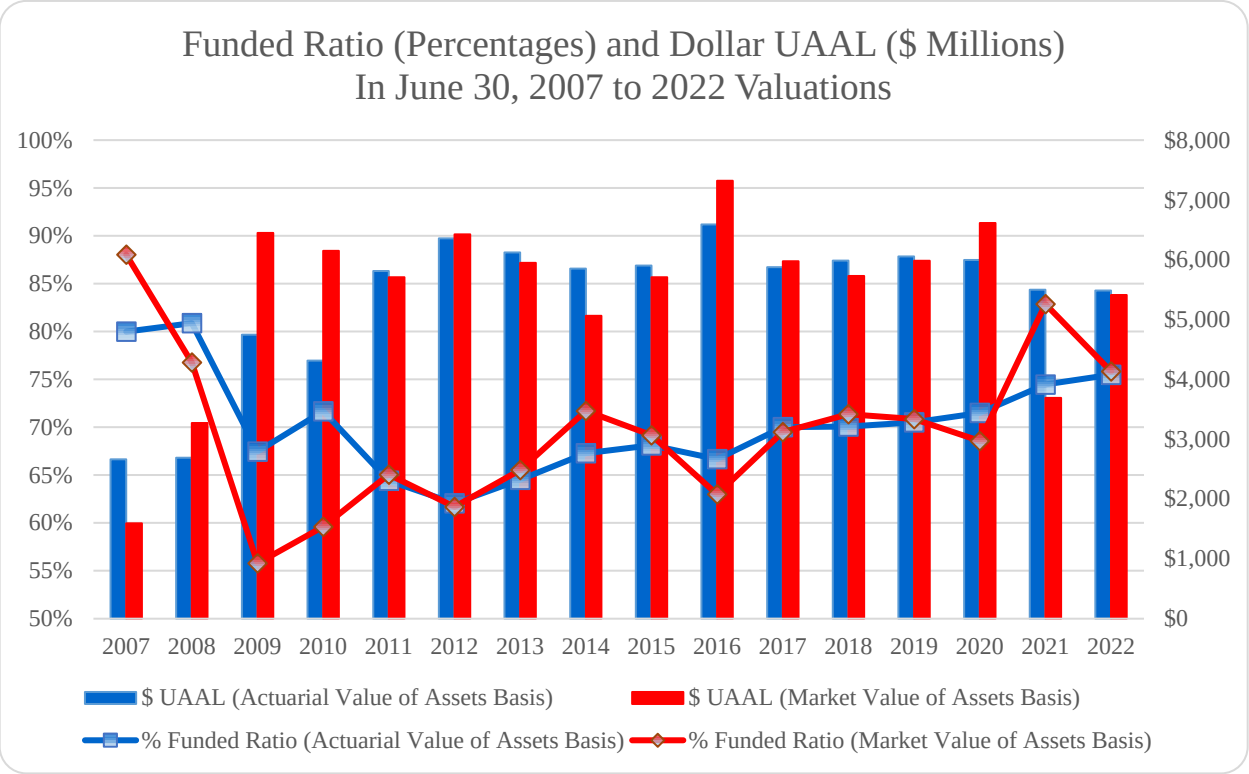
Actuarial Standard of Practice Number 51 (ASOP 51)

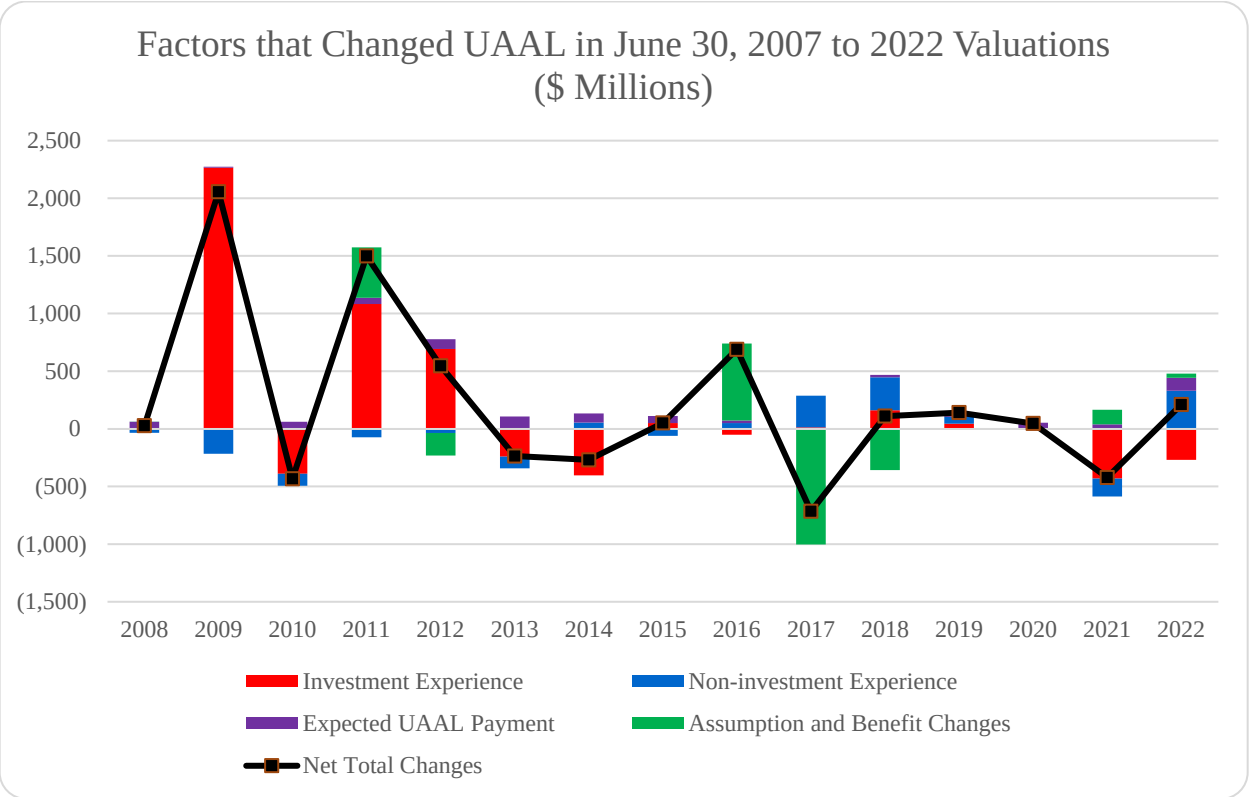
Actuarial Standards of Practice (ASOPs) are issued by the Actuarial Standards Board and are binding for credentialed actuaries practicing in the United States. These standards generally identify what the actuary should consider, document and disclose when performing an actuarial assignment. ASOP 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*, applies to funding valuations, actuarial projections, and actuarial cost studies of proposed plan changes.

A typical retirement system faces many different risks. The greatest risk for a retirement system is the inability to make benefit payments when due. If system assets are depleted, benefits may not be paid which could create legal and litigation risk. The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world risk is defined as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. ASOP 51 defines risk as the potential of actual future measurements deviating from expected future measurements due to actual experience that is different than the actuarial assumptions.

Factors that have Historically Impacted Funded Status and Employer Contribution Rates

The funding ratios for the past 16 valuations from June 30, 2007 to 2022 measured both actuarial and market value of assets basis and the unfunded actuarial accrued liabilities measured using both the actuarial value of assets and market value of assets basis and the factors that caused changes in the UAL for the past 16 valuations from June 30, 2007 to 2022 are shown in the charts on the following pages.


Funded Ratio (Percentages) and Dollar UAAL ($ Millions)
In June 30, 2007 to 2022 Valuations
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
$ UAAL (Actuarial Value of Assets Basis)
$ UAAL (Market Value of Assets Basis)
% Funded Ratio (Actuarial Value of Assets Basis)
% Funded Ratio (Market Value of Assets Basis)


Factors that Changed UAAL in June 30, 2007 to 2022 Valuations
($ Millions)
2,500
2,000
1,500
1,000
500
0
(500)
(1,000)
(1,500)
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Investment Experience
Non-investment Experience
Expected UAAL Payment
Assumption and Benefit Changes
Net Total Changes

Identifying Risks

The first step in a project such as this is to identify the significant risks that affect how SERS liabilities are measured and contributions determined. Some risks, such as investment return for a funded retirement plan, are obvious, but there are others that are not as clear. There is no definition of "significant" to clearly define which risks should be considered, nor is it possible to tell in advance whether certain risks are significant or not.

The identification of risks is also specific to the retirement plan being studied. Different plans expect different risks. Thus, this analysis for SERS is uniquely prepared for SERS and the risks it faces.

Assessing Risks

In this report, we consider a variety of risks faced by SERS. A common theme for most retirement plans is that risks change as a plan matures. Because this is a fundamental issue, ASOP 51 gives special attention to requiring the disclosure of appropriate measures of how a plan is maturing. In the section of this report that considers maturity measures, we provide a number of illustrations to help demonstrate this trend.

There are some risks that are inherently difficult to quantify, as well as some risks that are addressed by the way in which a system is designed to react. In our section on qualitative measures, we discuss some of these risks. We also discuss how the SERS contribution rate policy is designed to help address the way in which SERS faces risks.

Finally, we conclude this report with some numerical assessment of some significant demographic and economic risks. The point of this analysis is to provide some perspective on the magnitude of the risks faced by SERS.

Conclusions

Risk is not necessarily a negative concept. As humans, we regularly take risks such as driving in an automobile because we believe that the gain to be received outweighs the possible negative consequences. We do, however, take steps to mitigate the risk by looking both ways at an intersection before proceeding, wearing seatbelts, etc. We do these things, because we have some understanding of the sources of risk. The goal of this report is to help SERS understand the major risks facing SERS funding, thereby allowing a reasoned approach to determining how to move into the future if negative experience emerges.

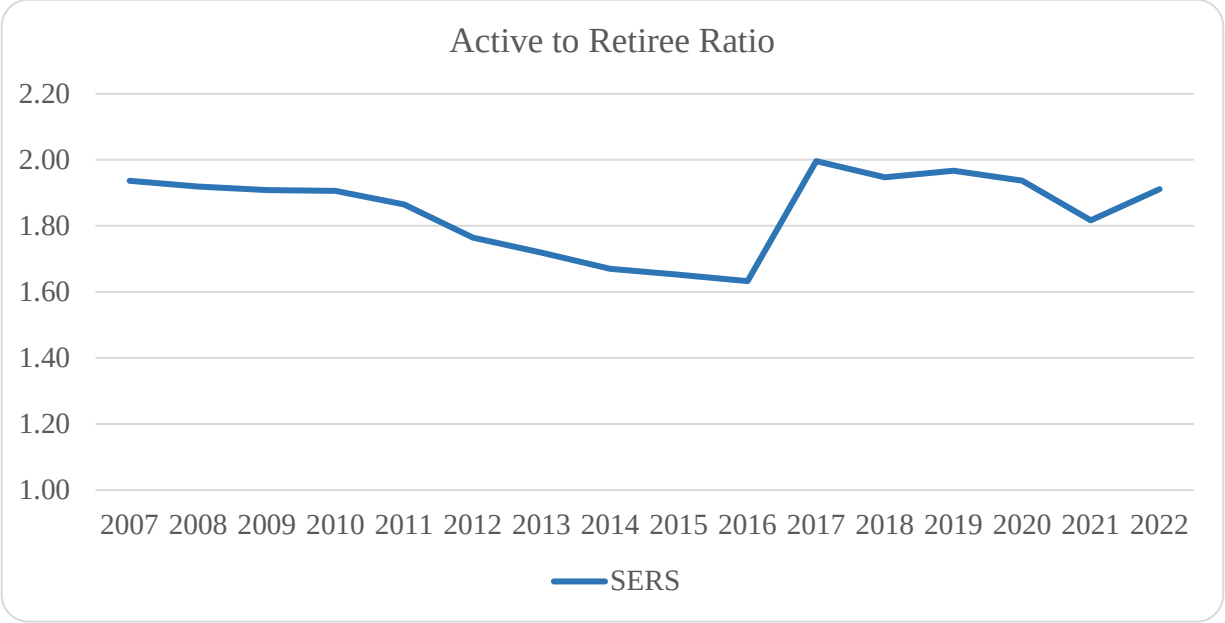
In our opinion the risk profile of SERS has improved significantly since the previous risk study was performed. The major causes attributing to this improvement are:

- Investment performance since June 30, 2018 has increased the market value of assets by $2.7 billion.
- The Board adopted funding policy has accelerated the funding of Basic Benefits by approximately $600 million since June 30, 2015.

SERS was created in 1937. The aging of the population, including the retirement of the baby boomers, has created a shift in the demographics of most retirement systems. This change is not unexpected and has, in fact, been anticipated in the funding of the retirement systems. Even though it was anticipated, the demographic shift and maturing of the plans have increased the risk associated with funding the systems. There are different ways to measure and assess the maturity level of a retirement system and we will discuss several in this section of the report.

Historical Active to Retiree Ratio

One way to assess the maturity of the system is to consider the ratio of active members to retirees. In the early years after a retirement system is established, the ratio of active to retired members will be very high as the system is largely composed of active members. As the system matures over time, the ratio starts to decline. A very mature system often has a ratio near or below one. In addition, if the size of the active membership declines over time, it can accelerate the decline in the ratio.



Asset Volatility Ratio

As a retirement system matures, the size of the market value of assets increases relative to the covered payroll of active members, on which the System is funded. The size of the plan assets relative to covered payroll, sometimes referred to as the asset volatility ratio (AVR), is an important indicator of the contribution risk for the System. The higher this ratio, the more sensitive a plan's contribution rate is to investment return volatility.

Even though the System is funded with statutory contribution rates, these measures are still meaningful as an indication of the expected pressure on the portion of the statutory employer funding required for pension benefits.

The asset volatility measure reflects the change to contributions which would be necessary to offset the impact of a change in the market value of assets. The following tables show the historical trend for the asset volatility ratio for SERS.

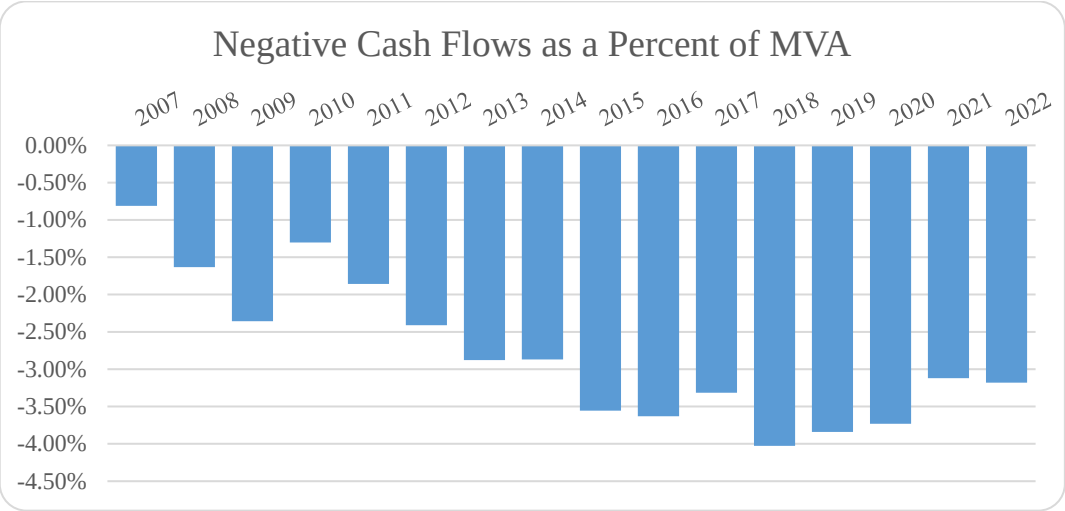
Fiscal Year End	Market Value of Assets ($ Millions)	Covered Payroll ($ Millions)	Asset Volatility Ratio
6/30/07	$11,711.2	$2,603.3	4.50
6/30/08	10,793.5	2,651.8	4.07
6/30/09	8,134.1	2,787.4	2.92
6/30/10	9,071.9	2,842.7	3.19
6/30/11	10,619.2	2,852.4	3.72
6/30/12	10,331.7	2,788.2	3.71
6/30/13	11,300.5	2,746.8	4.11
6/30/14	12,820.9	2,759.3	4.65
6/30/15	12,797.2	2,845.4	4.50
6/30/16	12,451.6	2,932.2	4.25
6/30/17	13,613.6	3,302.8	4.12
6/30/18	14,270.5	3,332.4	4.28
6/30/19	14,544.1	3,462.5	4.20
6/30/20	14,419.6	3,477.6	4.15
6/30/21	17,840.1	3,622.1	4.93
6/30/22	16,962,7	3,994,7	4.25

As the System's Market Value of Assets increases, market gains and losses due to over or under-performance as compared to the expected return, generate impacts to the unfunded liability that are generally a significant percentage of covered payroll in dollar amount. To Illustrate, as of the 2022 measures, a 3% market rate of return (4% below the 7% assumption) would produce an asset loss in dollar amount approximately equaling 17% of payroll (4.25 times 4%). As assets gains and losses are smoothed over four years and the impact of these gains and losses on the plan's required funding are spread over the amortization period, this measure is only to provide the scale of the risks associated with asset performance relative to covered payroll.

Historical Cash Flows

Plans with negative cash flows will experience increased sensitivity to investment return volatility. Cash flows, for this purpose, are measured as contributions less benefit payments and expenses. If the System has negative cash flows and experiences returns below the assumed rate, there are fewer assets to be reinvested to earn the higher returns that typically follow. While any negative cash flow will produce such a result, it is typically a negative cash flow of more than 4% of market value that causes significant concerns.

