REPORT ON EXAMINATION

OF THE

NEW YORK STATE TEACHERS'

RETIREMENT SYSTEM

AS OF JUNE 30, 2021

EXAMINER: **DONALD CARBONE, CFE**

DATE OF REPORT: **JUNE 29, 2023**

TABLE OF CONTENTS

ITEM		PAGE NO.
1.	Scope of examination	2
2.	System Overview	3
	A. History	3
	B. Management	3
	C. Growth	4
3.	Treatment of members	7
4.	Investment review report	8
5.	Actuarial review report	9
6.	Prior report summary and conclusions	10

February 26, 2026

Honorable Kaitlin Asrow
Acting Superintendent of Financial Services
New York, New York 10004

Dear Kaitlin Asrow:

In accordance with instructions contained in Appointment No. 32467, dated November 29, 2022, and annexed hereto, an examination has been made into the condition and affairs of the New York State Teachers Retirement System, hereafter referred to as "the System." The System's home office is located at 10 Corporate Woods Drive, Albany, New York 12211. The examination was completed remotely due to the COVID-19 pandemic.

Wherever "Department" appears in this report, it refers to the New York State Department of Financial Services.

The report indicating the results of this examination is respectfully submitted.

1. SCOPE OF EXAMINATION

The examination covers the five-year period from July 1, 2016 through June 30, 2021. The examination was conducted observing the guidelines established by the Government Accounting Standards Board and by the Actuarial Standards Board. As necessary, the examiner reviewed transactions occurring subsequent to June 30, 2021, but prior to the date of this report (i.e., the completion date of the examination).

In the course of the examination, a review was made of the manner in which the System conducts its operations and fulfills its contractual obligations to members and claimants. The results of this review are contained in item 3 of this report.

The examination included a verification of assets and actuarial present values as of June 30, 2021, to determine whether the System's filed June 30, 2021 annual statement fairly presents its funding status. The examination also included a review of the following matters:

History of the system
Governance and management
Accounts and records
Financial statements
Actuarial issues
Treatment of members
Member benefits

The examiner reviewed the corrective actions taken by the System with respect to the recommendations contained in the prior report on examination. The results of the examiner's review are contained in item 6 of this report.

This report on examination is confined to financial statements and comments on those matters which involve departures from laws, regulations or rules, or which require explanation or description.

2. SYSTEM OVERVIEW

A. History

The New York State Teachers' Retirement System was created in 1921 by an act of State legislature to succeed the New York State Teachers' Retirement Fund and a number of local teachers' systems. The System is a public agency, having the powers and privileges of a corporation, in which eligible New York State public school teachers employed outside of New York City are members.

B. Management

Control of the administration and operation of the System is vested in a ten-member board, known as the "Retirement Board," which sets policies and oversees operations consistent with applicable laws. Three members of the board are elected from the membership. Two members are school administrators who are appointed by the Commissioner of Education. Two present or former local school board members, experienced in the fields of finance and investment, are appointed by the Board of Regents, one of whom must be or have been an executive of an insurance company. The Board of Regents also appoints a present or former bank executive to the board. The ninth member is the Comptroller of the State or his designee. The tenth member of the Retirement Board is elected from among the retired members of the System. The board members normally serve three-year terms.

The System's trustees, in their individual and collective capacities, are fiduciaries and must:

(1) Act solely in the interests of the members and beneficiaries of the System; and

(2) Perform their responsibilities in a manner consistent with those of a reasonably prudent person exercising care, skill and caution.

C. Growth

The change of the System assets and liabilities from the beginning to the end of the period under review is illustrated by the table below ($000):

	6/30/2016	6/30/2021	Increase / (Decrease)
Investments	$105,143,303	$146,200,797	$41,057,494
Receivables for investments sold	13,642	584,843	571,201
Receivables for employer and member	2,148,330	1,717,185	(431,145)
Receivables for member loans	239,645	236,944	(2,701)
Other assets	1,970,456	540,657	(1,429,799)
Total assets	$109,515,376	$149,280,426	$39,765,050
Payables for investment securities purchases	$ 0	$ 450,377	$ 450,377
Mortgage escrows and deposits	278	6,755	6,477
Other liabilities:	132,675	144,584	11,909
Net Other Post Employment Benefit ("OPEB") liability	0	47,187	47,187
Payables for securities lending transactions	1,890,030	479,186	(1,410,844)
Total liabilities	$ 2,022,983	$ 1,128,089	$ (894,894)
Deferred outflows of resources:			
Changes in net OPEB liability	$ 0	$ 10,904	$ 10,904
Changes in net pension liability	15,834	21,767	5,933
Total deferred outflows of resources	$ 15,834	$ 32,671	$ 16,837
Deferred inflows of resources:			
Changes in net OPEB liability	$ 0	$ 4,276	$ 4,276
Changes in net pension liability	2,085	32,275	30,190
Total deferred inflows of resources	$ 2,085	$ 36 551	$ 34,466
Net position restricted for pensions	$107,506,142	$148,148,457	$40,642,315

As of June 30, 2021**,** the System's invested assets were mainly comprised of domestic and international equities, domestic and global fixed income securities, mortgages and real estate, alternative investments, and cash and cash equivalents.