Fiscal Year End	Market Value of Assets (MVA)	Contributions	Benefit Payments and Expenses	Net Cash Flow	Net Cash Flow as a Percent of MVA
6/30/07	$11,711,235,288	$791,898,275	$886,970,001	($95,071,726)	(0.81%)
6/30/08	10,793,470,372	563,517,862	739,766,146	(176,248,284)	(1.63%)
6/30/09	8,134,107,324	586,857,670	778,564,059	(191,706,389)	(2.36%)
6/30/10	9,071,931,012	703,697,035	821,895,581	(118,198,546)	(1.30%)
6/30/11	10,619,175,301	682,413,480	879,772,413	(197,358,933)	(1.86%)
6/30/12	10,331,658,392	696,696,215	945,748,626	(249,052,411)	(2.41%)
6/30/13	11,300,482,029	695,112,180	1,020,260,801	(325,148,621)	(2.88%)
6/30/14	12,820,884,107	700,720,177	1,068,606,495	(367,886,318)	(2.87%)
6/30/15	12,797,184,030	701,545,178	1,156,439,511	(454,894,333)	(3.55%)
6/30/16	12,451,630,823	750,747,397	1,202,843,730	(452,096,333)	(3.63%)
6/30/17	13,613,638,590	804,424,396	1,255,785,189	(451,360,793)	(3.32%)
6/30/18	14,270,515,748	759,945,694	1,334,666,485	(574,720,791)	(4.03%)
6/30/19	14,544,076,104	809,896,173	1,367,920,194	(558,024,021)	(3.84%)
6/30/20	14,419,598,627	843,900,853	1,381,761,865	(537,861,012)	(3.73%)
6/30/21	17,840,046,988	830,633,505	1,387,181,011	(556,547,506)	(3.12%)
6/30/22	16,962,691,005	900,194,639	1,439,199,522	(539,004,883)	(3.18%)

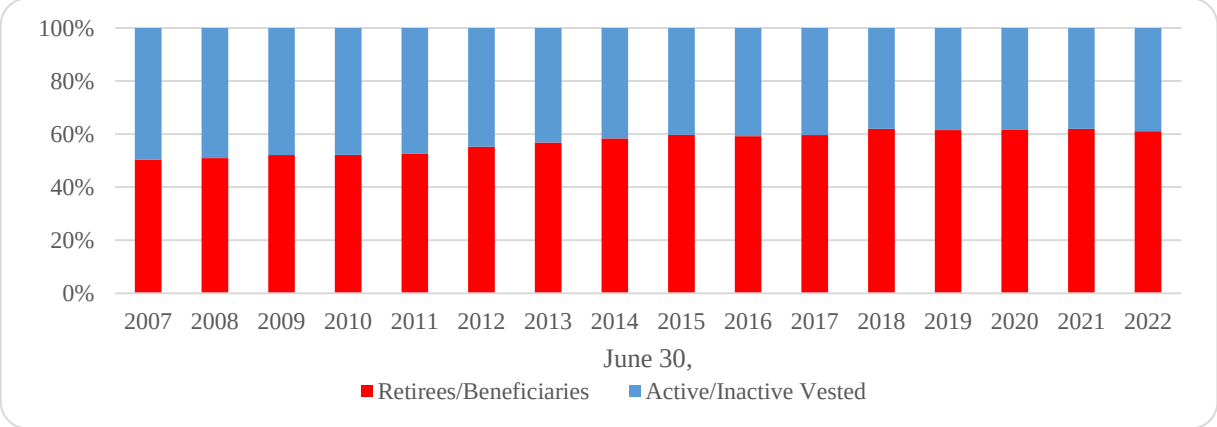


Liability Maturity Measurements

As discussed earlier, most public sector retirement systems, including SERS, have been in operation for over 80 years. As a result, they have aging plan populations indicated by a decreasing ratio of active members to retirees and a growing percentage of retiree liability when compared to the total. The retirement of the remaining baby boomers over the next 10 years is expected to further exacerbate the aging of the retirement system population. With more of the total liability residing with retirees, investment volatility has a greater impact on the funding of the system since it is more difficult to restore the system financially after losses occur when there is comparatively less payroll over which to spread costs.

The retirement system is also growing larger as can be seen by the ratio of actuarial liability to payroll.

Fiscal Year End	Retiree Liability (a)	Total Actuarial Liability (b)	Retiree Percentage (a) / (b)	Covered Payroll (c)	Ratio (b) / (c)
6/30/07	$6,688,590,916	$13,303,223,045	50.3%	2,603,300,211	5.11
6/30/08	7,161,196,395	14,061,894,365	50.9%	2,651,800,981	5.30
6/30/09	7,591,581,493	14,581,977,247	52.1%	2,787,390,954	5.23
6/30/10	7,941,876,226	15,221,613,179	52.2%	2,842,660,159	5.35
6/30/11	8,605,491,444	16,325,004,259	52.7%	2,852,378,614	5.72
6/30/12	9,250,285,737	16,754,566,023	55.2%	2,788,153,585	6.01
6/30/13	9,793,009,567	17,247,161,078	56.8%	2,746,827,535	6.28
6/30/14	10,436,607,389	17,881,827,171	58.4%	2,759,281,606	6.48
6/30/15	11,047,009,232	18,503,280,961	59.7%	2,845,443,802	6.50
6/30/16	11,702,282,405	19,770,708,121	59.2%	2,932,236,551	6.74
6/30/17	11,679,469,034	19,588,417,687	59.6%	3,302,805,662	5.93
6/30/18	12,398,898,951	19,997,700,966	62.0%	3,332,395,171	6.00
6/30/19	12,628,920,814	20,527,251,448	61.5%	3,462,524,396	5.93
6/30/20	12,948,507,140	21,033,809,319	61.6%	3,477,578,726	6.05
6/30/21	13,345,595,908	21,529,757,004	62.0%	3,622,097,199	5.94
6/30/22	13,657,627,450	22,371,468,812	61.1%	3,994,657,693	5.60



ASOP 51 provides that the assessment of risk does not necessarily have to be quantitative, but may be qualitative. This report will provide quantitative analysis for SERS in a later section, but first we will discuss the overall assessment of risk for SERS from a qualitative perspective.

(1) Contribution Rate Funding Policy

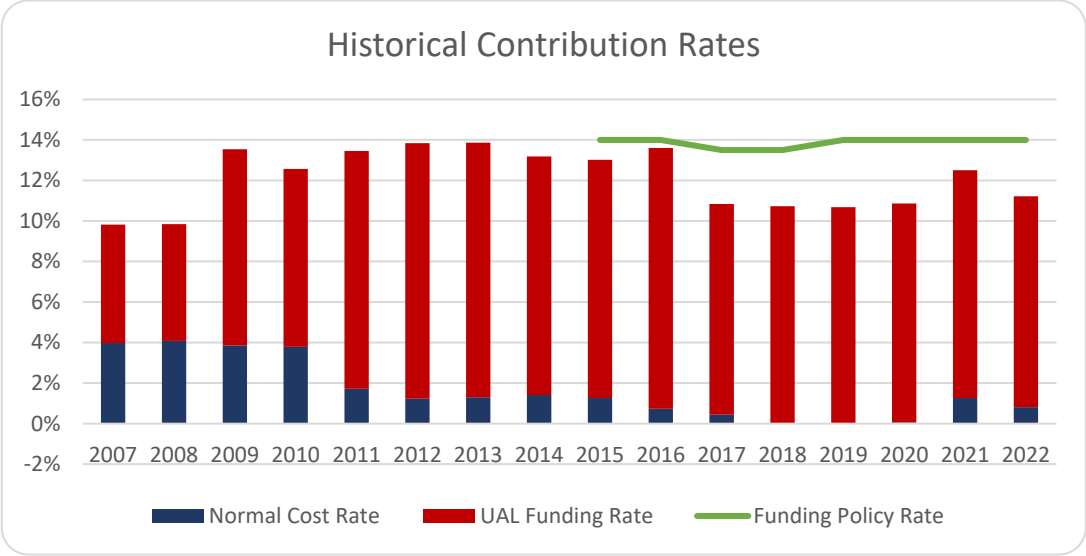
The statute sets a contribution cap of 24% of payroll: 14% from employers and 10% from employees. Employer contributions in excess of those required to support the basic benefits may be allocated to retiree health care funding.

Effective June 30, 2015, changes were made to funding policy to meet the competing goals of providing Healthcare and improving SERS' long term funding as quickly as possible.

If the funded ratio is less than 70%, the entire 14% employers' contribution shall be allocated to SERS' basic benefits. If the funded ratio is 70% but less than 80%, at least 13.50% of the employers' contribution shall be allocated to SERS' basic benefits, with the remainder (if any) allocated to the Health Care Fund. If the funded ratio is 80% but less than 90%, at least 13.25% of the employers' contribution shall be allocated to SERS' basic benefits, with the remainder (if any) allocated to the Health Care Fund. If the funded ratio is 90% or greater, the Health Care Fund may receive any portion of the employers' contribution that is not needed to fund SERS' basic benefits.

SERS Contribution Rate Funding Policy should be considered as a positive factor in risk assessment because it accelerates funding of the Basic Benefits. Since July 1, 2015, the Board has allocated the entire 14% of payroll employer contribution to Basic Benefits except for the periods beginning July 1, 2017 and July 1, 2018 when the Board allocated 13.50% of compensation to Basic Benefits. This is a positive factor in that it accelerated the funding of Basic Benefits by an estimated $600 million.

A historical summary of the actual contribution rate, split between the normal cost and the remaining amount available to fund the UAL, and the Funding Policy Rate is shown in the following graph:



(2) Amortization Policy

Actuarial assumptions are intended to be long-term estimates so even if experience follows the assumption over the long-term, short-term fluctuations are to be expected. When this occurs, and when changes to the actuarial assumptions, methods, or benefit structure occur, any deviation in the unfunded actuarial liability is financed based on the provisions of the amortization policy.

SERS Amortization Policy

The SERS Board shall establish a period of not more than thirty years to amortize the SERS unfunded actuarial accrued pension liability. If in any year the period necessary to amortize the unfunded actuarial accrued pension liability exceeds thirty years, as determined by the annual actuarial valuation required by section 3309.21 of the Revised Code, the board, not later than ninety days after receipt of the valuation, shall prepare and submit to the Ohio Retirement Study Commission and the standing committees of the Ohio House of Representatives and the Ohio Senate with primary responsibility for retirement legislation a report that includes the following information:

(A) The number of years needed to amortize the unfunded actuarial accrued pension liability as determined by the annual actuarial valuation;

(B) A plan approved by the board that indicates how the board will reduce the amortization period of the unfunded actuarial accrued pension liability to not more than thirty years;

(C) Whether the board has made any progress in meeting the thirty-year amortization period.

The remaining amortization period as of June 30, 2022 is 22 years. The amortization payments are calculated as a level percentage of payroll assuming payroll will grow at 1.75%.

SERS amortization policy should be considered as a positive factor in risk assessment because it requires the Board to take action if the amortization period exceeds 30 years.

(3) Payroll Growth Assumption and Active Membership

When the actuarial valuation is performed each year, it determines the funded ratio, unfunded actuarial liability and the contribution rates needed to fully fund the System based on SERS funding policy. The contributions needed (normal cost plus UAL amortization) are expressed as a percent of payroll which is consistent with how contributions are collected. Because the amortization payment on the unfunded actuarial liability is determined using the level percent of payroll methodology, an assumption must be used to develop the payment stream for the amortization of the UAL. The current payroll growth assumption for SERS is 1.75% per year which implicitly assumes that the number of active members remains stable over time.

The funding of the System could be impacted if there was a material shift in the SERS active membership. When the payroll of SERS does not grow at the assumed rate, it requires an increase in the amortization rate to maintain the amortization schedule. While the dollar amount of the UAL amortization payment might be the same, the amortization payment as a percent of payroll has to increase maintain the same amortization payment. Given the statutory limit on the employers and member contributions rates, sustained declines in payroll over a long time could prevent the amortizing the system according to the

amortization schedule. In addition, experience losses due to other sources, such as investment returns, would exacerbate the System decline in funding progress.

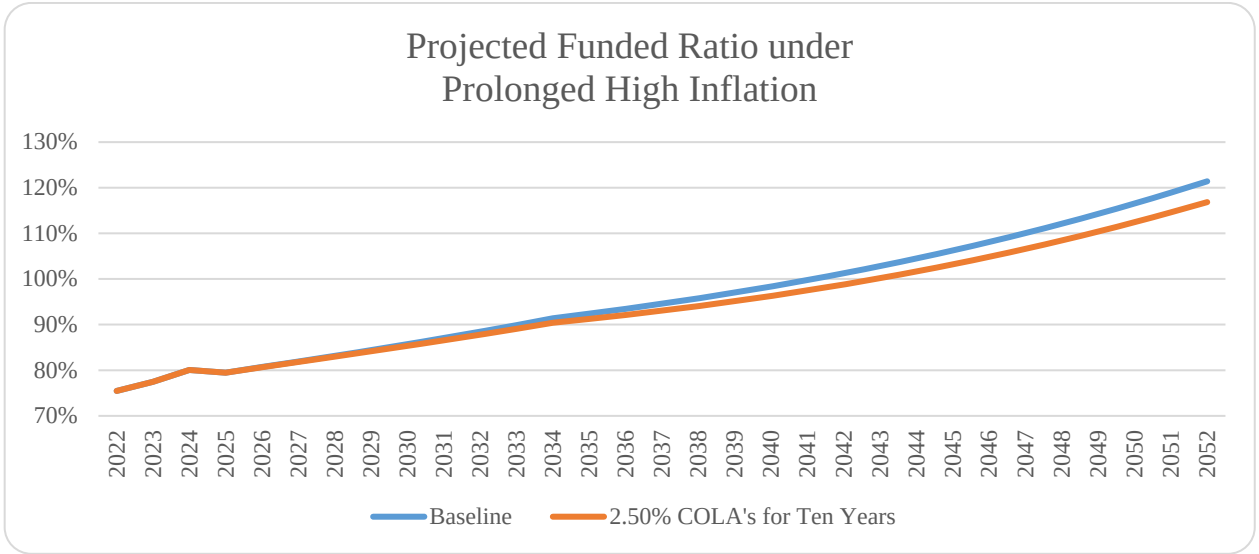
(4) Cost of Living Adjustments

Effective January 1, 2018, the cost-of-living adjustment changed from a fixed 3.00% to a cost-of-living adjustment that is indexed to CPI-W not greater than 2.5% with a floor of 0%. Before granting a cost of living increase, the Board may adjust the percentage of any increase if the board's actuary, in its annual actuarial valuation, or in other evaluations, determines that an adjustment does not materially impair the fiscal integrity of the retirement system or is necessary to preserve the fiscal integrity of the retirement system.

The enactment of SB 8 granted authority to the Board to decide how many anniversaries a new benefit recipient must achieve before they become eligible to receive a COLA. The Board exercised its authority and established that benefit recipients must wait until the fourth anniversary to become eligible for a COLA. This change became effective for benefits commencing on or after April 1, 2018.

The authority granted to SERS in regard to cost of living adjustments should be considered a positive factor in risk assessment. If additional contributions to the System are unlikely, the only alternative to alter trends in the projected funded status are temporary or permanent benefit reductions. Granting the Board this authority allows SERS to act quickly rather than rely on the legislative process to address an issue and mitigate a portion of the risk.

In the most recent experience study we recommended an assumed Cost-of-Living (COLA) adjustments of 2.00% for valuation purposes. The inflation assumption was recommended in a period of persistently low inflation. Since then, inflation has exceeded assumed inflation. As a result, the Board has adopted granting the maximum COLA for eligible members of 2.50%. Based on current forecasts of inflation, higher than normal inflation could persist for some time. The chart below shows the impact on SERS if the Board adopted 2.50% COLA's over the next ten years.



There are a number of risks inherent in the funding of a defined benefit plan. These include:

- demographic risks such as mortality, payroll growth, aging population including impact of baby boomers, and retirement ages;
- economic risks, such as investment return and inflation;
- contribution risk, i.e., the potential for contribution rates to be too high for the plan sponsor/employer to pay; and
- external risks such as the regulatory and political environment.

The various risk factors for a given system can have a significant impact – favorable or unfavorable – on the actuarial projection of liabilities and contribution rates. Under ASOP 51, the actuary is required to include plan-specific commentary regarding the risks that are identified. However, such comments can be qualitative rather than quantitative. In this section of the report, we include quantitative analysis to assist with a better understanding of some of the key risks for SERS.

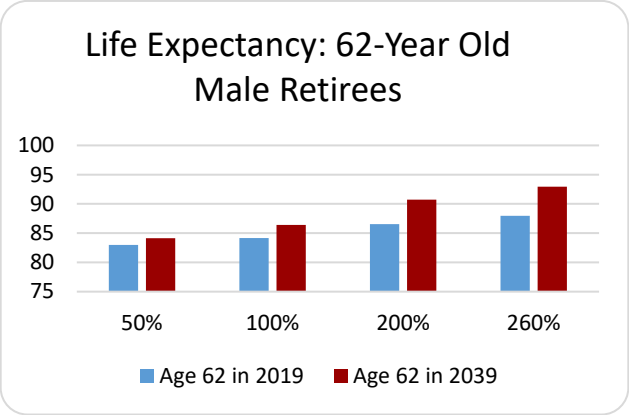
Demographic Risks

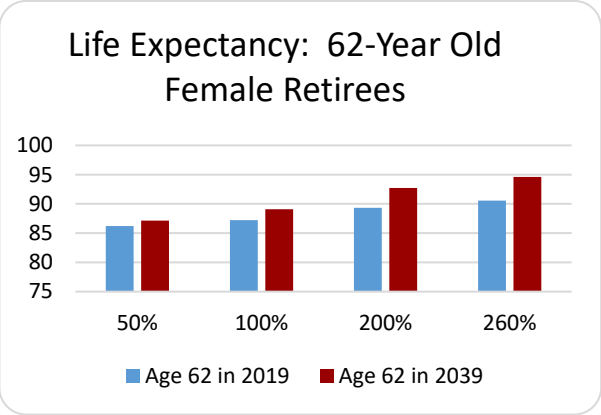
Demographic risks are those arising from the actual behavior of members differing from that expected based on the actuarial assumptions. These changes may arise when a significant portion of members is influenced to take some particular action due to employer or governmental actions, when there are improvements in medicine that affect broad groups of retirees, when societal trends encourage new behavior, or they may simply be random. Examples include early retirement windows, new drugs to treat common diseases, or trends across society to work longer before retiring. Many of these risks are minor in nature since they unfold gradually and generally have a small impact on a retirement system. Some, however, are comparatively more significant and warrant additional discussion.

Mortality Risk

A key demographic risk for all retirement systems, including SERS, is improvement in mortality (longevity) greater or less than anticipated. While the actuarial assumptions used in the valuation reflect small, continuous improvements in mortality experience each year, and these assumptions are evaluated and refined in every experience study, the risk arises because there is a possibility of some sudden shift, perhaps from a significant medical breakthrough that could quickly impact life expectancy and increase liabilities. Likewise, there is some possibility of a significant public health crisis that could result in a significant number of additional deaths in a short time period, which would also be significant, although more easily absorbed.

The mortality projection scale used for the valuation is somewhat more complex than this, but it suffices for illustration to think of the current mortality improvement assumption as also being about 1% per year. To consider longevity risk, we considered the impact of faster improvements in life expectancies of 2.0 and 2.6 times as much improvement, along with only half as much improvement. As the following charts illustrate, a greater improvement factor greatly increases the life expectancy over time.