The table below shows the annual change in the plan net assets ($000):

	Fiscal Year ending June 30,				
Additions:	**2017**	**2018**	**2019**	**2020**	**2021**
Investment income:					
Net appreciation in fair value of investments	$ 10,743,830	$ 7,683,568	$ 5,631,436	$ 1,643,319	$ 31,499,853
Interest income	697,454	737,383	829,852	819,183	762,391
Dividend income	1,268,224	1,326,510	1,406,530	1,320,921	1,306,813
Real estate – net operating income	462,481	442,740	433,087	447,481	416,860
Securities lending – gross income	14,916	26,519	32,667	15,082	3,456
Other – net	14,661	1,611	5,423	15,788	17,060
	$ 13,201,566	$ 10,218,331	$ 8,338,995	$ 4,261,774	$ 34,006,433
Less:					
Investment expenses	248,706	276,769	294,160	330,012	339,540
Securities lending:					
Broker rebates	(234)	12,031	19,951	6,083	(2,849)
Management fees	1,614	2,159	1,852	1,203	871
Depreciation (appreciation) of collateral	(412)	(639)	(148)	843	863
Net investment income	$ 12,951,892	$ 9,928,011	$ 8,023,180	$ 3,923,633	$ 33,668,008
Contributions:					
Employer contributions	1,857,359	1,597,139	1,774,646	1,504,688	1,618,437
Member contributions	129,770	131,595	136,610	145,034	159,874
Transfers in/out - net	7,845	9,278	9,087	3,955	10,025
Total contributions	1,994,974	1,738,012	1,920,343	1,653,677	1,788,336
Net additions	$ 14,946,866	$ 11,666,023	$ 9,943,523	$ 5,577,310	$ 35,456,344
Deductions:					
Retirement benefit payments – periodic	$ 6,838,093	$ 7,023,870	$ 7,223,248	$ 7,420,488	$ 7,659,950
Beneficiary payments	65,268	65,079	62,114	63,974	57,571
Return of contributions	19,676	20,050	21,956	19,439	14,379
Administrative expenses	61,611	60,610	74,242	71,385	55,492
Total deductions	$ 6,984,648	$ 7,169,609	$ 7,381,560	$ 7,575,286	$ 7,787,392
Net increase (decrease)	$ 7,962,218	$ 4,496,414	$ 2,561,963	$ (1,997,976)	$ 27,668,952
Net position restricted for pensions:					
Beginning of year	$107,506,142	$115,468,360	$119,915,518	$122,477,481	$120,479,505
Net increase (decrease)	7,962,218	4,496,414	2,561,963	(1,997,976)	27,668,952
Cumulative effect of change in accounting principle	0	(49,256)	0	0	0
End of year	$115,468,360	$119,915,518	$122,477,481	$120,479,505	$148,148,457

The following table indicates the change of the System's membership during the period under examination (annually 6/30):

	6/30/2017	6/30/2018	6/30/2019	6/30/2020	6/30/2021
Retired members and beneficiaries currently receiving benefits	163,818	166,285	169,203	172,569	175,790
Active Members	256,171	255,930	254,740	252,091	249,355
Terminated members entitled to but not yet receiving benefits	8,590	8,660	8,777	9,141	9,803
Total	428,579	430,875	432,720	433,801	434,948

3. TREATMENT OF MEMBERS

The examiner reviewed a sample of various types of retirement benefits to members and beneficiaries. The examiner also reviewed the various controls involved, checked the accuracy of the computations and traced the accounting data to the books of accounts.

Based upon the samples reviewed, no significant findings were noted.

4. INVESTMENT REVIEW REPORT

The Investment Review Report is attached to this report as an Exhibit.

5. ACTUARIAL REVIEW REPORT

The Actuarial Review Report is attached to this report as an Exhibit.

6. PRIOR REPORT SUMMARY AND CONCLUSIONS

Following are the recommendations contained in the prior report on examination and the subsequent actions taken by the System in response to each recommendation:

Item	Description
A	The examiner recommends that the System review its fidelity bond coverage and increase it accordingly. The review indicated that the System reviewed its fidelity bond coverage and increased it accordingly.
B	The examiner recommends that all future complaint logs maintained by the System are to be maintained in a columnar format that contains, at the minimum, the required items. The review revealed that in the fiscal year starting July 1, 2020, the System maintained the complaint log in a columnar format that contains, at the minimum, the required items.

Respectfully submitted,

/s/
Vincent Targia
Principal Insurance Examiner

STATE OF NEW YORK)
)SS:
COUNTY OF NEW YORK)

Vincent Targia, being duly sworn, deposes and says that the foregoing report, subscribed by him, is true to the best of his knowledge and belief.

/s/
Vincent Targia

Subscribed and sworn to before me

this_____ day of _____

Respectfully submitted,

Donald Carbone, CFE
INS Regulatory Insurance Services, Inc.

STATE OF SOUTH CAROLINA)
)SS:
COUNTY OF CHARLESTON)

Donald Carbone, being duly sworn, deposes and says that the foregoing report, subscribed by him, is true to the best of his knowledge and belief.