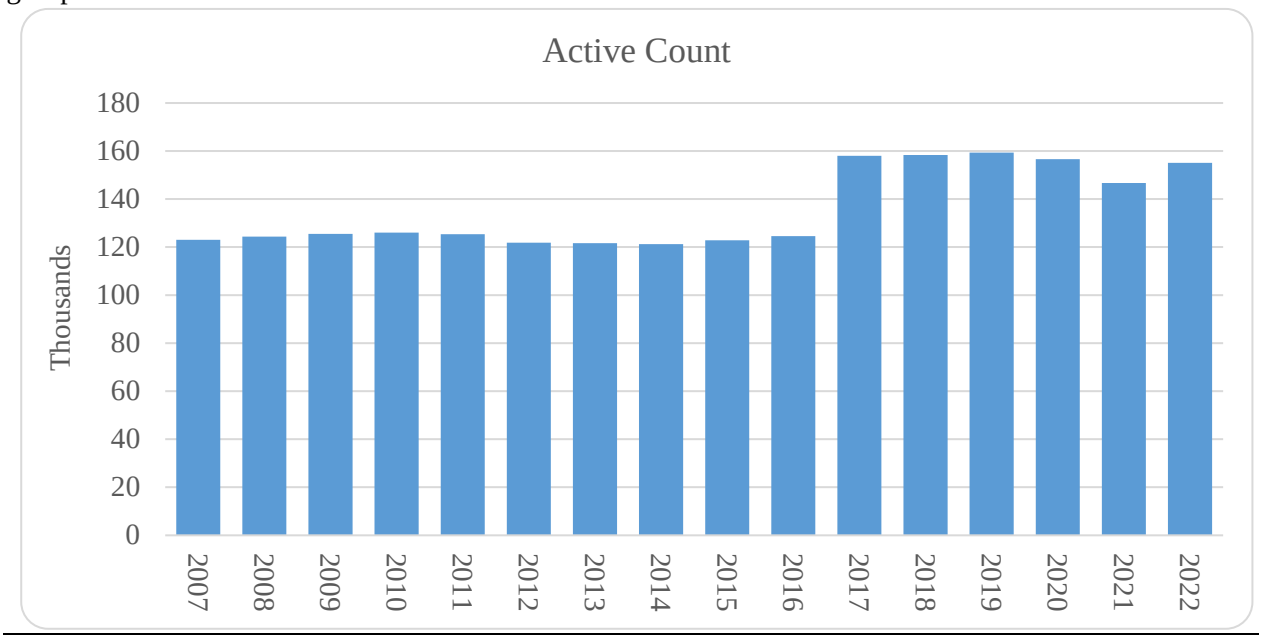


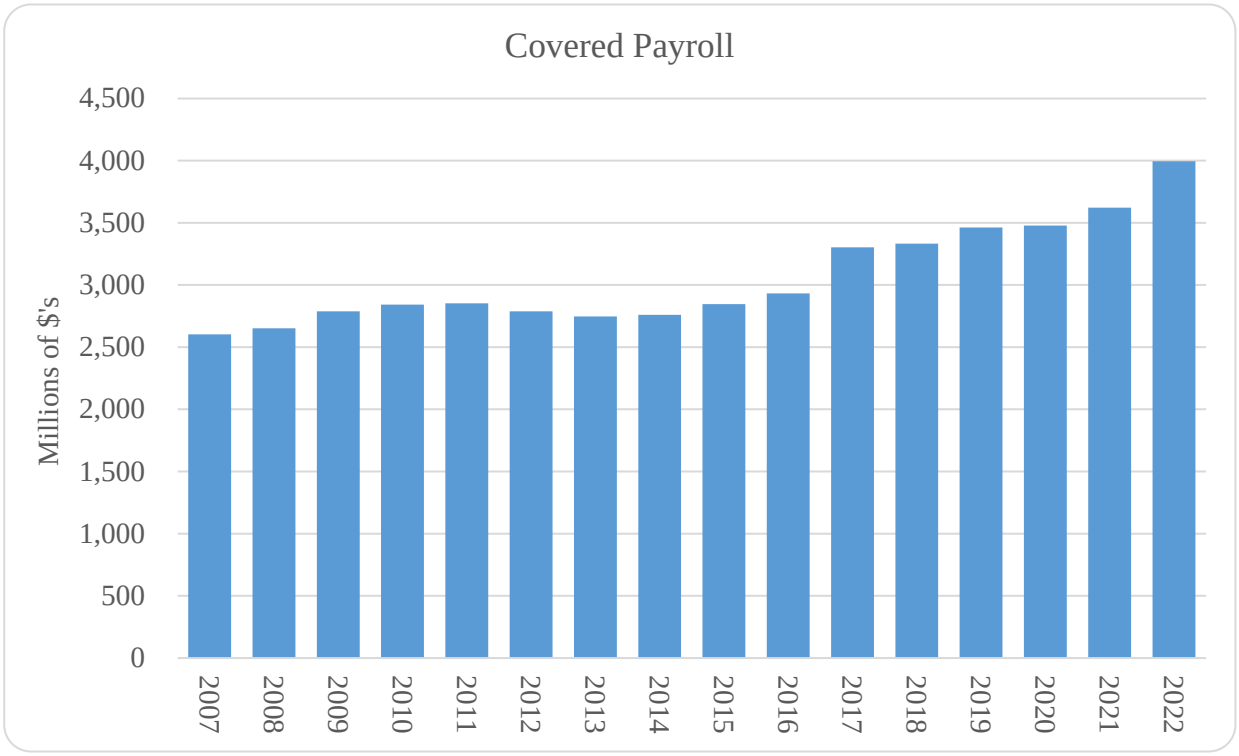
In performing valuations, we do not directly use life expectancy values, but rather apply the mortality rates at each age directly. For 2023, if the mortality improvement scale were cut in half (to a 0.5% per year improvement), the liabilities would decrease by about 1% at age 62, while if the mortality improvement scale were doubled (resulting in a 2% per year improvement), liabilities at age 62 would increase approximately 2%. Over the next 20 years, the impact of either change would roughly double. Note that these changes in mortality improvement are noticeable departures from historical norms, but they are plausible.

Active Population Growth or Decline Risks

Valuations consider the data on a single date and do not make a direct assumption regarding future members, with the exception of the amortization method's assumption of payroll increases that inherently assumes a constant population size. However, the reality is that if the active membership increases or decreases, it will lead to decreases or increases in the actuarial contribution rate.

The following graphs show the historical count and covered payroll for active members in each membership group:

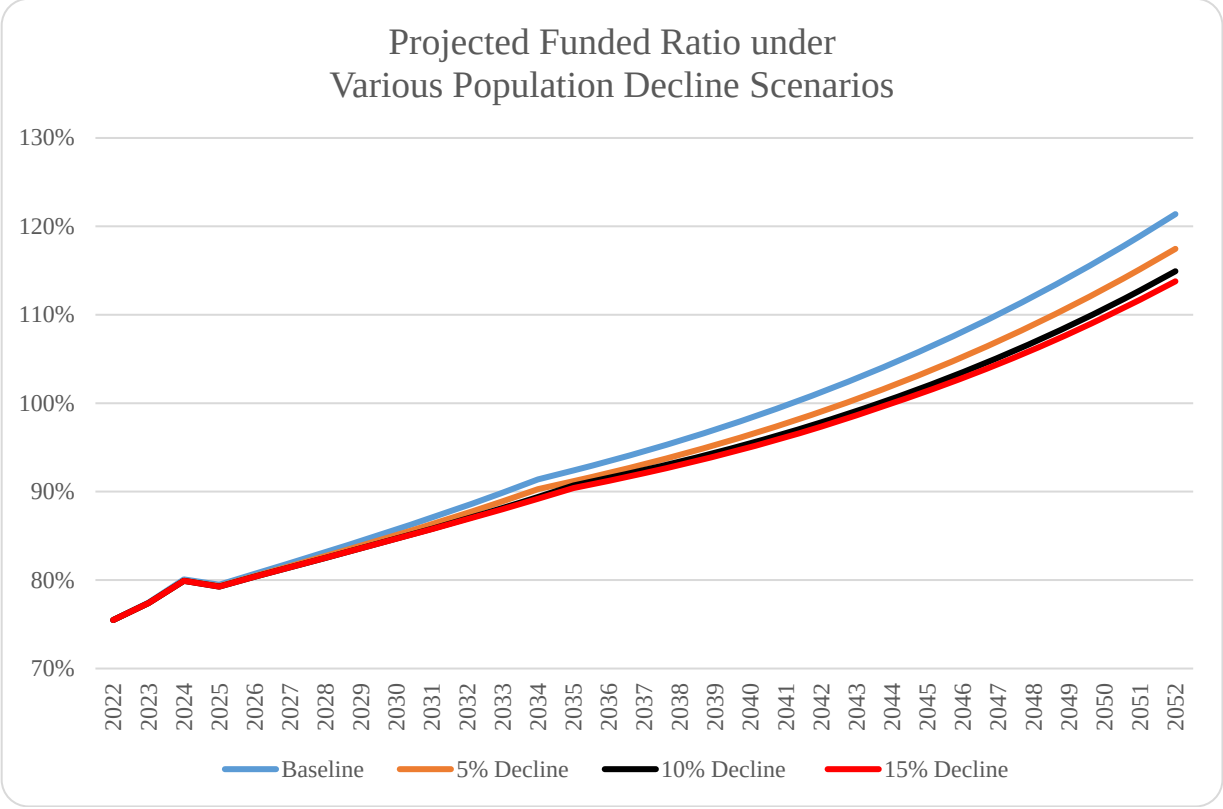



Covered Payroll
Millions of $'s
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

A decline in SERS active membership could occur for a number of reasons. If the local school systems experiences severe and prolonged fiscal challenges, the number of school employees might be reduced. Alternatively, if there is a decline in the student population, it could reduce the need to maintain the current level of school employees. Another possibility that could impact the number of active members is a shift in the way education is delivered, with higher utilization of online teaching. Regardless of the cause for the decline, a substantial decrease in the active membership by itself could be mitigated.

In the event of a significant decrease in population, the payroll used to amortize the UAL is unlikely to grow at the assumed rate. This will, in turn, increase the actuarial contribution rate, although not the contribution dollar amount, needed to pay off the UAL. Referring to the maturity measures shown earlier in the report, it should be evident that lower payroll will increase the Asset Volatility Ratio. Of course, an increase in active membership would conversely decrease the contribution rate and Asset Volatility Ratio.

The chart below illustrates the projected funded ratio based on three population reduction scenarios. The first assumes an immediate 5% reduction in the population followed by no further reduction in active membership. The second assumes an immediate 5% reduction in the population followed by additional 1% reductions in the active population until the total reduction in the active workforce is 10%. The final scenario assumes an immediate 5% reduction in the population followed by additional 1% reductions in the active population until the total reduction in the active workforce is 15%. Since employer and member contributions to the system are set in statute, any reduction in the workforce reduces the income stream to SERS, thereby prolonging the amount of time SERS will need to achieve 100% funded status. If these population scenarios were combined with investment returns that are less than the assumed rate of return of 7.00% the affects would be magnified.



Other Demographic Risks

Changes to retirement and termination rates are likely to occur through time as the nature of the workforce and societal expectations shift. For instance, over the past decade or so, we have observed a general shift in retirement patterns in which retirements are occurring later. This may be a function of prior plan changes to eligibility, economic considerations, expectations of longer life in retirement, a proportionate decrease in physically-demanding jobs, or changes in family composition. Such changes do affect the funding of the plan, but generally these changes are minor and gradual and are reflected in modified assumptions resulting from regular experience studies.

More significant changes in demographic assumptions are likely to be influenced by something significant such as a legislative change. Obviously, some changes in SERS provisions or state employment rules could quickly change behavior patterns, but these would probably be anticipated as part of the legislation. Externally, a significant change in Social Security or Medicare provisions could change retirement patterns if the changes were implemented rapidly. These changes are not ones that can be easily quantified because the timing of such events, the impact of the event on behavior, and the magnitude of the behavior change cannot be anticipated.

Investment Return Risk

Investment risk volatility is the greatest risk facing SERS and most public retirement systems today. In recent years, interest rates have been in decline. In response, retirement systems had to choose between reducing expected returns which would increase required contributions or increase investment risk and maintain expected returns and contribution levels. Most systems chose to increase investment risk. In 2022 the average yield on the 10-year treasury was 2.95%. Compared to the current assumed rate of return of 7.00%, the risk premium is 4.05%. As the System continues to mature, investment returns will have an increasingly greater impact on the funding of the system. When investment returns are below the expected return (investment return assumption), the unfunded actuarial liability increases which prolongs the time period necessary for SERS to achieve full funding. Likewise, returns above the expected return, which are easier to absorb, decrease the unfunded actuarial liability and reduce the period necessary for SERS to achieve full funding. Because of the inherent volatility of most retirement system investment portfolios, there is, therefore, volatility in the plans' funded status and contribution requirements.

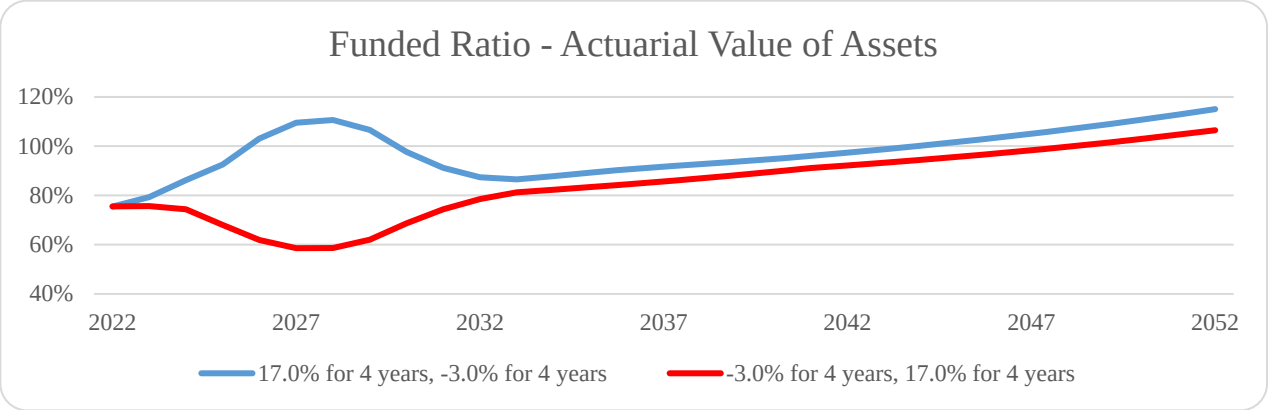
In order to understand the impact of investment volatility, we present a sequence of projections, based on the model prepared for SERS as part of the valuation each year. These "deterministic" projections use one or more selected scenarios to help illustrate certain key concepts. Following these projections, we show a summary of the results of a "stochastic" projection in which 1,000 equally plausible random scenarios are run and summarized.

Risk Due to Return Order

The long-term funding outcome is impacted not only on the returns but also the order in which they occur. In other words, a "good" return followed by a "bad" return can lead to a different final result than the same "bad" return followed by the same "good" return. While this may not be intuitive at first, the concept makes sense once it is realized that there are net cash flows out of the system.

To illustrate this concept, consider the funded ratio for SERS under two different scenarios. In each case, there are four years of returns that are 17.0% (10% above the assumed 7.0% return). There are also four years of -3.0% returns (10% below the assumed return). In one case, we assume the four good years come before the four bad years, while in the other case, we assume that the four bad years are followed by the four good years.

The following graph shows the results:

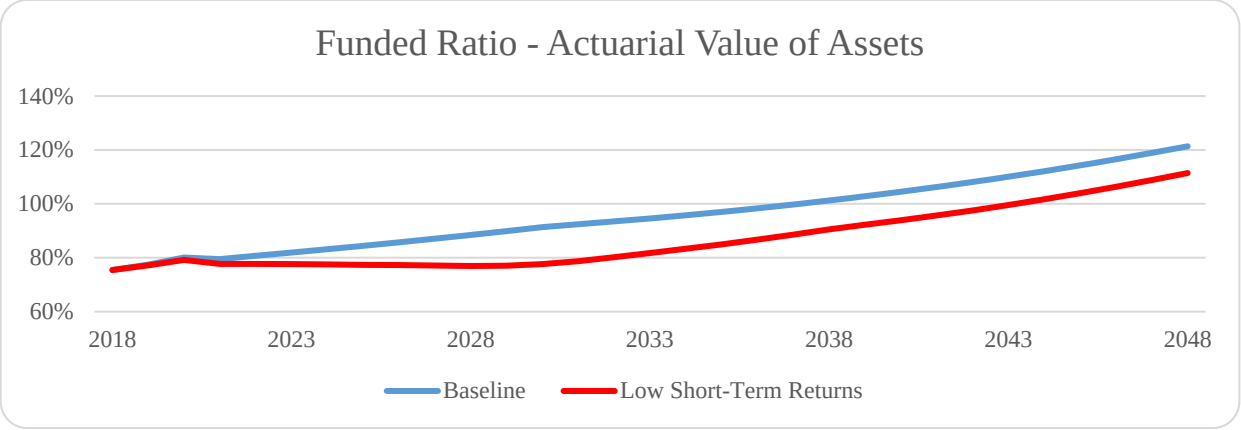


At the end of the projection, the high return followed by low return scenario has a funded ratio of 115%, while the low return followed by a high return is 106% funded. The order of the returns leads to a $3.3 billion dollar difference in market value ($44.1 billion vs. $40.8 billion). While the scenarios displayed here are artificial, they do illustrate that the return order matters.

Risk of Low Returns for Sustained Period

It is important to determine the potential impact of low returns over a sustained period on SERS funding. In particular, we want to examine the scenario, that returns will be 5.5% for the next 10 years, and 7.6% thereafter. It should be noted that such an assumption is not inconsistent with the 7.0% long-term rate of return currently used for the SERS valuation. The difference is really a variant of the prior discussion on order of returns: How does a scenario that has lower returns followed by higher returns compare with a scenario that has the (approximately) average returns for all years?

The following graphs shows the impact of low returns on the funded ratio SERS. In each case, the scenario (5.5% for 10 years, 7.6% thereafter) is compared with the baseline scenario of 7.0% for all years.



In this scenario, the low returns for the next 10 years reduce the funded ratio until 2028. In 2036, the gap is greatest, reaching a 10.8% difference (80.3% funded vs. 91.1% funded, reflecting a UAL difference of $ 3.0 billion). Ultimately, this difference is eliminated and actually reversed as the higher investment returns, result in a higher funded ratio.

While this scenario will not happen exactly as modeled, if the average returns over the next 10 years are around 5.5% and then the average returns increase to around 7.6%, similar patterns as these will emerge. It should be stressed, however, that this is only one plausible scenario and there is not universal consensus on return expectations.

Risk of Shock in a Single Year

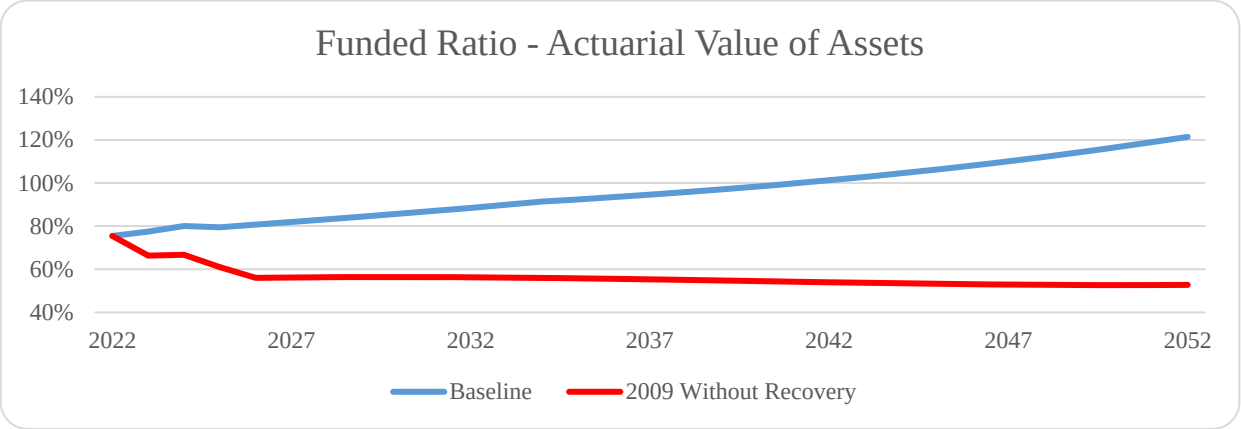
From late 2007 through early 2009, the financial markets crashed both in the U.S. and abroad resulting in the most impactful loss due to investment return ever experienced by SERS. The return on the market value of assets for FY 2009 was -22.9% and this single year dropped the funded status on a market value basis by more than 20%. Like many other systems around the country, SERS and the State of Ohio responded with changes in the benefit structure. Coupled with the financial market recovery, significant progress has been made in improving the situation.

Even with SERS' current Contribution Rate Funding Policy and the progress made toward improving the funding, there is still risk from another shock of this magnitude in a single year. The impact of such an event would be different depending on when it occurs. As the System matures and assets grow in comparison to payroll (increasing the asset volatility ratio), severe investment declines will have a greater impact on the actuarial contribution rate.