Donald Carbone

Subscribed and sworn to before me
this 20th day of February 2026

Comm Exp: June 17, 2034

DAMION DORCH
NOTARY PUBLIC
My Comm. Exp. Jun 17, 2034
STATE OF SOUTH CAROLINA

APPOINTMENT NO. 32467

NEW YORK STATE

DEPARTMENT OF FINANCIAL SERVICES

*I, **ADRIENNE A. HARRIS**, Superintendent of Financial Services of the State of New York, pursuant to the provisions of the Financial Services Law and the Insurance Law, do hereby appoint:*

DONALD CARBONE
(INS REGULATORY INSURANCE SERVICES)

as a proper person to examine the affairs of the

NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

and to make a report to me in writing of the condition of said

SYSTEM

with such other information as he shall deem requisite.

In Witness Whereof, I have hereunto subscribed my name and affixed the official Seal of the Department at the City of New York

this 29th day of November, 2022

ADRIENNE A. HARRIS
Superintendent of Financial Services

By: Mark McLeod

MARK MCLEOD
DEPUTY CHIEF - LIFE BUREAU

NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

INVESTMENT ANALYSIS REPORT

EXAMINERS: **PAUL HANNON, CFA**
CHIA-LING HSU, CFA
ROBERT D. SELVAGGIO, PH.D.

RUTTER ASSOCIATES, LLC

DATE OF REPORT: **JUNE 27, 2023**

Updated: JANUARY 10, 2024

Table of Contents

Executive summary 3
Scope of examination 5
(#1) Risk Profile 5
(#2) Reasonableness of the Risk Profile 6
(#3) Risk Guidelines and Practices 9
(#4) Required Risk Signoffs and Escalation Procedures 9
(#5) Duration and Convexity 9
(#6) Liquidity Management 10
(#7) Stated Return Expectations 11
(#8) Asset Valuation 14
(#9) Securities Lending 14
(#10) Portfolio Credit Risk Metrics and Management 15
(#11 and #12) Derivative Usage and Counterparty Credit Risk Management 16
(#13) Asset Allocation 17
(#14) Background and Diligence of Investment Managers 18
(#15) Investment Fees and Expenses. 21
(#16) Climate Risk Management 21

Executive summary

During the past six months, the exam team reviewed numerous documents including risk reports, investment and risk management policy statements and guidelines, asset allocation studies, Board and Committee charters, and annual reports and statements. Key staff and Board of Trustees Members were interviewed including:

Executive Director and Chief Investment Officer ("CIO")
Head of Audit
Chief Risk Officer ("CRO")
Managing Director, Fixed Income
Managing Director, Private Equity
Managing Director, Public Equities
Managing Director, Real Estate

Chair, Board Risk Committee
Chair, Board Investment Committee

The New York State Teachers' Retirement System ("NYSTRS" or the "System") investment and risk teams appears professional and competent, and they take their fiduciary responsibilities of loyalty, care, and prudence seriously. During our interviews, it became clear that each staff member was very experienced and skilled in investment management.

The chairmen of the Board Risk and Investment Committees are both accomplished professionals with many years of experience in investments and investment risk. The NYSTRS Board of Trustees is structured with appropriate financial expertise and representation for a well-functioning public pension system, and its fiduciary responsibilities are laid out in the first paragraphs of its Governance Manual. The Executive Director (*de facto* CEO) is not a member of the Board. The examination team sees this as best practice in governance.

The returns to investments in high-performing Executive staffing and Board members is reflected in a history of positive investment outcomes. As of June 30, 2022, the System's net assets were $132 billion and its 5-year, 10-year and 30-year annualized returns net of fees were 7.7%, 8.9% and 8.5% respectively. (For the fiscal year 2022 into June 30, the System recorded a loss of 7.1% net of fees as US inflation climbed to over 9% while over the same period the S&P500 suffered a 10.62% decline). The following table from the 2022 Annual Comprehensive Financial Report presents portfolio performance net of fees in aggregate relative to benchmarks as of June 30, 2022. Overall, performance against benchmarks has been very good.

Investment Performance Results

	Annualized Rates of Return				
	1-YR	**3-YR**	**5-YR**	**10-YR**	**30-YR**
Domestic Equity	**(11.1)%**	**10.3 %**	**10.8 %**	**12.7 %**	**10.0 %**
Benchmark: S&P Composite 1500 Index	(11.0)	10.3	10.9	12.8	10.0
International Equity	**(19.7)**	**1.9**	**2.9**	**5.3**	**5.4**
Benchmark: MSCI ACWI Ex-U.S. Index	(19.4)	1.4	2.5	4.9	5.1
Global Equity	**(16.8)**	**7.4**	**—**	**—**	**—**
Benchmark: MSCI ACWI Index	(15.8)	6.2	—	—	—
Real Estate Equity	**15.0**	**10.0**	**9.3**	**10.7**	**9.8**
Benchmark: NCREIF - ODCE Index	28.3	12.1	10.1	10.3	8.2
Private Equity	**4.6**	**20.1**	**18.1**	**16.6**	**—**
Benchmark: S&P 500 Index plus 5%	(5.6)	15.6	16.3	18.0	—
Domestic Fixed Income	**(8.3)**	**(0.5)**	**0.9**	**1.4**	**4.9**
Benchmark: Bloomberg U.S. Aggregate Float Adjusted Bond Index[1]	(10.4)	(0.9)	0.9	1.6	4.9
High-Yield Bonds	**(11.8)**	**(0.2)**	**—**	**—**	**—**
Benchmark: ICE BofAML U.S. BB-B Constrained Index[1]	(12.2)	0.0	—	—	—
Global Bonds	**(10.4)**	**(0.9)**	**1.5**	**—**	**—**
Benchmark: Bloomberg Global Aggregate Float Adjusted Ex-CNY Bond Index (in USD hedged to USD)[1]	(10.4)	(1.5)	1.0	2.2	—
Real Estate Debt	**(2.8)**	**2.3**	**3.4**	**4.2**	**6.6**
Benchmark: Giliberto-Levy Custom Index	(5.8)	1.4	2.9	3.6	6.9
Private Debt	**8.0**	**9.0**	**10.1**	**—**	**—**
Benchmark: S&P/LSTA Leveraged Loan Index plus 3%	0.2	5.1	5.9	—	—
Cash Equivalents	**0.3**	**0.7**	**1.2**	**0.7**	**2.5**
Benchmark: iMoneyNet Money Fund Avg/Taxable (All)	0.1	0.4	0.8	0.4	2.1
Total Fund	**(7.1)**	**7.4**	**7.7**	**8.9**	**8.5**
Benchmark: Blended Benchmark	(7.4)%	6.9 %	7.6 %	8.8 %	8.2 %

Similarly, the consistency of a very healthy funded ratio over a 10-year period (including the emergence from the "Great Financial Crisis") is indicative of a well-managed investment portfolio (as well as, of course, of a statute guaranteeing actuarially required contributions from state taxpayers).

Funded Ratio[1] Based on Market Value of Assets ($mm)

Fiscal Year Ended	Market Value of Assets	Actuarial Accrued Liability	Funded Ratio
2012	$88,056.30	$92,250.90	95.50%
2013	$95,367.00	$94,583.80	100.80%
2014	$108,155.10	$96,904.50	111.60%
2015	$109,718.90	$105,401.80	104.10%
2016	$107,506.10	$109,305.10	98.40%
2017	$115,468.40	$115,672.50	99.80%
2018	$119,915.50	$118,861.10	100.90%
2019	$122,477.50	$121,049.30	101.20%
2020	$120,479.50	$123,801.70	97.30%
2021	$148,148.50	$131,077.40	113.00%
2022			97%

In the body of this report, we have made two suggestions that NYSTRS might consider:

1. Establish an independent line of reporting from the CRO to the Risk Committee of the Board of Trustees. It is best practice for a CRO to have a reporting line to both the CEO (in this case, the Executive Director) and either a dotted or solid line into the Board.

2. Assign internal credit ratings to credit-risky investments that do not have Nationally Recognized Statistical Rating Organization ("NRSRO") ratings.

Scope of examination

The following 16 items constitute the full scope of the exam Rutter Associates LLC ("Rutter Associates") was assigned. Through most of these we worked in collaboration with a team from the New York State Department of Financial Services.

(#1) Risk Profile

The main objective of investment risk management for NYSTRS is to identify, measure, manage and mitigate risks that may adversely affect the System's ability to effectively manage its assets, meet liquidity requirements and maintain an appropriate funding level.

The NYSTRS's Key Risk Indicator ("KRI") Dashboard lists its key risk tolerance and risk appetite and provides the current assessment of its KRIs, which include asset allocation governance, liquidity,

[1] 2022 Data not published in CAFR. See https://nystrs.org/About-Us/Press-Room/NYSTRS-by-the-Numbers#:~:text=The%20Retirement%20System%20is%20among,the%20funded%20ratio%20was%2099%25.

net benefit payment as % of assets, employer contribution rate level and volatility, funded ratio etc.

Investment Risk – Key Risk Indicators
Investment Risk Board Report January 2023

Key Risk Indicator	Outside Tolerance	Risk Tolerance	Risk Appetite	Current Assessment
Asset Allocation (Market Risk Management)	One or More Asset Classes Out of Bounds	One or More Asset Classes Outside of Policy During Transition Period	All Asset Classes within Policy Range	All Asset Classes within Policy Range
Net Benefit Payments as % of Assets (Liquidity)	>10%	>5 - 10%	<= 5%	4.9%
Short Term Liquidity (Liquidity)	<= 1 Month	1 - 2 Months	>= 2 Months	3.1 Months
Medium Term Liquidity (Liquidity)	<= 10 Months	10 - 12 Months	>= 12 Months	11.1 Months
Stressed Contingency Funding Liquidity (Liquidity)	<= 18 Months	18 - 24 Months	>= 24 Months	13 Months
Stressed Long Term Liquidity (Liquidity)	<= 3 Years	3 - 5 Years	>= 5 Years	7.2 Years
Funded Ratio: Market Value of Total Plan Assets (Unfunded Liability)	<80% or >120%	80 - 90% or 110 - 120%	90 - 110%	113.0% (6/30/2021)
ECR Volatility (Unfunded Liability)	Δ +/- >3%	Δ +/- 2 - 3%	Δ +/- 2%	0.49% (6/30/2021)
ECR Level (Unfunded Liability)	<4% or >17%	4 - 6% or 12 - 17%	6 - 12%	10.29% (6/30/2021)
Actuarial Valuation: Quinquennial Full Scope Audit (Valuation Process)	Replicated Liabilities >4% of NYSTRS' Calculation	Replicated Liabilities 1 - 4% of NYSTRS' Calculation	Replicated Liabilities <=1% of NYSTRS' Calculation	0.04% (4/16/2019)
Actuarial Valuation: Annual Independent Review (Valuation Process)	Adverse Opinion	Modified Opinion	Unmodified Opinion	Unmodified Opinion (10/28/2021)