To study the impact of a similar shock, we modeled a repeat of 2009 with its -22.9% return in FY 2023, but 7.0% returns in every other year.

First, the probability of such a return in a single year is around 0.5% to 0.6% - meaning an event that occurs maybe every 150 to 200 years. Second, market crashes have been historically followed by significant rebounds in the following few years that have recovered significant portions of the losses. Third, SERS and its stakeholders have a history of proactively addressing significant problems by making changes in the benefit provisions and/or funding mechanism. This is not to minimize the risk of a shock. Rather, it is a reminder that the risk can be addressed in multiple ways.

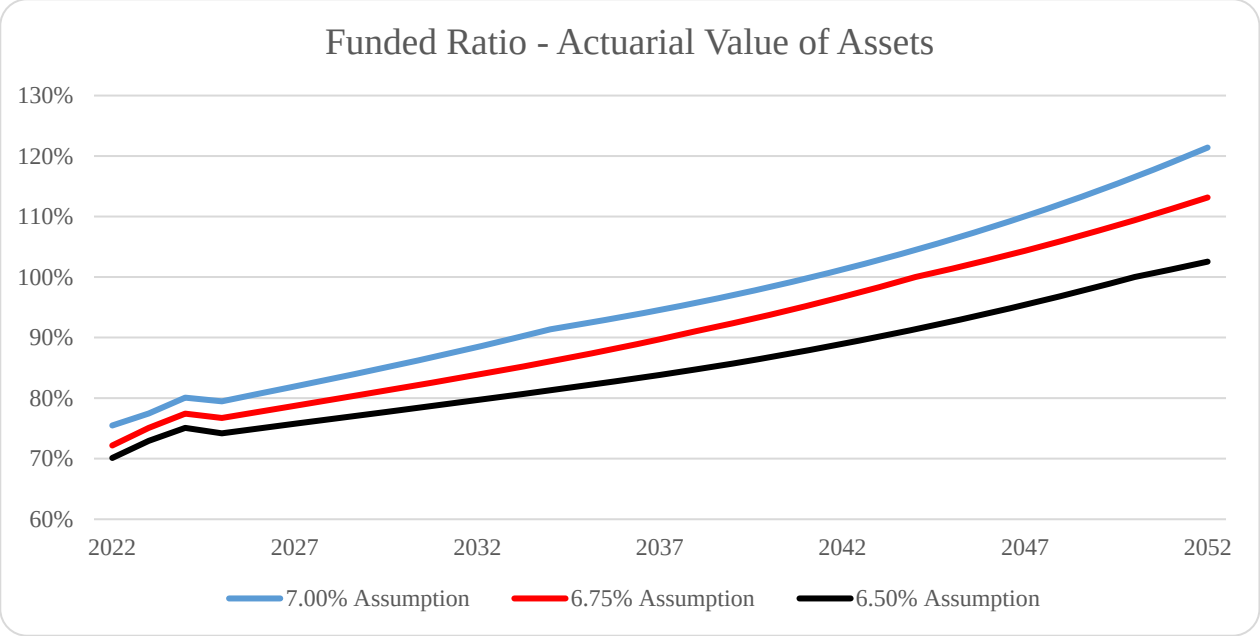
Please note, the graph below is an improvement from the previous study when the -22.9 % shock return led to insolvency.



In this scenario, the funded ratio drops significantly in the initial years. Note that this graph is based on the actuarial value of assets, so the smoothing mechanism delays the recognition of the return over several years. The funded ratio gradually but remains constant through out the projection period

Sensitivity Analysis

The valuation results are sensitive to the set of economic assumptions used to estimate the System's liabilities. In all scenarios considered thus far, the baseline results are those based on the assumption that all of the current actuarial assumptions (those used in the June 30, 2022 actuarial valuation) will be met in the future. To illustrate the sensitivity of the valuation results to different investment return assumptions, we have modeled the results if the investment return assumption is changed from 7.00% to 6.75% or 6.50%, with no other change in the set of economic assumptions. These illustrations further reflect that the assumed rate of return is actually earned in all years and using the current Contribution Rate Funding Policy.



As would be expected, the 7.0% assumption has the highest funded ratio, largely because the liabilities are the lowest and the assets grow at the highest rate. As should be expected., the 6.5% assumption results in the lowest funded ratio due to the increased measure of liabilities and the lowest annual returns.

Another way to perform sensitivity analysis is to look at how results would unfold if the assumptions remain unchanged, but actual experience varies. Of course, in reality, the assumptions would eventually be updated to reflect actual experience, so this type of analysis is useful only when shorter periods of time are considered. In the following charts, rates of return from 5.0% to 8.0% are considered. The impact is shown using a "heat map" in which the results are color coded from green (most favorable) to red (least favorable) to help visually show trends.

In this analysis, the current investment return assumption is not changed, but the impact of differing actual returns over the next ten years is studied.

Funded Ratio at June 30 Valuation

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
5.00%	75%	77%	79%	77%	77%	76%	76%	75%	75%	74%	73%
5.25%	75%	77%	79%	77%	77%	77%	77%	76%	76%	75%	75%
5.50%	75%	77%	79%	78%	78%	78%	77%	77%	77%	77%	77%
5.75%	75%	77%	79%	78%	78%	78%	78%	79%	79%	79%	79%
6.00%	75%	77%	79%	78%	79%	79%	79%	80%	80%	80%	81%
6.25%	75%	77%	80%	79%	79%	80%	80%	81%	81%	82%	82%
6.50%	75%	77%	80%	79%	80%	81%	81%	82%	83%	84%	84%
6.75%	75%	77%	80%	79%	80%	81%	82%	83%	84%	85%	86%
7.00%	75%	77%	80%	79%	81%	82%	83%	84%	86%	87%	88%
7.25%	75%	77%	80%	80%	81%	83%	84%	86%	87%	89%	91%
7.50%	75%	78%	80%	80%	82%	83%	85%	87%	89%	91%	92%
7.75%	75%	78%	81%	80%	82%	84%	86%	88%	90%	92%	94%
8.00%	75%	78%	81%	81%	83%	85%	87%	89%	92%	94%	96%

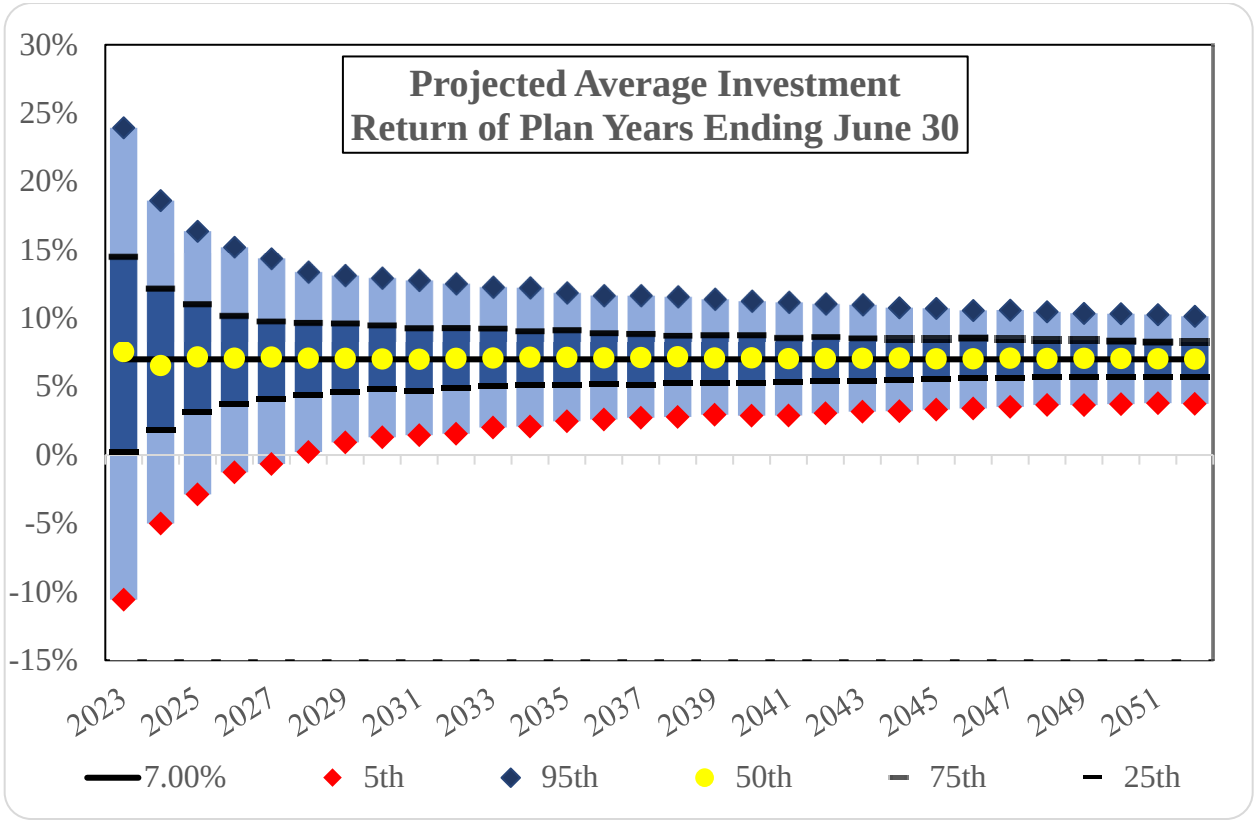
The yellow that predominates the left side of the charts indicates that the system is starting from a position that is comparatively in the middle of the outcomes. Higher returns lead to higher funded ratios, indicated by the green color in the lower right, while lower returns lead to lower funded ratios, as indicated in the red in the upper right.

Variability of Returns – Stochastic Modeling

Deterministic modeling is helpful to compare different scenarios, which can lead to a better understanding of the funding dynamics of the system. Missing in this analysis is an understanding of the likelihood of various scenarios and the plausible range of outcomes from the anticipated volatility associated with the asset allocation. These issues are handled with the more robust approach of stochastic modeling, in which investment performance is varied, based on the expected distribution of portfolio returns. Rather than obtaining a single result, this approach develops the results for many plausible scenarios, so that the distribution of outcomes can be considered.

For this modeling, we generated 1,000 30-year scenarios for the SERS's portfolio based on the expected return of 7.00% and standard deviation of 10.67% as disclosed in the recent experience study and assumed that each year's returns are independent. For each simulation, the asset, liabilities, and actuarial contribution rate were modeled for the next 30 years.

The chart below is based on the expected return and standard deviation noted above. We utilize those assumptions to produce the percentile ranks of expected returns over 30 years. Focusing on the longer time spans, the analysis indicates that over the next 30 years there is a 25% chance that the cumulated rate of return will be below 5.73% and a 25% chance it will be above 8.29%. In other words there is a 50% chance the cumulative market returns over the next 30 years will be between 5.73% and 8.29%. The 50th percentile average investment return over the next 30 years is 7.00%.



Probability of Low Funding Ratios

Because of issues such as asset liquidity and the ability to withstand severe market volatility, low funded ratios are a concern. Consequently, understanding the likelihood of the occurrence of a low funded ratio can be helpful to the Board's considerations. The following tables show the probability of being below a given level during the specified period.

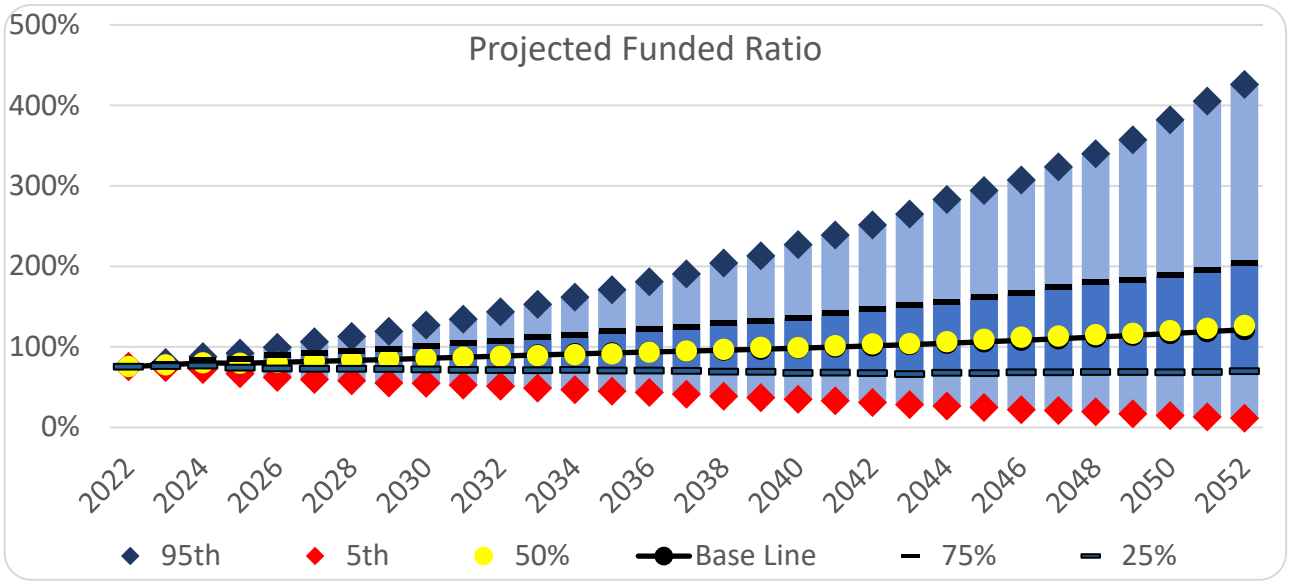
	Ratio <40%	Ratio <50%	Ratio <60%	Ratio <70%	Ratio <80%
2022 – 2027	0%	0%	2%	8%	64%
2022 – 2032	0%	1%	5%	14%	53%
2022 – 2037	1%	3%	8%	17%	47%

It is important to note that these are probabilities of the event occurring at any point during the period. There are scenarios in which the first few years may have low investment returns, leading to a low funded ratio, but due to strong investment returns in later years, the funding ratio after 10 or 15 years may be over 100%. Nonetheless, such scenarios would count in this table as an occurrence of a low funded ratio.

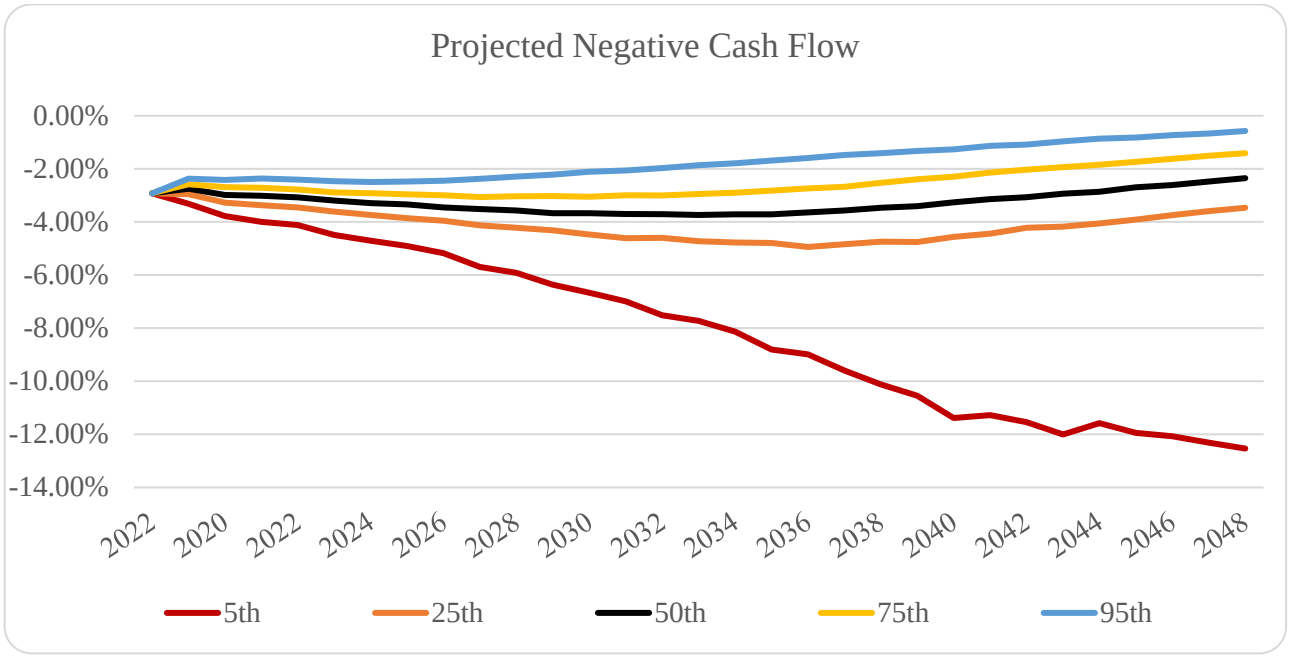
In general, there is a less than 8% chance that the funded ratio will decline below 60% over the next 15 years, and about a 17% chance that it will drop below 70% during the next 15 years.

Distributions of Outcomes

To this point, the discussion of stochastic modeling has focused on the probability of selected outcomes. It can also be useful to examine the distribution of outcomes for insight into the risk associated with investment returns. The following charts show the distribution for the next 30 years of the funded ratio. The darker blue portion of the bar represents the range between the 25th and 75th percentiles, or the middle 50% of results. A yellow line in the middle of the blue portion indicates the median (50th percentile) result. The lighter blue portion of the bars extend to show the 5th and 95th percentile ranges.



This graph indicates that in 10 years, the middle 50% of possible outcomes are between 71% and 108% funded. There is a 5% chance of being more than 144% funded, and a 5% chance of being less than 51% funded. Of course, should these less likely events occur, changes would mostly likely be made, thus changing the results.



The median negative cash flow tends to -3.7% over the next 10 years which is followed by improvement in the negative cash flow over the rest of the projection period. This is a contributing factor to the fact that the median funded ratio exceeds 100% in the projected funded ratio chart above.

RECESS FOR LUNCH

Goldman Sachs | Asset Management

Market Snapshot
Point Break

Candice Tse
Global Head of Strategic Advisory Solutions, Goldman Sachs Asset Management

MARKET STRATEGY | STRATEGIC ADVISORY SOLUTIONS
FEBRUARY 2023

Bio

Candice Tse

Global Head of Strategic Advisory Solutions

Candice is a managing director in the Global Client Business within Goldman Sachs Asset Management and serves as global head of the Strategic Advisory Solutions team. She focuses on global capital market research, macroeconomic strategy, portfolio construction and client engagement. In addition, Candice developed the firm’s EMPOWER the Investor framework, which guides Asian, Black, female, Hispanic/Latinx and LGBTQ+ investors toward greater financial success. She serves as co-head of the Asian Network within Asset Management.

Prior to assuming her current role, Candice served as US head of Market Strategy and held positions in Fundamental Equity Product Management, Institutional Sales and Portfolio Administration. Candice joined Goldman Sachs as an analyst in 1998 and was named managing director in 2019.

Candice is a founding board member of the Rutgers Business School's Center for Women in Business and is a board member of the Rutgers Business School Dean’s Board of Advisors. She is also an associate board member for Junior Achievement of New York. In 2021, she was named to the HERoes Role Model List, as a Top 100 Future Leader for her efforts in championing women in business and driving change for gender diversity in the workplace.

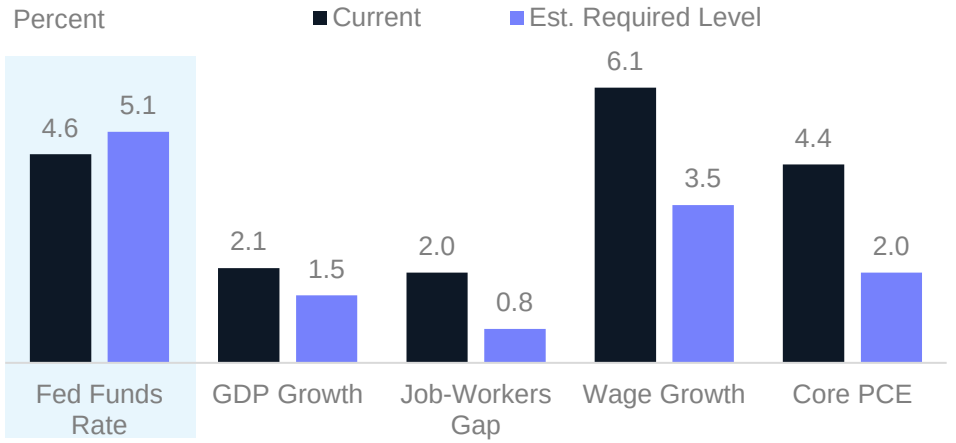
Candice earned a BS in Marketing, magna cum laude, from Rutgers University and an MBA in Finance and Management from Columbia Business School.

Executive Summary

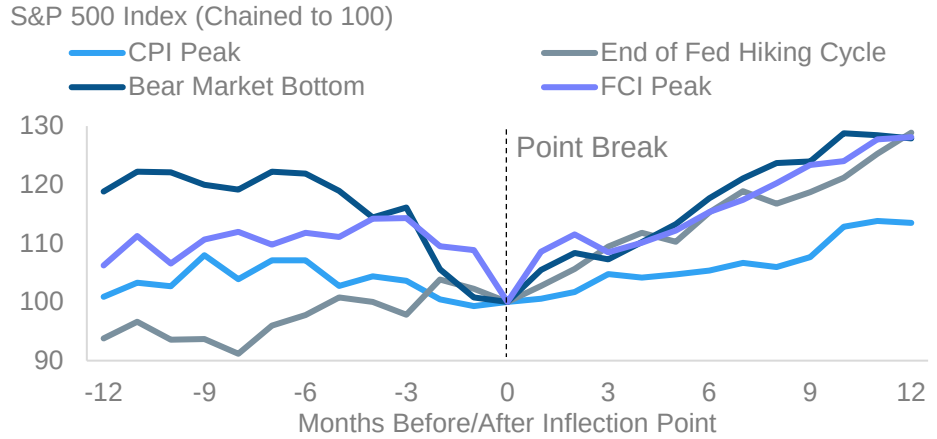
Point Break

- **Deceivingly Simple**: The Fed is solving for inflation, the markets are solving for the Fed. We expect a terminal Fed Funds rate of 5.00%–5.25%, with risk to the upside.
- **The Fed's Playbook:** To solve for inflation, we believe the Fed's aim is to 1) bring GDP growth below trend, enough to 2) materially reduce labor demand, to ultimately 3) slow wage acceleration to 3.5%.
- **US Recession**: History and consensus thinking suggest that a recession is all but a done deal. We believe there is a narrow path for a soft landing due to: 1) less drag from tighter FCI, 2) less pain needed to unwind the jobs-workers gap, 3) ongoing supply chain improvement, and 4) well-anchored long-run inflation expectations.
- **Inflection Points:** Investment results for the S&P 500 look quite hopeful in the 12 months following the top/bottom of key trends:
  - **Peak Inflation:** +13.5%
  - **FCI Top:** +28.1%
  - **Market Bottom:** +27.9%
  - **Last Hike:** +28.9%
- **Bottom Line:** We believe the intersection between inflation and policy is likely to remain volatile, but there are already clear points of entry, including yield, idiosyncratic alpha, and pricing dislocations.

THE FED'S PLAYBOOK TO TAMING INFLATION



MULTIPLE INFLECTION POINTS



Top Right Source: Current Population Survey, Bureau of Labor Statistics, and Federal Reserve Bank of Atlanta Calculations, Goldman Sachs Global Investment Research (GIR) and Goldman Sachs Asset Management. As of February 1, 2023. All forecasts refer to Goldman Sachs Global Investment Research. Please see definitions in the top right chart in the disclosures at the end of this presentation. Bottom Right Source: Bloomberg, Goldman Sachs Global Investment Research, and Goldman Sachs Asset Management. "CPI" refers to the Consumer Price Index. "FCI" refers to the GIR's US Financial Conditions Index. As of January 31, 2023. "We" refers to Goldman Sachs Asset Management, Strategic Advisory Solutions. "Recession" refers to a significant decline in economic activity that is spread across the economy and lasts more than a few months. "Alpha" refers to returns in excess of a benchmark. The economic and market forecasts presented herein are for informational purposes as of the date of this document. There can be no assurance that the forecasts will be achieved. **Past performance does not guarantee future results, which may vary.**

Sources of Volatility

POLICY RATES

5.13%

Forecasted Fed terminal rate, reached by May 2023

BUSINESS SENTIMENT

<50

ISM Manufacturing PMI while also contracting, in three consecutive months

DEBT CEILING

$31.4tn

Current federal debt ceiling, estimated to be breached later this year if not raised

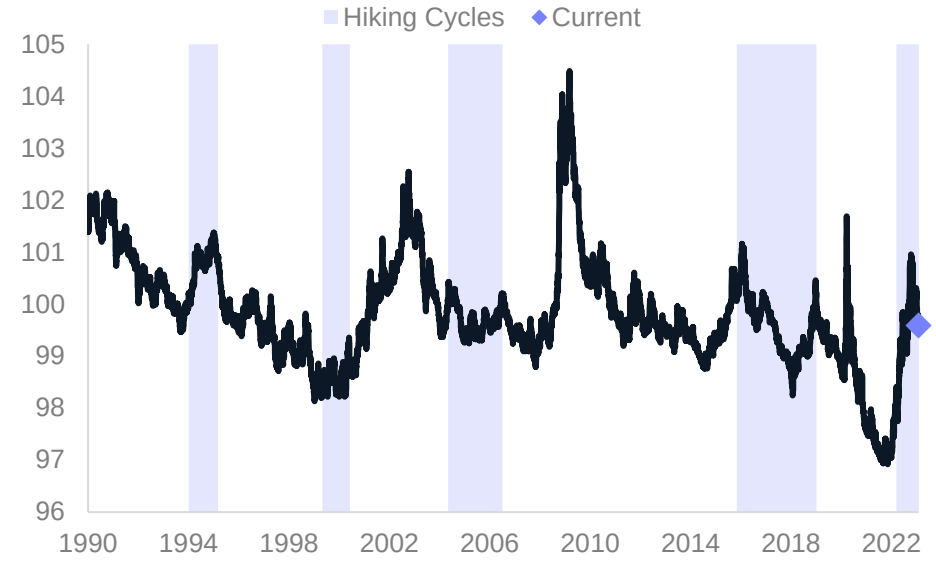
RECESSION RISK

65%

Consensus US recession probability

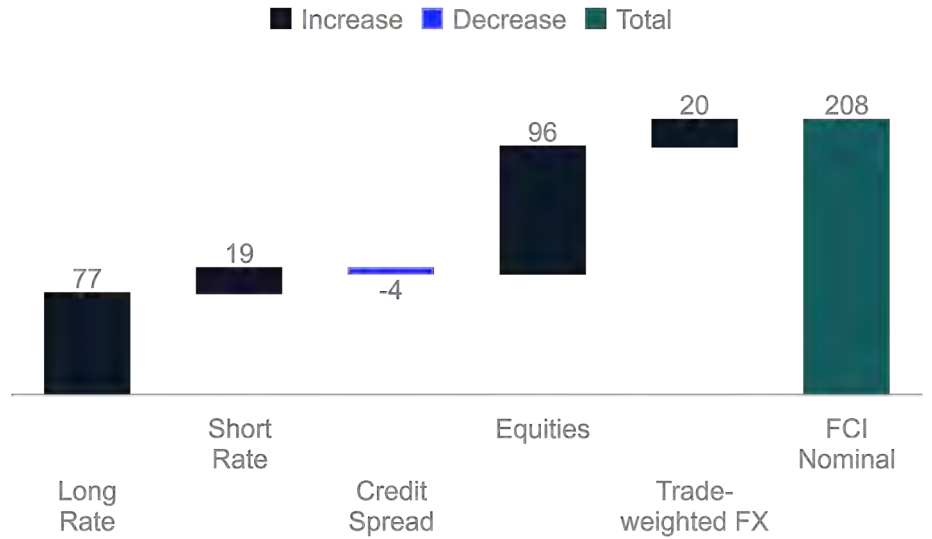
US FINANCIAL CONDITIONS INDEX

US Financial Conditions Index



TIGHTENING ACROSS COMPONENTS

US Financial Conditions Index Movement in Past Year (bps)



Source: Goldman Sachs Global Investment Research, Bloomberg, Department of the Treasury, and Goldman Sachs Asset Management. All as of January 31, 2023 or latest available. The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation. Bottom Notes: "US Financial Conditions Index" refers to a Goldman Sachs Global Investment Research Index designed to gauge the overall looseness or tightness of financial conditions across the world's major economies. **Past performance does not guarantee future results, which may vary.**

Sources of Stability

BANKING

0.72%

Total loans and leases that are past due, vs. long-term average of 1.9%

CORPORATES

2.4%

Of US high yield debt maturing in 2023

HOUSING

5%

Of households have an adjustable-rate mortgage, compared to 25% in 2006

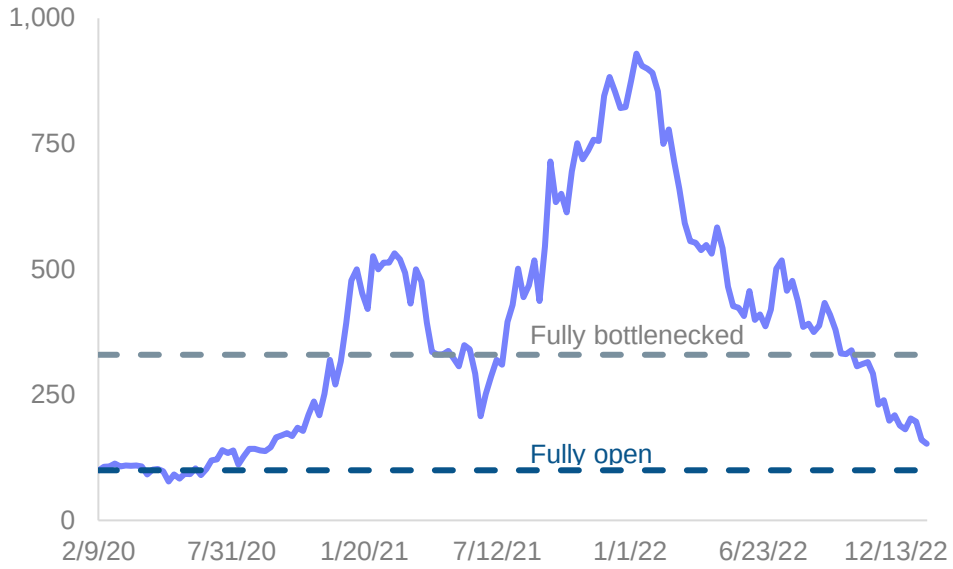
LABOR

5.3mn

US jobs-workers gap, providing a potential buffer to reduce labor demand

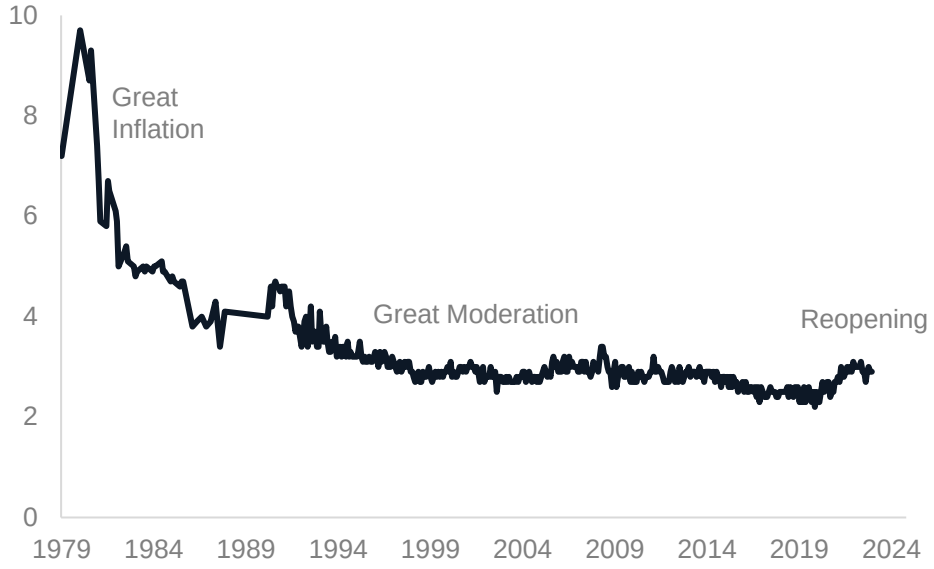
ROOM FOR IMPROVEMENT

GS Supply Chain Congestion Scale



INFLATION EXPECTATIONS

US Long-Run Inflation Expectations (%)



Top Source: Goldman Sachs Global Investment Research, Federal Reserve Economic Data, and Goldman Sachs Asset Management. All as of February 1, 2023 or latest available. "Past due" refers to loans and leases that are 90 days or more past due or in a nonaccrual status. Bottom Left Source: Goldman Sachs Global Investment Research and Goldman Sachs Asset Management. As of January 22, 2023. Index reflects data on ships at anchor, days to deliver, various dwell times, intermodal volume and velocity statistics, amongst others. Bottleneck refers to a lack of transport fluidity and an inability to properly re-stock and replenish inventory. Bottom Right Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. "US Long-Run Inflation Expectations" refers to University of Michigan 5-10 Year Inflation Expectations. **Past performance does not guarantee future results, which may vary.**

Macro Drivers

Below-trend growth, with a recession in the UK and weaker growth in the Euro area

REAL GDP GROWTH

Percent Change YoY	2021	2022 (f)		2023 (f)		Potential
		GS	Cons	GS	Cons	GS
US	5.9	2.1	2.0	1.5	0.5	1.8
Euro Area	5.3	3.5	3.3	0.8	0.1	1.1
Japan	1.6	1.2	1.3	1.2	1.3	0.8
UK	7.5	4.1	4.1	-0.5	-0.9	1.4
China	8.1	3.0	3.0	6.5	5.1	4.2
Russia	4.7	-3.3	-3.0	-1.3	-3.0	1.2
Developed Markets	**5.3**	**2.6**	**2.7**	**1.1**	**0.6**	**-**
Emerging Markets	**7.1**	**3.5**	**3.1**	**3.8**	**4.1**	**-**
World	**6.1**	**3.0**	**3.1**	**2.3**	**2.1**	**2.6**

Our views:

- **Globally**, we see decelerating growth, elevated inflation, and higher policy rates
- The **US** has an excess demand issue, with more jobs than workers fueling strong wage growth
- The **Euro area** has an energy supply shock issue, which is pushing up inflation and weighing on growth
- The **UK** economy faces both issues
- Still, **this cycle may be different**: Labor market rebalancing, room for supply chain and shelter inflation normalization, and anchored long-term inflation expectations act as macro buffers

Source: Bloomberg, Goldman Sachs Global Investment Research, and Goldman Sachs Asset Management. As of February 6, 2023. "GDP" refers to gross domestic product. "f" refers to forecast. "Cons." refers to consensus expectations. "YoY" refers to year over year. Some forecasts may be shaded to highlight data points. All forecasts refer to Goldman Sachs Global Investment Research. "Our views" refers to Strategic Advisory Solutions, Goldman Sachs Asset Management. The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. **Past performance does not guarantee future results, which may vary.**

Capital Market Forecasts

Current macro conditions reflect a broadening opportunity set across asset classes

	Current	Forecast 3m	Forecast 6m	Forecast 12m	Upside / Downside to 12m TP (%)
Equities					
S&P 500	4,136	4,000	4,000	4,000	-3.3
STOXX Europe 600	461	420	440	465	0.9
MSCI Asia-Pacific Ex-Japan	554	580	600	620	12.0
Topix (FY Basis)	1,970	2,000	2,050	2,200	11.7
10Y Rate (%)					(bp)
US	3.5	3.8	4.2	4.2	63
Euro area (Germany)	2.2	2.8	2.8	2.7	50
Japan	0.5	0.6	0.8	0.9	40
Currencies					
€/$	1.08	1.02	1.02	1.10	1.6
£/$	1.21	1.15	1.15	1.22	1.2
$/¥	131	132	125	125	-4.6
Commodities					
Brent Crude Oil ($/bbl)	79.9	95.0	100.0	105.0	31.3
NYMEX Nat. Gas ($/mmBtu)	2.40	3.70	3.70	3.60	49.4
London Gold ($/troy oz)	1,870	1,850	1,950	1,950	4.3
LME Copper ($/mt)	8,951	9,500	10,000	11,000	22.9

We believe that equities are likely to be **resilient over the long-term**, though **volatility may persist near-term**. Still, demand may moderate from historically high levels as other asset classes compete

We forecast **global rates to level off** reflecting the impacts of past rate hikes, though the path of further adjustment remains data-dependent

Global uncertainty and policy differentials may support a **strong US dollar in the near term**, though high valuation and cyclicality may be long-term headwinds

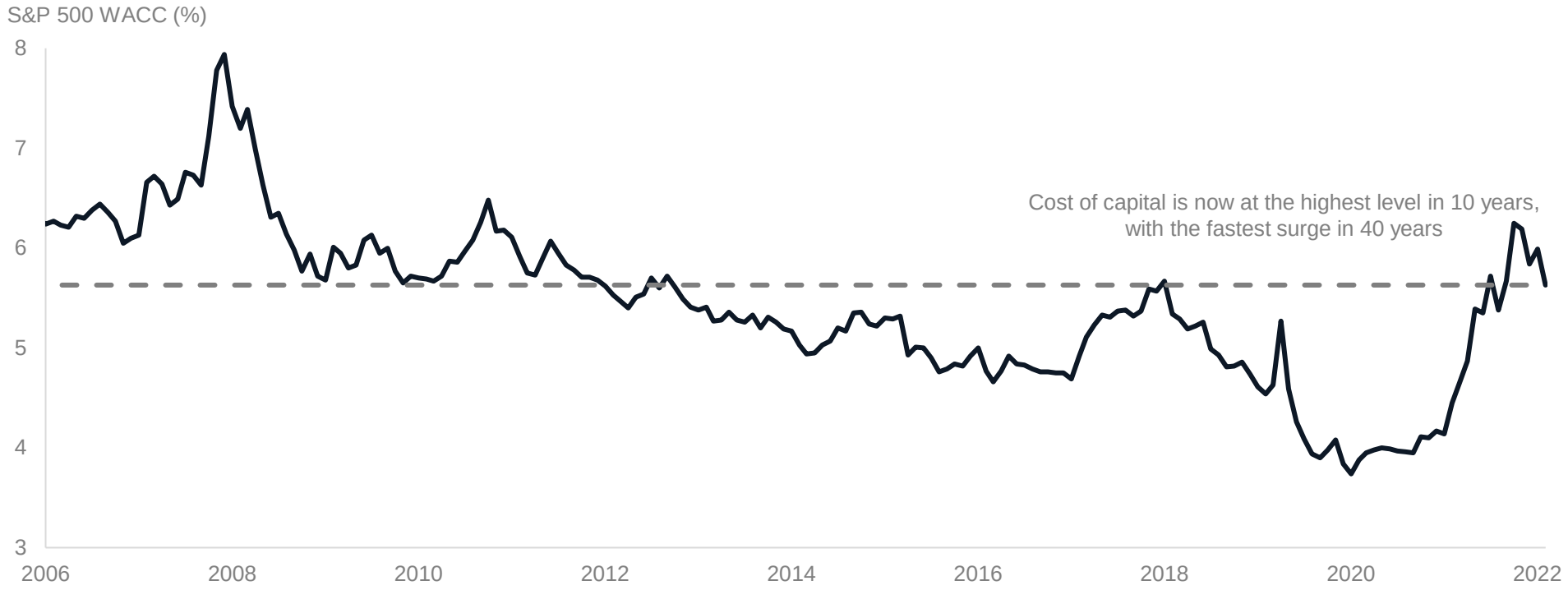
Supply-demand imbalances may partially offset recessionary risks and keep **commodity prices firm**, albeit with wide tails

Source: MSCI, Goldman Sachs Global Investment Research, and Goldman Sachs Asset Management. As of February 6, 2023. "TP" refers to Target Price. The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation.