The Risk Committee Meetings review the Investment Risk Update on a quarterly basis. The Investment Risk Update reports the assessment of its key risks, as well as the total plan risk and the risk contributions by asset classes, risk factors, sectors, and geographic regions. Tail risk is measured by 1 year 99% Value at Risk or "VaR" (i.e., there is a 99% chance that the portfolio's market value will not lose more than VaR amount over the next year) and historical stress scenario analysis is performed. The funding liquidity and net benefit payment as % of stressed assets are also reported under each stress scenario.

Rutter Associates observes that NYSTRS defines the investment risk appetites properly and the NYSTRS risk profile is consistent with the System's risk appetite and its positioning on the efficient frontier subject to basket constraints. In other words, once the System chooses an expected return at least as great as the AIR, it also chooses asset allocation to minimize expected standard deviation for that expected return subject to basket constraints.

(#2) Reasonableness of the Risk Profile

Rutter Associates examined the System's Investment Risk Update to the Board Risk Committee as of January 2023, its Investment Policy Manual and the Asset Liability Study prepared by its general consultant, Callan LLC ("Callan"). Callan provides NYSTRS with a set of asset allocation vectors consistent with various levels of Expected Portfolio Returns with minimum possible Standard Deviations (i.e., risk). The inputs to Callan's model for determining these optimal (Expected Return, Standard Deviation) combinations are:

- Capital Market Assumptions:
  - Expected Return of Each Asset Class
  - Standard Deviation of the Returns of Each Asset Class
  - Covariance or Correlations of Returns Among the Asset Classes
- Any Basket Constraints as instructed by NYSTRS.

Callan embeds climate risk into its capital market assumptions so that the asset allocation vector ultimately chosen by the System is based in part on Callan's climate risk assessments.

The System's actuary chooses among these optimal combinations and sets an "Actuarial Interest Rate" ("AIR"); the CIO chooses a target asset allocation consistent with an Expected Return at least as high as the AIR. Risk tolerances around the allocations are also determined. The allocation targets are approved by the Retirement Board.

As documented in the 2022 Annual Comprehensive Financial Report (the latest published), the asset class allocations were chosen to be consistent with a 6.95% expected return. The following are the targets and tolerance ranges approved for 2021 and 2022:

Asset Class	Target June 30, 2022	Target June 30, 2021	Range June 30, 2022	Range June 30, 2021
Domestic equity	33%	33%	29-37%	29-37%
International equity	16	16	12-20	12-20
Global equity	4	4	0-8	0-8
Real estate equity	11	11	6-16	6-16
Private equity	8	8	3-13	3-13
Total equity	72	72		
Domestic fixed income	16	16	12-20	12-20
High-yield bonds	1	1	0-3	0-3
Global bonds	2	2	0-4	0-3
Real estate debt	6	7	2-10	3-11
Private debt	2	1	0.5-5	0-5
Cash equivalents	1	1	1-4	0-4
Total debt	28	28		
Total	100%	100%		

The risk profile (and ultimate return) of the investment portfolio is determined primarily by the portfolio's asset allocation. The CRO's January 2023 Investment Risk Update (above) includes several key risk indicators, one of which shows all asset class allocations within their policy (i.e., risk appetite) ranges. Additional KRIs include four liquidity metrics, three of which are within tolerance ranges with the fourth, "stressed contingency funding liquidity", being significantly below its 18-month tolerance range. We followed up with NYSTRS in June and learned that the metric is improving (up to 15 months currently from 13 months in January).

Some of the steps NYSTRS is taking to improve the metric:

- Internal Investment Committee cash flow and asset allocation meetings weekly.

- Working to increase allocation to domestic fixed income by selling equities as markets cooperate.
- Review commitment sizes to new Real Estate and Private Equity funds

We are told that the real driver to this is the NYSTRS allocation to Fixed Income being towards the bottom of its tolerance range which is reviewed weekly, and plans are in place to keep investing there to get it closer to target.

The NYSTRS team explains that this is a stressed metric where the assets are hit with a GFC-type scenario (about a 40% loss across the total portfolio) on top of the losses they have already incurred (about 20% from the peak) so that it is extremely stressful. NYSTRS views liquidity across all the four metrics, with one of these alone not telling the complete story of liquidity at the System. Overall, NYSTRS believes it to be still in an extremely strong position to continue making payments on time, without interruption. Rutter Associates has no reason to disagree and is pleased to see the System working to bring this KRI within its tolerance level.

Additional metrics the CRO provides to the CIO and the Board (without limits but for informational purposes and, perhaps, as signals to adjust asset allocations within tolerance ranges) include:

- Current calculated contribution of each asset class to portfolio risk vs. market value weight of each in the portfolio.
- Active predicted risk, the expected volatility of excess returns, and results from differences between actual portfolio weights and holdings vs. policy weights and holdings.
- Value at Risk with a 1-year horizon and 99% tail calculated two alternative ways.
- Historical Scenario Analysis covering five stressful periods over the past four decades.
- A decomposition of portfolio risk by fundamental common factors.