Investing in the Next Cycle

Last Cycle	This Cycle
Very Strong Growth	Decelerating Growth
Falling Interest Rates	Rising Interest Rates
Rising Profit Margins	Stable Profit Margins
Low Starting Valuations	Falling Valuations
Limited Market Volatility	More Episodic Volatility

A NEW REGIME

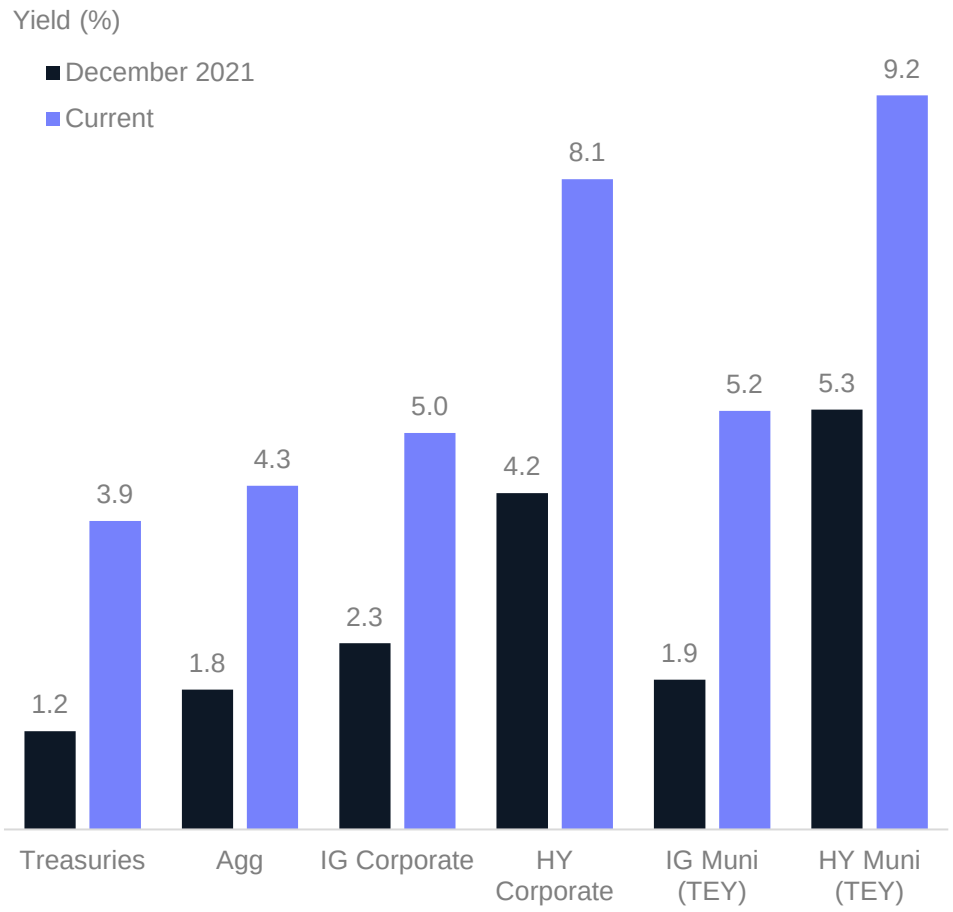


Source: Goldman Sachs Global Investment Research and Goldman Sachs Asset Management. As of January 31, 2023. "WACC" refers to the weighted average cost of capital. **Past performance does not guarantee future results, which may vary.**

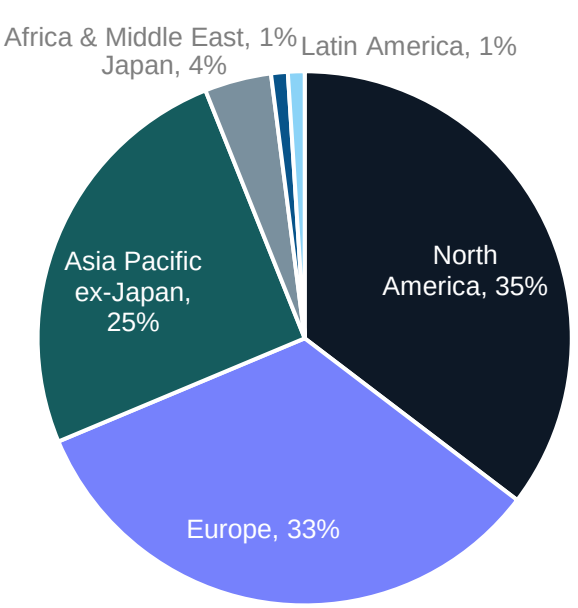
Investing in the Next Cycle

Generating alpha may require more idiosyncratic and global portfolios, given cross-asset competition

CROSS-ASSET COMPETITION



POTENTIAL WEALTH CREATORS OF THE FUTURE



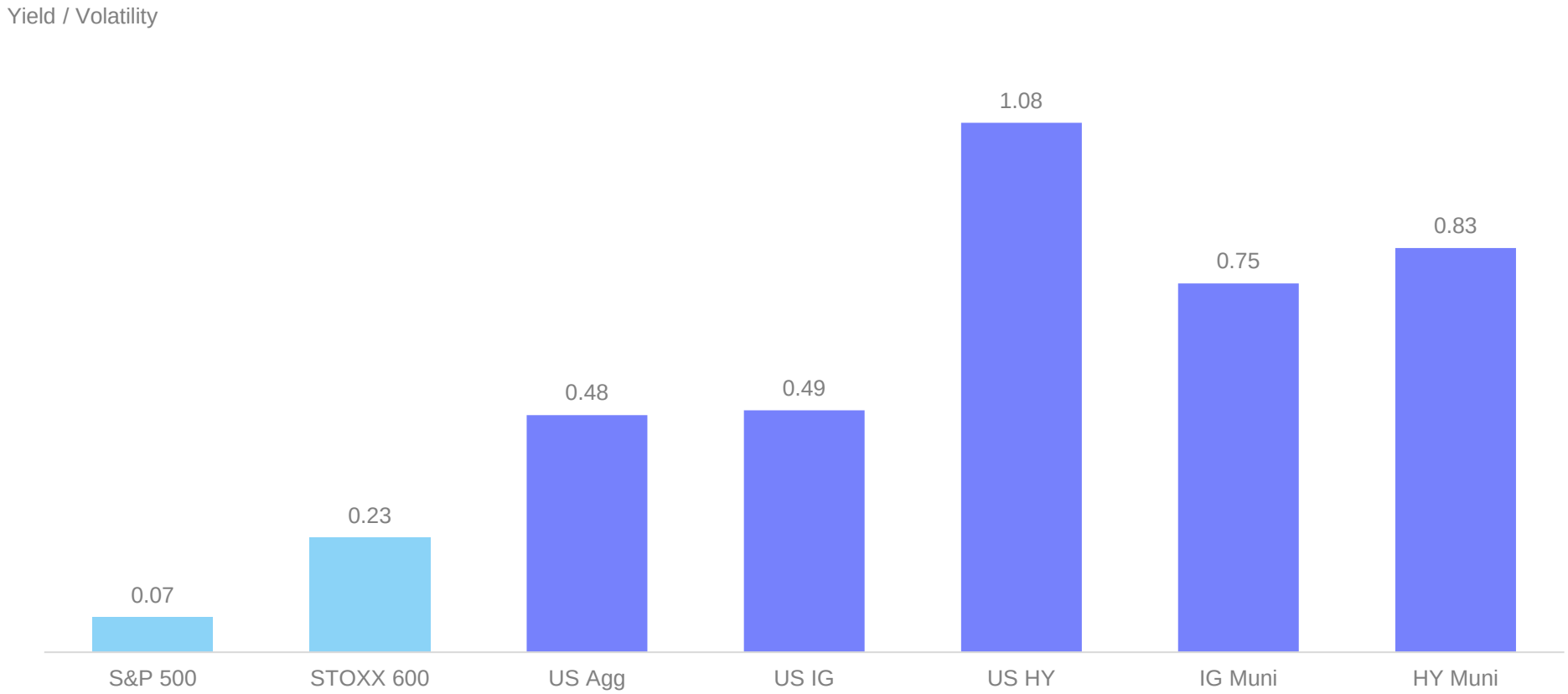
Characteristics of Potential Future Wealth Creators			
Innovators	Disruptors	Enablers	Adapters

Left Chart Source: Barclays Live and Goldman Sachs Asset Management. As of January 31, 2023. Please see definitions for the abbreviations in the disclosures at the end of this presentation. Right Chart Source: Bloomberg, FactSet, Goldman Sachs Global Investment Research, and Goldman Sachs Asset Management. As of October 13, 2021. "Alpha" is the portion of the total return on the portfolio not attributable to the portfolio's exposure to its benchmark or index. **Past performance does not guarantee future results, which may vary.**

Investing in the Next Cycle

More episodic equity market volatility may mean renewed opportunities for income and tax-alpha

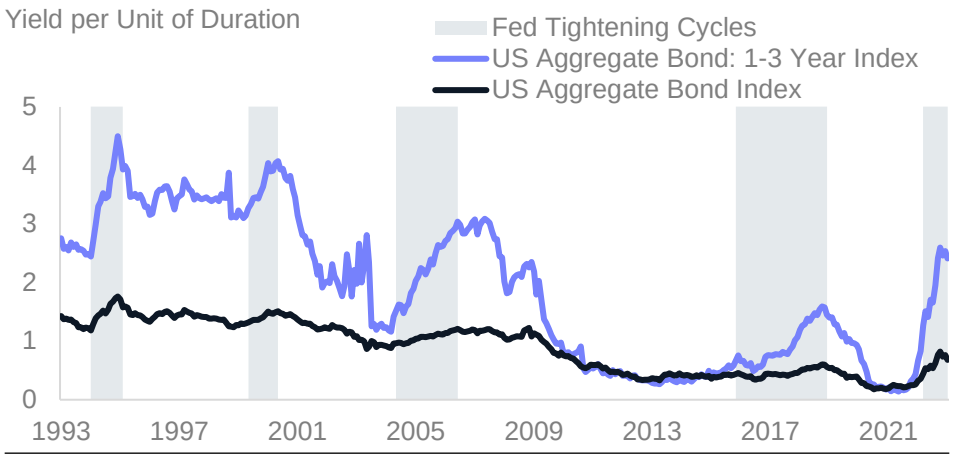
FROM YIELD SCARCITY TO YIELD SURPLUS



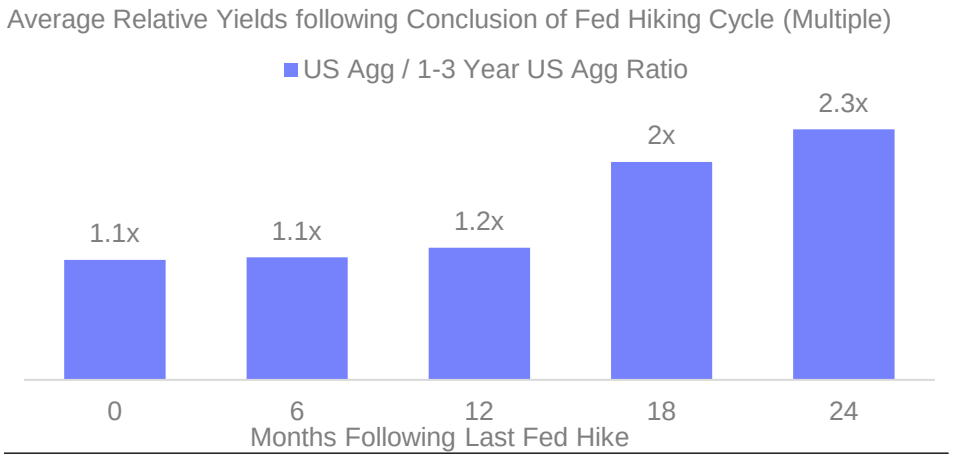
Left Chart Source: Goldman Sachs Global Investment Research and Goldman Sachs Asset Management. As of January 31, 2023. "Agg" refers to aggregate. "IG" refers to investment grade. "HY" refers to high yield. Right Chart Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. Chart shows the bucketed averages of the S&P 500 calendar year after-tax total return, the illustrative tax savings generated by monthly tax-loss harvesting, and the S&P 500 calendar year after-tax total return with monthly tax-loss harvesting. Data are from January 1, 1945 to January 31, 2023. Additional assumptions can be found in the disclosures at the end of this presentation. These examples are for illustrative purposes only and are not actual results. If any assumptions used do not prove to be true, results may vary substantially. Goldman Sachs does not provide accounting, tax, or legal advice. Please see additional disclosures at the end of this presentation. **Past performance does not guarantee future results, which may vary.**

Risks in Context

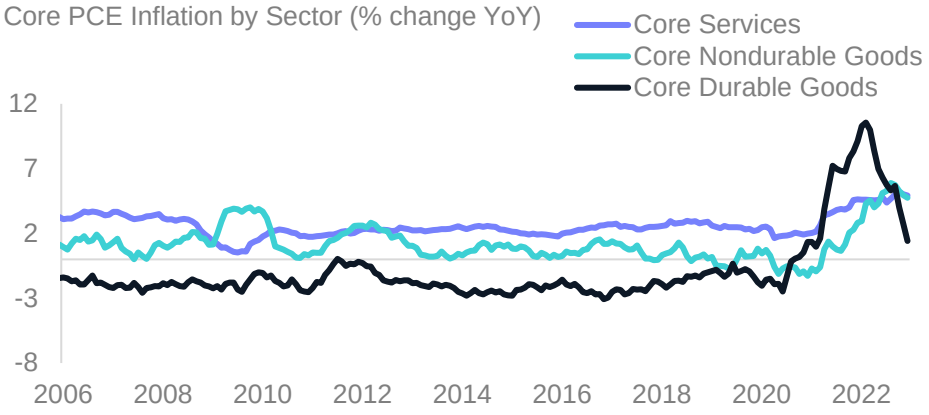
TIGHTENING



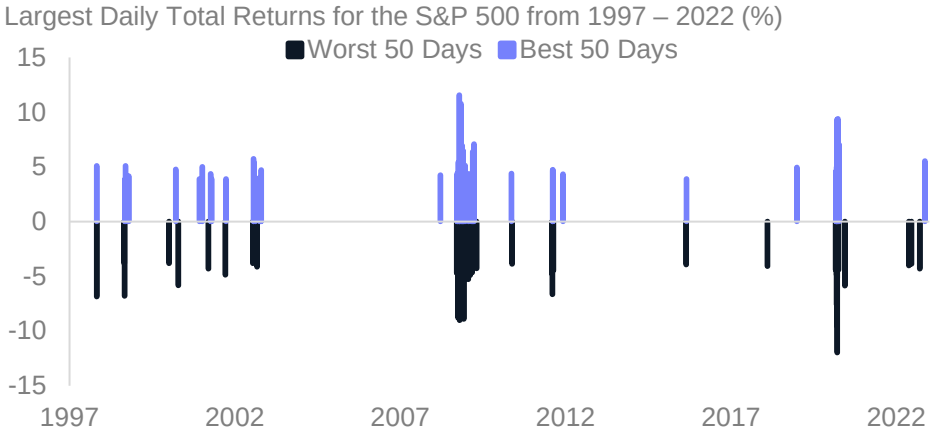
POST-TIGHTENING



INFLATION



VOLATILITY



Top Left Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. "Yield per unit of Duration" represents yield to worst divided by duration. Top Right Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. Chart shows the average yield to worst of the Bloomberg US Aggregate Bond Index divided by the average yield to worst of the Bloomberg US Aggregate Bond: 1-3 Year Index at different time periods following the end of the month of the last hike in the last three Fed hiking cycles. Bottom Left Source: Goldman Sachs Global Investment Research and Goldman Sachs Asset Management. As of December 31, 2022. Bottom Right Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. "Volatility" is a measure for variation of price of a financial instrument over time. **Past performance does not guarantee future results, which may vary.**

Volatility

Volatility may be amplified by low liquidity

FREQUENCY

S&P 500 Daily Price Δ (days)	± 1%	± 2%	± 3%	± 4%	± 5%
Avg	**62**	**18**	**7**	**3**	**2**
Bear Market Avg	**87**	**31**	**13**	**7**	**3**
2022	**122**	**46**	**12**	**3**	**1**
2023 YTD	**9**	**1**	**0**	**0**	**0**

Top Source: Bloomberg and Goldman Sachs Asset Management. As of January 31, 2023. “Bear market” refers to a period when a market experiences prolonged price declines. Bottom Source: Goldman Sachs Global Investment Research. As of January 31, 2023. “Top-of-book liquidity” refers to the liquidity of the highest bid and the lowest ask in an order book. “Volatility” is a measure for variation of price of a financial instrument over time. **Past performance does not guarantee future results, which may vary.**

Market Solutions

In a world of macro uncertainty, there may be a menu of asset classes serving as potential solutions

POTENTIAL SOLUTION SET FOR PREVAILING INVESTOR CONCERNS

		Fixed Income		Equities		Satellites / Alternatives		
		Ultra-Short Duration	Core	Value	Direct Indexing	Real Assets	Private Credit	Absolute Return Strategies
NOW	**Sticky Inflation**	X		X		X		
NOW	**Elevated Rates**	X	X	X		X	X	X
NOW	**Recession Risk**	X	X	X				X
ALWAYS	**Market Volatility**	X	X	X	X	X	X	X
ALWAYS	**Income Generation**	X	X	X		X	X	
ALWAYS	**Tax Efficiency**	X			X	X		

Source: Goldman Sachs Asset Management. As of January 31, 2023. Goldman Sachs does not provide accounting, tax, or legal advice. Please see additional disclosures at the end of this presentation. A Buy-Write strategy refers to an investment that receives call premium on an underlying equity position to generate income. **This material is provided for educational purposes only and should not be construed as investment advice or an offer or solicitation to buy or sell securities.**

Key Takeaways

We believe:

- Slower economic growth is driven by tighter financial conditions and necessary to tame inflation
- Cross-asset competition may keep equity valuations capped, limiting return potential to earnings growth
- A surge in the cost of capital has created focus on profitability and income
- Generating alpha may require portfolios to be increasingly idiosyncratic, global, and tax-aware

Source: Goldman Sachs Asset Management. As of January 31, 2023. The portfolio risk management process includes an effort to monitor and manage risk, but does not imply low risk. The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation.