The NYSTRS investment risk profile is appropriate for the goal of achieving its expected return target. The System's asset allocation is monitored regularly and remains consistent with positioning the portfolio on the appropriate point of the efficient frontier as defined by the optimization calculus performed by Callan and driven by their capital market assumptions.

Additionally, the CRO calculates a robust set of risk metrics that can inform decisions about re-allocating assets within their tolerance ranges, and in extreme situations making changes to allocation targets.

(#3) Risk Guidelines and Practices

The investment policy manual contains all the System's risk management objectives and guidelines. The risk reports and key risk indicators published by the risk management group support the maintenance of portfolio risk within stated risk appetites and tolerances. The liquidity needs and asset allocation boundaries as well as other risks are properly monitored and communicated to the Executive Director/CIO and the board of trustees.

(#4) Required Risk Signoffs and Escalation Procedures

Rutter Associates notes that the NYSTRS' CRO reports to its CIO. The CRO and the CIO (the de facto CEO) have weekly meetings with the four investment MDs. While we have not seen any formal requirement for CRO risk signoffs, we believe that the weekly meetings provide an adequate forum for the CRO to communicate any risk issues with the four investment MDs. We also note that the CRO's office is footstep away from the office of the CEO/CIO.

Rutter Associates recommended that the CRO have a reporting line to the Board Risk Committee. This would benefit the committee by having increased information flow and will benefit the CRO by having the advantage of the experience of the Risk Committee members. In response, the System implemented an alternative that the review team deems to be acceptable: as part of every quarterly Risk Committee meeting, the CRO, independent of the Executive Director and CIO, meets in an exclusive one-to-one session with the Risk Committee in executive session. This additional session provides the CRO with the forum and time to exclusively discuss with and report to the Risk Committee of the Board on any and all additional matters of concern including but not limited to personnel, security, and governance.

(#5) Duration and Convexity

Based on our interview with the CRO, duration is reported in the fixed income department and monitored by the Internal Investment Committee. Rutter Associates received a report of the duration and convexity of the public fixed income asset classes as well as those of the total plan as of 3/31/2023 (see the table below), which is indicative of risk management attention to duration and convexity (the interest rate sensitivities) of the fixed income portfolio.

Asset Class	Mkt Value	Weight (%)	Effective Duration	Modified Duration	Macaulay Duration	OA Convexity	Yield To Maturity (%)
Total Plan	129,958,001,533.08	100.0000%	4.0532	4.2693	4.3568	0.3210	4.3810%
Cash Equivalents	1,561,392,993.82	1.2015%	0.0544	0.0536	0.0549	0.0001	4.7665%
Domestic Fixed Income	17,531,838,940.84	13.4904%	5.1954	5.3005	5.3943	0.3903	4.2784%
Global Bonds	2,698,689,973.00	2.0766%	6.5221	6.3919	6.5028	0.7710	3.8252%
High Yield Bonds	1,213,160,904.13	0.9335%	3.7944	4.1670	4.3284	0.0048	7.7597%

(#6) Liquidity Management

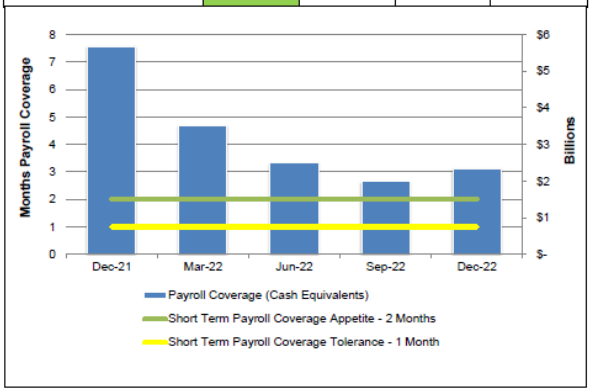
Liquidity is a key risk to NYSTRS, as NYSTRS's main need is to pay benefits. The key risk indicator dashboard shows the short-term, mid-term and stressed long-term liquidity risk. The following table and charts show the liquidity KRI assessment in the January 2023 Investment Risk Update.

Key Risk Indicator	Outside Tolerance	Risk Tolerance	Risk Appetite	Current Assessment
Net Benefit Payments as % of Assets (Liquidity)	>10%	>5 - 10%	<= 5%	4.9%
Short Term Liquidity (Liquidity)	<= 1 Month	1 - 2 Months	>= 2 Months	3.1 Months
Medium Term Liquidity (Liquidity)	<= 10 Months	10 - 12 Months	>= 12 Months	11.1 Months
Stressed Contingency Funding Liquidity (Liquidity)	<= 18 Months	18 - 24 Months	>= 24 Months	13 Months
Stressed Long Term Liquidity (Liquidity)	<= 3 Years	3 - 5 Years	>= 5 Years	7.2 Years

Investment Risk Board Report January 2023

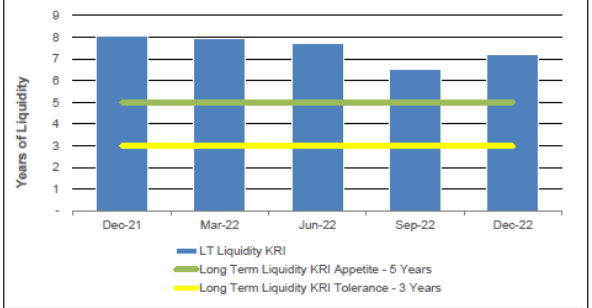
Funding Liquidity - Short Term Payroll Coverage

Short Term Liquidity KRI (Months)	Current Qtr.	Appetite	Tolerance	Outside Tolerance
	3.1	>= 2 months	1-2 months	<=1 month



Stressed Long Term Funding Liquidity - Allocation to Liquid Assets

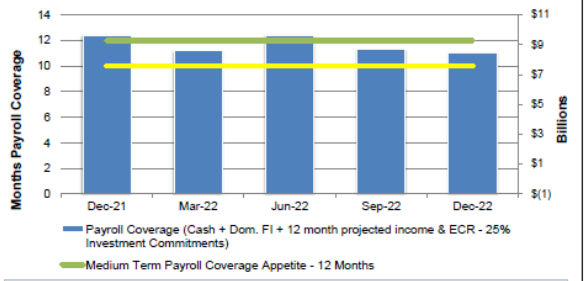
Stressed Long Term Liquidity KRI (Years)	Current Qtr.	Appetite	Tolerance	Outside Tolerance
	7.2	>=5 Years	3-5 Years	<=3 Years



The Stressed Long Term Liquidity KRI assumes a hypothetical 40% portfolio loss then calculates years of required cash flow coverage from remaining public market assets and 12 months *estimated net cash flows (*includes stressed projections for: portfolio income, employer contributions and unfunded capital calls)

Funding Liquidity - Medium Term Payroll Coverage

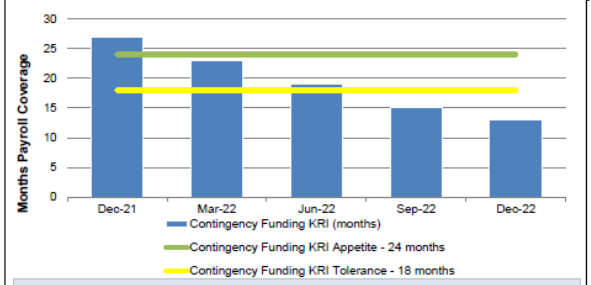
Medium Term Liquidity KRI (Months)	Current Qtr.	Appetite	Tolerance	Outside Tolerance
	11.1	>=12 months	10-12 months	<=10 months



Domestic Fixed Income included in payroll coverage observe the minimum allocation bound. Capital calls of 25% are indicative of a "non-stressed" market environment. Income and employer contributions are 12 month projections from the most recent quarter date depicted.

Stressed Funding Liquidity - Contingency Funding Plan

Stressed Contingency Funding Liquidity KRI (Months)	Current Qtr.	Appetite	Tolerance	Outside Tolerance
	13.0	>=24 months	18-24 months	<=18 months



The Stressed Contingency Funding Liquidity KRI seeks to evaluate how many months of payroll can be made during a GFC like scenario before NYSTRS' CFP is triggered. GFC loss is experienced over 12 months with asset classes returning capital market assumptions years 2-5. Employer contributions are capped at 17%

Rutter Associates observed that the "stressed contingency funding liquidity" KRI is significantly below its 18-month tolerance range. As discussed above, we followed up with NYSTRS in June and learned that the metric is improving and that NYSTRS views liquidity across all the four metrics, with one of these alone not telling the complete story of liquidity at the System. See "Reasonableness of Risk Profile" section above.

Rutter Associates observes that NYSTRS liquidity measurement is adequate, and the risk is being monitored and communicated properly.

(#7) Stated Return Expectations

Rutter Associates reviewed the latest asset liability study, NYSTRS 2021 Asset Liability Study as of April 27, 2021, conducted by Callan, the general Investment consultant. The asset allocation process used by Callan is based on modern portfolio theory, which is standard market practice. Rutter Associates reviewed Callan's assumptions for expected return, standard deviation, and correlations for and among each asset class.

Capital Market Assumptions

2021 Return and Risk

Asset Class	Performance Index	10-Year Geometric Return	30-Year Geometric Return	Standard Deviation
Equity				
Broad US Equity (1)	S&P 1500	6.60%	7.60%	17.95%
Global Ex-US Equity (2)	MSCI ACWI ex USA	6.80%	7.90%	20.70%
Global Equity	MSCI ACWI	6.85%	7.95%	18.25%
Real Estate Equity (3)	NCREIF ODCE & NAREIT All Equity	6.75%	7.50%	16.75%
Private Equity	Cambridge Private Equity	8.00%	8.75%	27.80%
Debt				
Private Credit	N/A	6.25%	7.25%	14.60%
Core U.S. Fixed Income	Bloomberg Barclays Aggregate	1.75%	3.50%	3.75%
Global Fixed Income (4)	Bloomberg Barclays Global Aggregate	1.20%	2.95%	3.10%
Real Estate Debt (5)	Bloomberg Barclays Securitized	3.50%	5.50%	4.65%
High Yield	Bloomberg Barclays High Yield	4.35%	5.55%	10.75%
Cash Equivalents	90-Day T-Bill	1.00%	2.00%	0.90%
Inflation	CPI-U	2.00%	2.00%	1.50%