Glossary

Additional Notes

Page 2 Top Right Chart Notes: “GDP Growth” refers to the annual change in real gross domestic product. “Job-Workers Gap” refers to the difference in labor supply to labor demand as a percent of the civilian noninstitutional population. “Core PCE” refers to personal consumption expenditures, excluding food and energy.

Page 8 Left Chart Notes: Potential Wealth Creators consist of 500 companies selected in a framework developed by Goldman Sachs Global Investment Research to identify companies considered to provide value creation and growth in a post-pandemic market cycle. Four categories exist in the framework: innovators, disruptors, enablers, and adapters. Innovators are broadly defined as companies using new technologies. Disruptors are broadly defined as utilizing technology to disrupt other industries. Enablers are broadly defined as companies facilitating social and economic change. Adapters are broadly defined as companies adapting business models to generate higher returns.

Page 8 Right Chart Notes: “Treasuries” refer to the US Treasury component the Bloomberg US Aggregate Bond Index. “Agg” refers to the Bloomberg US Aggregate Bond Index. “MBS” refers to the Mortgage-Backed Securities component of the Bloomberg US Aggregate Bond Index. “ABS” refers to the Asset-Backed Securities component of the Bloomberg US Aggregate Bond Index. “IG Corporate” refers to the Bloomberg US Corporate Investment Grade Index. “HY Corporate” refers to the Bloomberg US High Yield Corporate Index. “IG Municipal” refers to the Bloomberg Municipal Bond Index. “HY Municipal” refers to the Bloomberg Municipal High Yield Index. “TEY” refers to tax-equivalent yield.

Equities

The S&P 500 Index is the Standard & Poor’s 500 Composite Stock Prices Index of 500 stocks, an unmanaged index of common stock prices. The index figures do not reflect any deduction for fees, expenses or taxes. It is not possible to invest directly in an unmanaged index.

The Euro Stoxx 600 Index represents the performance of 600 publicly-traded companies based in one of 18 EU countries.

The FTSE 100 Index is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange.

The TOPIX Index is a free-float adjusted market capitalization-weighted index that is calculated based on all the domestic common stocks listed on the Tokyo Stock Exchange First Section.

The MSCI Asia Pacific ex-Japan Index captures large and mid cap representation across 4 of 5 Developed Markets countries (excluding Japan) and 9 Emerging Markets countries in the Asia Pacific region.

Fixed Income

The 10-Year Treasury is a US Treasury debt obligation that has a maturity of 10 years.

The Bloomberg U.S. Aggregate Bond Index measures the performance of investment grade, U.S. dollar denominated, fixed rate taxable bond market, including Treasuries, government related and corporate securities, MBS (agency fixed rate and hybrid ARM pass throughs), ABS, and CMBS.

The Bloomberg U.S. Aggregate 1-3 Year Index measures the performance of investment grade, USD denominated, fixed rate taxable bond market securities with maturities of 1 3 years, including Treasuries, government related and corporate securities, mortgage backed securities (MBS; agency fixed rate and hybrid ARM pass throughs), asset backed securities, and commercial MBS.

Risk Considerations and General Disclosures

Risk Considerations

Equity securities are more volatile than fixed income securities and subject to greater risks. Small and mid-sized company stocks involve greater risks than those customarily associated with larger companies.

Investments in foreign securities entail special risks such as currency, political, economic, and market risks. These risks are heightened in emerging markets.

Emerging markets securities may be less liquid and more volatile and are subject to a number of additional risks, including but not limited to currency fluctuations and political instability.

Investments in fixed-income securities are subject to credit and interest rate risks. Bond prices fluctuate inversely to changes in interest rates. Therefore, a general rise in interest rates can result in the decline in the bond's price. Credit risk is the risk that an issuer will default on payments of interest and principal. This risk is higher when investing in high yield bonds, also known as junk bonds, which have lower ratings and are subject to greater volatility. All fixed income investments may be worth less than their original cost upon redemption or maturity.

Although Treasuries are considered free from credit risk, they are subject to interest rate risk, which may cause the underlying value of the security to fluctuate. Income from municipal securities is generally free from federal taxes and state taxes for residents of the issuing state. While the interest income is tax-free, capital gains, if any, will be subject to taxes. Income for some investors may be subject to the federal Alternative Minimum Tax (AMT).

Investments in commodities may be affected by changes in overall market movements, commodity index volatility, changes in interest rates or factors affecting a particular industry or commodity.

The currency market affords investors a substantial degree of leverage. This leverage presents the potential for substantial profits but also entails a high degree of risk including the risk that losses may be similarly substantial. Such transactions are considered suitable only for investors who are experienced in transactions of that kind. Currency fluctuations will also affect the value of an investment.

Buy-write strategies are subject to market risk, which means that the value of the securities in which it invests may go up or down in response to the prospects of individual companies, particular sectors and/or general economic conditions. They are also subject to the risks associated with writing (selling) call options, which limits the opportunity to profit from an increase in the market value of stocks in exchange for up-front cash at the time of selling the call option. In a rising market, the strategy could significantly underperform the market, and the options strategies may not fully protect it against declines in the value of the market.

The above are not an exhaustive list of potential risks. There may be additional risks that are not currently foreseen or considered.

General Disclosures

Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities. It should not be assumed that investment decisions made in the future will be profitable or will equal the performance of the securities discussed in this document.

The portfolio risk management process includes an effort to monitor and manage risk, but does not imply low risk.

Index Benchmarks

Indices are unmanaged. The figures for the index reflect the reinvestment of all income or dividends, as applicable, but do not reflect the deduction of any fees or expenses which would reduce returns. Investors cannot invest directly in indices.

The indices referenced herein have been selected because they are well known, easily recognized by investors, and reflect those indices that the Investment Manager believes, in part based on industry practice, provide a suitable benchmark against which to evaluate the investment or broader market described herein.

Although certain information has been obtained from sources believed to be reliable, we do not guarantee its accuracy, completeness or fairness. We have relied upon and assumed without independent verification, the accuracy and completeness of all information available from public sources.

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Economic and market forecasts presented herein reflect a series of assumptions and judgments as of the date of this presentation and are subject to change without notice. These forecasts do not take into account the specific investment objectives, restrictions, tax and financial situation or other needs of any specific client. Actual data will vary and may not be reflected here. These forecasts are subject to high levels of uncertainty that may affect actual performance. Accordingly, these forecasts should be viewed as merely representative of a broad range of possible outcomes. These forecasts are estimated, based on assumptions, and are subject to significant revision and may change materially as economic and market conditions change. Goldman Sachs has no obligation to provide updates or changes to these forecasts. Case studies and examples are for illustrative purposes only.

Past performance does not guarantee future results, which may vary. The value of investments and the income derived from investments will fluctuate and can go down as well as up. A loss of principal may occur.

Date of First Use: February 17, 2023. **Compliance Code : 306791-OTU-1742434**

STRATEGIC PLAN UPDATE

FY2020 – FY2024

February 17, 2023

STRATEGIC PLAN DEVELOPMENT MILESTONES

FY2020-2024

September 2018

SERS engaged with RAMA Consulting to facilitate the development of a comprehensive 5-year plan through employee, organization, and stakeholder engagement

November 2018

- Completed Leadership Team interviews
- Board Interviews
- All Staff Survey

February/ March 2019

Leadership Team and Staff Discussions and Workshops

April/ May 2019

Preliminary FY20–24 Strategic Plan

May 2019

Draft FY20–24 Strategic Plan

June 2019

Final Strategic Plan and Approval

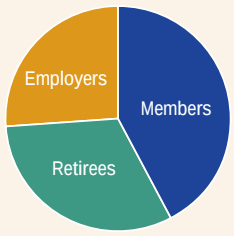
Sep 2018 | **Oct 2018** | **Nov 2018** | **Dec 2018** | **Jan 2019** | **Feb 2019** | **Mar 2019** | **Apr 2019** | **May 2019** | **Jun 2019**

December 2018 – January 2019

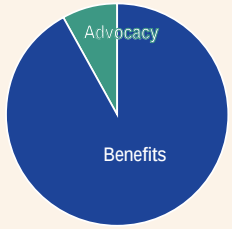
Stakeholder Engagement Survey of members, retirees, and employers

1. Which SERS advocacy partner group does your organization represent?

**some respondents represent multiple stakeholder groups*



2. How would you define the business of SERS? In other words, describe briefly in your own words what the organization does.



3. What are the top three challenges facing SERS in next 5 years?

4. What strategies or solutions would you suggest?

Health Care: Negotiate rates, be visionary

Technology: Education and engagement

Financial Stability: Review, Incremental change, streamline, COLA

Legislative strategy: Education

5. What are the top 2-3 priorities for SERS?

Health Care

Governance

Legislative Strategy

Pension Fund Sustainability (COLA, Health Care, Communication, Maintain current level of benefits, Fund management, Employer contributions, Outreach, Technology)

6. How would your members rate their overall level of satisfaction with communications received from SERS?

7. How would you rate overall satisfaction with the services received from SERS?

STRATEGIC PLAN
FY2020 - 2024

SCHOOL EMPLOYEES RETIREMENT SYSTEM OF OHIO

JULY 1 - JUNE 30

INTRODUCTION

The SERS Strategic Planning Project

In 2018, the School Employees Retirement System of Ohio (SERS) initiated the development of a five-year strategic plan to guide the organization's work. Technological and organizational changes inspired the organization's leadership to embark upon a strategic planning process that included a broad number of stakeholders. RAMA Consulting (RAMA), a performance management consulting firm in Columbus, Ohio with expertise in evaluation and assessment, strategic planning, leadership development, and cultural competence, was engaged to facilitate the strategic planning process for SERS' FY2020 – 2024 plan. A highly participative process was designed that included collecting and analyzing survey data, facilitating key informant focus groups, and producing a preliminary report and final strategic plan.

Planning Process Overview

The process was designed to develop a realistic and action-oriented plan for the organization's sustainability and growth over the next five years. The process is summarized below:

LEARNING PHASE

- Meet with SERS Leadership
- Review Relevant Documents and Research
- Preliminary Engagement of Planning Stakeholders

PLANNING PHASE

- Advocacy Partner Roundtable
- Leadership Team Planning Retreat
- Staff Follow-up/Work Session

DOCUMENTATION PHASE

- Document 5-year Strategic Plan Goals/Priorities
- Design and Present Executive Summary Document
- Produce Final Strategic Plan

Beyond the primary focus of pension fund sustainability and provision of health care benefits, the organization sought to consider ways in which it could strengthen its infrastructure, service delivery, and culture after the implementation of the new pension administration system (SMART). To aid SERS in crafting its strategic vision, the Board, Leadership Team, Staff, and Advocacy Partners participated in a number of interviews, surveys, workshops, and focus groups to define its goals for the next five years and develop actionable strategies to strengthen infrastructure and service delivery in order to increase efficiency and sustainability. Key milestones of the strategic planning process include:

- **Kick-off Meeting with SERS Leadership:** September 2018
- **Environmental Scan:** September 2018
- **Leadership Team Engagement (interviews and workshops):** Late October 2018 - April 2019
- **Board Engagement (interviews):** November - Early December 2018
- **Staff Engagement (survey and focus groups):** November 2018, February 2019
- **Stakeholder Engagement (survey and focus group):** December 2018 - Early January 2019
- **Preliminary Report:** January 2019
- **Submission and Review of Strategic Plan Framework:** April - May 2019
- **Draft Strategic Plan:** May 2019
- **Final Strategic Plan:** June 2019

NOTE: The timelines listed in this document reflect the first 18 – 24 months of the strategic plan's duration.

Throughout the plan's implementation, the organization will revisit and revise actions, timelines, and responsibilities associated with each strategic goal to ensure continued progress. The items contained in this document have been thoughtfully planned and considered to allow the organization to evolve its approach and progress toward the goals identified in the plan.

MISSION

To provide our membership with valuable lifetime pension benefit programs and services.

VISION

Through the continuous pursuit of excellence and innovative solutions, we will partner with our stakeholders so that our membership will understand and achieve security in retirement.

VALUES

We believe these deeply ingrained principles guide all of our actions and enable SERS to fulfill its mission:

FOCUS • ACCOUNTABILITY • COMMUNICATION • COLLABORATION • INNOVATION

CORE BELIEFS

We are here to serve.
We are open and honest.
We are professional.
We are dedicated.
We are enthusiastic.
We are high performers.
We are valuable partners.
We are member advocates.
We are innovators.
We are SERS.

GOAL #1: PENSION FUND SUSTAINABILITY

Our pension fund is designed to be sustainable and adaptive to meet the needs of our members, employers, and retirees.

GOAL #2: HEALTH CARE SUSTAINABILITY

Our approach to health care focuses on program sustainability and access to quality care.

GOAL #3: SERVICE DELIVERY

Our service delivery is responsive and shaped by the needs of those we serve.

GOAL #4: OPERATIONS

Our systems and processes foster organization-wide efficiency, agility, and accountability.

GOAL #5: CULTURE

Our culture promotes a high-performing team driven by mission and continuous improvement.

GOAL #6: COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT

Our communications and stakeholder engagement promotes awareness, transparency, accountability, and trust.

GOAL #1 PENSION FUND SUSTAINABILITY

Our pension fund is designed to be sustainable and adaptive to meet the needs of our members, employers, and retirees.

Strategy 1.0 Assist the Board in identifying plan design features that are sustainable, meet the recruiting and retention goals of employers, and provide value to members and retirees.

Action 1.1: Establish metrics for data collection from members and employers that help better inform the plan design and communicate the value of the plan.

Action 1.2: Conduct periodic comparative analyses of pension and benefit plan designs and provide information to the Board inclusive of comparative analysis findings, actuarial studies, and membership demographics.

Action 1.3: Work with the Board to develop a common definition of "sustainability" that will aid in planning efforts.

Action 1.4: Evaluate any proposed plan changes to ensure regulatory compliance.

Success Indicators

- Board prioritization of sustainability recommendations
- Implementation plan for Board-endorsed recommendations
- New data collection metrics
- Comparative analyses of plan designs
- Prepare and provide a report to the Board on comparative analysis findings, actuarial studies, and membership demographics
- Board-endorsed "sustainability" definition
- Evaluation of proposed plan changes

Lead: Executive Director

Target Timeline: Q4 2020

Strategy 2.0 Support the development and execution of sustainability action plans to implement measures identified by the Board.

Action 2.1: Enhance strategies for stakeholder engagement and outreach aligned with Board priorities.

Action 2.2: Expand efforts towards a proactive governmental relations strategy with considerations of legislative and constituent buy-in and support for plan design features.

Action 2.3: Create a framework for implementation of changes considered and/or approved by the Board to develop and communicate timeframes and resources.

Success Indicators

- Updated stakeholder engagement and outreach strategy
- Updated legislative strategy
- Implementation plan for Board-endorsed recommendations
- Board member engagement in plan design

Lead: Executive Director

Target Timeline: Q4 2021

GOAL #1 PENSION FUND SUSTAINABILITY

Our pension fund is designed to be sustainable and adaptive to meet the needs of our members, employers, and retirees.

Strategy 3.0 Support the Board's ongoing analysis of risks to sustainability and develop measures to mitigate those risks

Action 3.1: Determine a framework for evaluating risks to sustainability.

Action 3.2: Determine the most effective method of communicating risks to sustainability to support Board decision-making processes.

Action 3.3: Assist Board in evaluating potential risk mitigation measures.

Success Indicators

- Sustainability evaluation framework
- Communication plan for risk analysis
- Actuarial assumptions assessment

Lead: Executive Director

Target Timeline: Q4 2020

Strategy 4.0 Maintain an investment program that meets or exceeds investment objectives over the long-term.

Action 4.1: Maintain prudent actuarial assumptions.

Action 4.2: Conduct an asset/liability study to assess risks to long-term funding goals and assist the Board in setting an appropriate asset allocation strategy.

Action 4.3: Execute an investment strategy to deliver value-added returns over benchmarks through superior portfolio design and structure, investment selection, risk management, and cost-effectiveness.

Action 4.4: Develop and maintain a high caliber investment team with a strong performance orientation and risk management culture.

Success Indicators

- Actuarial assumptions assessment
- Asset liability study
- Investment strategy results
- Actuarial experience study

Leads: Executive Director
Chief Investment Officer

Target Timeline: Ongoing

GOAL #2 / HEALTH CARE SUSTAINABILITY

Our approach to health care focuses on program sustainability and access to quality care.

Strategy 1.0 Support Board's development of health care options with consideration to funding availability and retiree needs.

Action 1.1: Conduct continuous research and cost/benefit analysis on innovations in health care that would make the Plan's benefit more cost-competitive and accessible.

Action 1.2: Support analysis of the proper scope of the sustainable health care program by facilitating the board's decision-making processes on key issues such as eligibility and subsidization.

Action 1.3: Communicate reasonable expectations of stakeholders regarding the health care benefit.

Success Indicators

- Cost/benefit analysis of health care options
- Health care options for sustainability
- Health care stakeholder communication strategy

Lead: Executive Director

Target Timeline: Q4 2020

Strategy 2.0 Maximize available health care resources through innovation and adaptability.

Action 2.1: Continuously analyze the health care landscape and regulatory environment to inform plan design to expand access, manage costs, and ensure the quality of the health care benefit.

Action 2.2: Continually engage stakeholders and other pension systems in developing solutions to maximize health care resources.

Action 2.3: Leverage vendor relationships to improve health care resources and programs.

Success Indicators

- Health care cost containment objectives
- Solvency levels of health care fund

Leads: Executive Director
Director of Health Care Services

Target Timeline: Ongoing

Strategy 3.0 Advocate for and support public policy health care solutions that support our mission.

Action 3.1: Develop and strengthen partnerships with other pension plans, national public sector advocates, and existing stakeholders to advocate for innovative health care solutions.

Action 3.2: Develop an advocacy plan to proactively educate decision makers on the ramifications of proposed health care policies.

Success Indicators

- System advocacy plan

Leads: Executive Director
Government Relations Officer

Target Timeline: Q4 2020

GOAL #3 / SERVICE DELIVERY

Our service delivery is responsive and shaped by the needs of those we serve.

Strategy 1.0 Evolve our service delivery model to continually improve internal and external customer focus.

Action 1.1: Identify and employ best practices for engaging internal and external customers.

Action 1.2: Leverage existing and developing technologies to improve the customer experience.

Success Indicators

- Customer service best practices research
- Identification of customer experience technologies
- Implementation of appropriate technology and tools to enhance experience

Leads: Deputy Executive Director
Director of Member Services

Target Timeline: Q4 2021

Strategy 2.0 Improve the customer service experience through data and analytics.

Action 2.1: Improve existing data collection activities and metrics to allow SERS to evaluate the qualitative and quantitative value of the customer service experience.

Action 2.2: Identify process improvement opportunities for customer service functions to streamline services and improve efficiency.

Action 2.3: Customize services grounded in efficiency and value based on customer needs.

Action 2.4: Identify areas where operational efficiencies have been successfully achieved and enhance evaluation metrics monitored to ensure gains are maintained.

Success Indicators

- Customer service metrics dashboard/scorecard
- Customer service gap analysis
- Customer interaction analytics

Leads: Deputy Executive Director
Director of Member Services

Target Timeline: Q4 2020

GOAL #4 / OPERATIONS

Our systems and processes foster organization-wide efficiency, agility, and accountability.

Strategy 1.0 Establish operational performance metrics across the organization.

Action 1.1: Identify key performance indicators to evaluate the effectiveness of the organization.

Action 1.2: Develop systems and protocols to promote collaboration across departments.

Action 1.3: Identify organization-wide process gaps with appropriate improvement strategies to streamline services and improve efficiency.

Success Indicators

- Organizational (operational) performance metrics
- Department level workplans
- Organizational processes gap analysis

Lead: Deputy Executive Director **Target Timeline:** Q4 2020

Strategy 2.0 Develop and implement an agile and forward-looking IT vision and philosophy.

Action 2.1: Align IT resources with organizational strategic goals and strategies.

Action 2.2: Capitalize on SMART's capabilities to increase organizational efficiency and effectiveness.

Success Indicators

- Appropriate technology investment
- Prioritization of IT resources
- Success measures for SMART capabilities
- Resources vs. needs analysis

Leads: Deputy Executive Director & Chief Technology Officer **Target Timeline:** Q4 2020

Strategy 3.0 Ensure our allocation of staff and resources align with the organization's strategic goals and priorities.

Action 3.1: Analyze existing staffing levels and revise organizational structure to meet current and future needs.

Action 3.2: Evaluate evolving business practices based on the post-SMART implementation environment.

Action 3.3: Implement strategies designed to improve organizational cost effectiveness.

Action 3.4: Facilitate budgeting process to support organizational strategic goals and objectives.

Success Indicators

- Budget analysis
- Staffing allocation plan
- Organizational processes gap analysis
- Technology capabilities

Leads: Deputy Executive Director & Chief Financial Officer **Target Timeline:** Q4 2020/Ongoing

Strategy 4.0 Implement and maintain an appropriate organization risk management program.

Action 4.1: Define Risk Management program goals inclusive of the organization's risk tolerance.

Action 4.2: Define Internal Audit goals inclusive of the organization's risk tolerance.

Action 4.3: Conduct ongoing assessments to evaluate the effectiveness of established risk management program.

Success Indicators

- Establish governance through a risk oversight committee
- Determine organizational risk management goals
- Risk management program audit
- Internal audit reports

Leads: ERM Officer & Chief Audit Officer **Target Timeline:** Q4 2020

GOAL #5 / CULTURE

Our culture promotes a high-performing team driven by mission and continuous improvement.

Strategy 1.0 Establish a demonstrated culture of collaboration, shared accountability, and innovation.

Action 1.1: Regularly measure and evaluate key elements of the organizational culture and engagement.

Action 1.2: Identify processes and interdependencies across departmental lines to improve team agility, cohesion, and opportunities.

Action 1.3: Establish collaboration as a key organizational priority and cultural driver.

Action 1.4: Support work/life balance for employees at all levels.

Success Indicators

- Culture and engagement survey results
- Employee morale
- Identified process efficiencies and improved cohesion

Leads: Deputy Executive Director & Director of HR

Target Timeline: Q2 2021

Strategy 2.0 Fully realize the benefits of a diverse workforce and an inclusive environment.

Action 2.1: Establish and communicate organizational values related to diversity and inclusion.

Action 2.2: Attract a more diverse workforce by increasing community outreach.

Action 2.3: Create opportunities for employees to provide feedback and innovative ideas into organizational decision-making.

Success Indicators

- Organizational values established and communicated
- Community outreach plan
- Staff engagement in idea generation and decision-making

Lead: Director of HR

Target Timeline: Ongoing

Strategy 3.0 Foster the professional growth and development of our staff.

Action 3.1: Enhance staff development opportunities to better prepare staff for career advancement.

Action 3.2: Establish and implement a succession planning strategy to ensure business continuity.

Success Indicators

- Number of staff development activities
- Quality of staff development activities
- Menu of development opportunities
- Succession plan

Lead: Director of HR

Target Timeline: Q4 2020

Strategy 4.0 Attract and retain a high-quality workforce.

Action 4.1: Implement active recruiting strategies to attract additional qualified applicants.

Action 4.2: Maintain a competitive compensation and benefits package through routine monitoring and benchmarking.

Success Indicators

- Human resources recruitment plan
- Annual benefit package evaluation
- Compensation study

Lead: Director of HR

Target Timeline: Q4 2021

GOAL #6 / COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT

Our communications and stakeholder engagement promotes awareness, transparency, accountability, and trust.

Strategy 1.0 Maintain and enhance the understanding of SERS' value to our members, employers, and retirees.

Action 1.1: Evaluate the effectiveness of SERS communication plans and modify, as needed, based on existing and future stakeholder needs.

Action 1.2: Develop customized, proactive education and outreach strategies that are inclusive, transparent, and responsive to encourage engagement with SERS.

Success Indicators

- Communications and engagement plan
- Engagement metrics/statistics

Leads: General Counsel
Manager of Administrative & Communications

Target Timeline: Q4 2020

Strategy 2.0 Maintain and enhance SERS' credibility and relationships with our stakeholders to build understanding and support.

Action 2.1: Actively engage key legislative and stakeholder groups to build understanding and support for SERS' goals.

Success Indicators

- Number of engagement activities
- Communications and engagement plan

Leads: Executive Director
Government Relations Officer

Target Timeline: Q4 2020/Ongoing

Strategy 3.0 Utilize communication tools and tactics that promote alignment with organizational goals and objectives.

Action 3.1: Establish communications strategies to proactively address regulatory changes that impact SERS goals and objectives.

Action 3.2: Identify methods to enhance brand value perception among stakeholders.

Success Indicators

- Stakeholder assessment surveys
- Communications and engagement plan
- Advocacy plan

Leads: General Counsel
Government Relations Officer

Target Timeline: Q4 2020

ACKNOWLEDGEMENTS

SERS wishes to thank the following individuals for their support in the School Employees Retirement System FY2020 – 2024 Strategic Planning Project. Your participation has assisted us in better understanding the challenges before us and more effectively addressing these issues through this comprehensive strategic plan. SERS is also grateful for the cadre of stakeholders who helped shape this important document.

SERS BOARD OF TRUSTEES

Jeffrey T. DeLeone
Hugh W. Garside Jr.
James Haller
Catherine P. Moss
Barbra M. Phillips
James Rossler Jr.
Daniel L. Wilson
Vacant – Employee Member
Vacant – Retiree Member

As of 7/1/2019

SERS LEADERSHIP TEAM

Richard Stensrud
Executive Director

Farouki Majeed
Chief Investment Officer

Tracy Valentino
Chief Financial Officer

John Grumney
Director of Member Services

Christi Pepe
Director of Health Care Services

Joe Marotta
General Counsel

Jay Patel
Chief Technology Officer

Matt Sanders
Director of Administrative Services

Joe Bell
Chief Audit Officer

Michelle Miller
Director of HR

Nikki Whitacre
Manager of Administrative & Communications

Karen Roggenkamp
Deputy Executive Director

Nancy Turner
Asst. Director of Investments

Maria Robinson
Asst. Director of Finance

Denise Kirk
Asst. Director of Member Services

Penny Baker
Asst. Director of Health Care Services

Susan Russell
Associate General Counsel

Scott Murta
Asst. Director of IT

Mike McManaway
Asst. Director of Administrative Services

Julie Deisler
Enterprise Risk Management Officer

Chris Collins
Government Relations Officer

Sheila Thornton
Executive Administrative Officer

CONSULTING PARTNER

RAMA
ENGAGEMENT THAT INSPIRES

STRATEGIC PLAN PROGRESS TO DATE

FY2020-2024

Strategic Plan Goals	Significant Milestone Dates	Key Events/Decisions	Related Activities
All Goals	Q4 FY19	SERS Approves Strategic Plan.	
All Goals	Q1 FY20	Strategic Planning Council (SPC) established for Strategic Plan Implementation and Monitoring – SERS Staff.	▪ SERS staff begins internal review of business team strengths, weaknesses, opportunities, and threats (SWOT) to organization and members. ▪ SERS staff starts a series of retirement peer operational and service retirement comparisons. Presentations from various firms on innovations underway for Retirement Systems.
Goal #1	Q1 FY20	SERS Board and Staff hold first session on Goal #1 Pension Sustainability.	▪ Over the last 2+ years the Board has held Pension Sustainability sessions and addressed topics such as alternate benefit formulas, risks to the fund, retirement age/ eligibility, FAS, vesting, disability program review, 120-day school year, benefit inflation, and the Medicare Part B reimbursement. The Board has committed to discussing pension sustainability on an annual basis, or as needed. ▪ Board continues to emphasize the importance of Investment performance. Reviewed and refined the Asset Allocation policy in FY20. Maintained adequate liquidity to fund pension payments. Continued review and updating of portfolio diversification. Reviewed cash-flow in light of SERS' active membership (gaps between contributions and payments). Investments and Wilshire plan to present an asset liability study to the Board in the near future. ▪ Working with Cavanaugh Macdonald, the Board completed an assessment and adoption of prudent actuarial assumptions. Reduced assumed investment rate of return. Lowered payroll growth, COLA and inflation assumptions effective in FY22.
Goal #2	Q1 FY20	SERS Board and Staff hold first session on Goal #2, HealthCare Sustainability, after morning discussion on Pension Sustainability.	▪ Board reviewed both the Medicare and Non-Medicare Plans and asked staff to provide further recommendations.
Goal #2	Q2 FY20	SERS Board approved change requiring those in Non-Medicare plan to obtain Medicaid if eligible with estimate HealthCare plan savings of over $500 million.	▪ The Board approved a rule change to terminate Medicare Advantage Plan coverage for members who did not secure Medicare Part B coverage as required by Medicare for savings over $1.0 million, June 2021. ▪ March 2022, Board approved Aetna contract for Medicare Advantage Plan effective January 2023. ▪ February 2022, Board approved Pharmacy Benefit Manager (PBM) contract for Non-Medicare and Medicare enrollees effective January 2023.

Goal #1: Pension Sustainability | Goal #2: HealthCare Sustainability | Goal #3: Service Delivery | **Goal #4: Operation Efficiency** | Goal #5: Culture | Goal #6: Communication and Shareholder Engagement

Strategic Plan Goals	Significant Milestone Dates	Key Events/Decisions	Related Activities
Goal #3 Goal #4 Goal #6	Q2 FY20	COVID 19 Pandemic begins in US. SERS office was closed March 19, 2020 by Executive Order. Service delivery and operational plans were re-prioritized.	▪ SERS Business Continuity Plan immediately activated. Pandemic team was formed and continued to meet through 2020, 2021, and early 2022. ▪ Operational changes were implemented in pandemic response. SERS staff stayed connected via a Remote Desktop Application. Laptops and Voice Over Internet Protocol (VoIP) licenses were procured for Member Services Team to activate call center. Employer Services and Healthcare were added as equipment became available. ▪ Virtual counseling options were rolled out to members via Zoom, Teams, and teleconferencing. Member engagement and satisfaction as well operational metrics were collected, analyzed and shared with the Board. ▪ Modified work model began January 1, 2021 starting with Senior Leadership team on-site then expanded across the organization. Masks were required along with COVID exposure tracking. Hybrid model effective September 2021. Depending on job functions up to two days remote, no position is 100% remote ▪ Board Room and O'Keefe Technology upgrades made in 2020 and 2021 to hold hybrid meetings. Additional upgrades in Anderson and other conference rooms during 2022 and 2023. ▪ OSERS, LLC Building tenant occupancy experiences rental income impacts as tenant business models changed, including 100% remote.
Goal #4	Q2 FY20	SERS created an enhanced Enterprise Risk Management Department (ERM) and named Chief Risk Officer.	▪ ERM expanded Information Security efforts to align to pandemic impacts. ▪ ERM focus expanded from policy and compliance to SERS operational integration and risk monitoring. ▪ ERM increased collaboration with Information Technology and better partnered with IT Infrastructure for Disaster Recovery Strategic Planning.
Goal #4	Q3 FY20	SERS is 85 years young. The System has many paper records and now an accumulation of electronic records. Information Governance Project begins to enhance records management and practices.	▪ Assessment to transition and manage electronic storage completed. ▪ Records retention schedule updated and paper storage contract revised. ▪ Clean-up of shared electronic files started (e.g. emails, shared electronic files, temporary files). ▪ Alignment of information security needs and member information protection.

Strategic Plan Goals	Significant Milestone Dates	Key Events/Decisions	Related Activities
Goal #6	Q4 FY20	SERS Government Relations staff facilitated one-on-one meetings during the pandemic between Executive Director and leaders from SERO, OAPSE, OEA, AFSCME Council 8, OFT, and OSABO in an ongoing effort to answer questions and provide updates about the Sustainability Initiative and SERS' financial health.	
Goal #3 Goal #6	Q1 FY21	Increased frequency of "Retiring with SERS" webinar to once per month and sent targeted communication to members within five years of retirement.	
Goal #1	Q1 FY21	SERS Board votes to seek legislative approval to mitigate benefit inflation through using a Contribution Based Benefit Calculation (CBBC).	▪ Senate Bill 347 for CBBC was introduced by Senators Hottinger and Schuring. ▪ SMART Agile team formed in July, 2022 for the CBBC project. ▪ During December 2022 year-end Legislative session, pension amendments introduced including CBBC. ▪ Legislative efforts on-going.
Goal #6	Q2 FY21	Roundtable Advocacy Meeting continues during pandemic.	▪ Moved to virtual for 2021 and 2022. ▪ Change to hybrid January 2023.
Goal #6	Q2 FY21	Ohio Congresswoman Marcy Kaptur (D-Toledo) introduced stand-alone legislation (HR 4763) in October 2020 to extend Wraparound program authorization for five years.	▪ SERS staff succeeded in getting bi-partisan co-sponsorship for the legislation among Ohio congressional delegation in advance of bill introduction.
Goal #3 Goal #4	Q2 FY21	SERS Board forms four person Technology Committee; Matt King Chair.	▪ Committee approved Charter during initial meeting. ▪ Committee approved request to move to cloud based solutions for disaster recovery, September 2021. ▪ Disaster Recovery migration to Cloud (DRaaS) completed in June/July 2022. ▪ Technology Committee approves 5-year Technology Roadmap for $8.3 million June, 2022. ▪ Key FY23 projects underway, Network and Wireless replacement, Telecommunication platform to Cloud, and SMART MVVM upgrade.
Goal #4 Goal #6	Q3 FY21	Digital Workplace rolled out to SERS business teams.	▪ Microsoft 365, Teams, collaboration tools. ▪ Sharepoint upgrade and expanded Boulevard internal staff website.

Strategic Plan Goals	Significant Milestone Dates	Key Events/Decisions	Related Activities
Goal #5	Q4 FY21	Employee Engagement Survey Completed.	▪ Culture Team enhanced. Supervisor Roundtable launched Q4 FY22. ▪ SERS Values updated. Renewed commitment to diversity and inclusion. Policies updated with gender neutral language. Participation in YWCA's Annual Stand Against Racism Challenge. ▪ Investment in Leadership Development Program started 2021. LinkedIn Recruiter purchased and usage grows in labor tight Columbus job market. ▪ SERS Seven Leadership Pillars and ONE SERS introduced August 2022 to enhance connection and cross department collaboration. ▪ Enhanced and relaunch of Individual Development Planning program Q1 FY21. ▪ Realignment to maintain culture in hybrid work model. Revised employee events, activities, employee recognition, and celebration of achievements. ▪ DiSC program re-introduced and all staff training completed Q2 FY23.
Goal #3 Goal #6	Q1 FY22	Moved to Virtual Retirement Conferences and sent targeted communication to members within one year of retirement.	▪ Member Services saw increased member participation. ▪ Travel expenses decreased (two vehicles sold). ▪ Reduced logistical issues.
Goal #5	Q1 FY22	CBIZ Compensation Study completed.	▪ FY23 Merit Recommendation implementation. ▪ Modest changes in salary and grades for some positions. ▪ On-going annual analysis and updates by CBIZ.
Goal #3 Goal #4 Goal #6	Q4 FY22	Rule change to require all benefits paid thru Bank electronic transfer.	▪ Informational pay stubs mailings reduced from four mailings to semiannual. ▪ Refunds moved to electronic transfer. ▪ 99.9% of monthly pension benefits paid via ACH.
Goal #6	Q4 FY22	Began regular posting of Myths and Misconceptions about pension plans on the website, June 2022.	▪ Allows targeted response to Ohio and national events.
Goal #6	Q1 FY23	Successfully worked with the Public Sector Health Care Roundtable to protect our prescription drug plan.	▪ Amending the Inflation Reduction Act to include language for EGWP plans like SERS administers.
Goal #3 Goal #4 Goal #6	Q1 FY23	Portal Registration Reimagine Project initiated to integrate additional security while improving user experience.	▪ Additional electronic document upload capabilities being added to MSS portal. ▪ MVVM project to be completed in 1Q FY2024 to add multi device access for portals.
Goal #6	Q1 FY23	SERS Celebrates 85 Years.	▪ Branding and Communications to all Stakeholders. ▪ Re-emphasis and refresh of SERS Culture messaging across organization.

Strategic Plan Goals	Significant Milestone Dates	Key Events/Decisions	Related Activities
Goal #3 Goal #6	Q2 FY23	Created half hour lunch sessions targeted to non-vested members emphasizing importance of SERS membership.	
Goal #2	Q2 FY23	Health Care Fund ended FY2022 with 38 years of funding, an all-time high.	▪ Board held HC sustainability reviews of the Non-Medicare program and the impact of recently passed Inflation Reduction federal legislation that expanded Marketplace health insurance incentives.

STRATEGIC PLAN REMAINING "TO DO" LIST

FY2020-2024

Goal #1 Pension Sustainability and
Goal #2 Health Care Sustainability

- Risk Analysis Assessment review
- Implement any additional Health Care changes for Non-Medicare plans
- Consider changes to Member's Open Enrollment Dental and Vision on a two year cycle
- CBBC legislative approval and implementation
- Annual Board Pension and Health Care Sustainability review

Goals #3 Service Delivery and
Goal #4 Operational Efficiency

- Member and Employer Reporting enhancements (e.g., Portal improvements, call back assist, additional call center options, edocuments, electronic messaging, key metrics and dashboarding)
- Finish Agile and project management SERS "right fit/sizing" - underway in FY23 and continues in FY24
- Five-year Technology Roadmap implementation - FY23 projects and beyond
- Continuous monitoring and adaptation of Risk Management to meet external and internal threats, increased vendor management and oversight

Goal #5 Culture

- Employee Engagement Survey update
- Continued labor monitoring and benchmarking - CBIZ and Columbus area
- Maintain and enhance culture - SERS Mission, Vision, Values, Core Beliefs as labor market evolves and new employees join SERS
- Continued leadership development around SERS Seven Leadership Pillars and ONE SERS

Goal #6 Communication and Stakeholder Engagement

- Rapid response to external events
- Tools and tactics adjustments as needed to maintain/enhance trust, transparency, awareness, and accountability

STRATEGIC PLAN REFRESH - WHAT'S NEXT?

FY2025 – FY2030

- Planning discussion in FY2024
- Framework development in FY2024-FY2025

ADJOURNMENT(R)

_____ moved that the SERS Retirement board adjourn to meet on for their next regularly scheduled meeting.

The meeting adjourned at _____ a.m./p.m.

_____
Jeffrey DeLeone - Chair

_____
Richard Stensrud, Secretary