(1) Broad US equity = 80% large cap, 20% mid and small cap
(2) Global ex-US equity = 75% developed markets, 25% emerging markets
(3) Real estate equity = 55% core real estate, 30% non-core real estate, 15% REITs
(4) Global fixed income = 60% non-US developed market bonds, 40% core US fixed income
(5) Real estate debt = 80% commercial mortgages/20% private mezzanine debt

Note that return projections for public markets assume index returns with no premium for active management

Capital Market Assumptions

2021 Correlations

	Broad US	Glb ex US	Glbl Eq	RE Eq	Priv Eq	Priv Cred	Core Fix	Glbl Fix	RE Debt	Hi Yield	Cash
Broad US Equity	**1.000**										
Global ex-US Equity	0.817	**1.000**									
Global Equity	0.955	0.951	**1.000**								
Real Estate Equity	0.798	0.783	0.830	**1.000**							
Private Equity	0.803	0.783	0.832	0.744	**1.000**						
Private Credit	0.735	0.720	0.763	0.667	0.680	**1.000**					
Core US Fixed	-0.104	-0.123	-0.118	-0.101	-0.190	-0.060	**1.000**				
Global Fixed Income	-0.138	-0.128	-0.138	-0.142	-0.092	-0.034	0.735	**1.000**			
Real Estate Debt	0.737	0.720	0.765	0.682	0.890	0.653	0.189	0.187	**1.000**		
High Yield	0.715	0.715	0.750	0.571	0.589	0.630	-0.004	-0.009	0.624	**1.000**	
Cash Equivalents	-0.064	-0.104	-0.088	-0.035	0.000	-0.060	0.150	0.072	0.061	-0.110	**1.000**

The return expectations, standard deviations, and correlations for and among each asset class, while different than the capital market assumptions of other institutions, are consistent with the range of capital market assumptions from other Institutions. For example, we see higher return and standard deviation on equity than on fixed income; higher return and standard deviation on private market (private equity and private debt); negative correlation between equity and traditional fixed income, while positive correlation between equity and private debt or real estate debt. And the levels are all consistent with capital market assumptions from other Institutions.

The following lists the expected returns for each asset class from different sources including Callan.

	NYSTRS 30Y Geo Return (2021)	RVK (2022)	Wells Fargo (2023)	Callan (10Y) (2022)	BNY (10Y) (2023)	BNY (10Y) (2022)	Barclays (30Y) (2023)	JPM (Long-Term) (2023)	JPM (Long-Term) (2022)
U.S. Equity	7.60%	5.93%	7.53%	6.60%	6.50%	5.90%	7.60%	8.00%	4.27%
Non-US Equity	7.90%	8.53%	6.93%	6.70%	8.10%	6.70%	7.80%	9.74%	6.59%
Global Equity	7.95%	6.80%	6.93%	6.70%	8.10%	6.70%	7.80%	9.74%	6.59%
Real Estate Equity	7.50%	7.08%	7.30%	5.75%	6.00%	4.70%	5.70%	7.08%	6.78%
Private Equity	8.75%	9.00%	11.30%	8.00%	8.20%	7.90%	11.62%	9.90%	8.10%
Private Debt	7.25%	7.25%	8.50%	5.50%	NA	NA	7.80%	7.80%	6.90%
Core US Fixed Income	3.50%	2.50%	3.38%	1.75%	4.10%	1.20%	4.30%	4.62%	2.37%
Global Fixed income	2.95%	4.33%	4.75%	0.80%	3.00%	0.30%	5.00%	5.36%	3.51%
Real Estate Debt	5.50%	NA	NA	NA	NA	NA	7.10%	NA	NA
High Yield Bond	5.55%	5.50%	5.25%	3.90%	6.20%	1.90%	6.49%	6.80%	3.90%
Cash	2.00%	1.50%	1.90%	1.20%	NA	NA	2.95%	2.40%	1.30%

Rutter Associates also notes that Callan's capital market assumptions embed climate risk:
"Callan's base case long-term capital market assumptions (CMAs) incorporate our expectations that climate change is occurring…We believe the role of climate change may become pronounced in the years ahead, and we believe the current consensus climate path is incorporated into our macroeconomic view that underpins our capital market assumptions."

Rutter Associates reviewed NYSTRS Recommended Actuarial Assumptions October 2021 Report and notes that the Actuarial Interest Rate Assumption ("AIR") was lowered to **6.95%** from 7.1%. NYSTRS' Investment Policy Manual states that:

The System's long-term objective is to earn an average rate of return greater than the rate of return of representative indices for individual asset classes but no less than the actuarial assumption rate (currently 6.95% per annum).

Callan's Asset Allocation study (prepared before the AIR was lowered to 6.95%) shows that the asset allocation modeled meets the 7.10% return requirement over a 30-year time horizon.

Using the capital market assumptions provided by Callan, Rutter Associates was able to approximate closely the results[2] of the Callan's asset allocation by using the EXCEL optimization routine with the basket constraints restricting the total allocation for certain asset classes to under 25%[3].

Basket Constraints:

New York State Public Pension Fund Statutory Limits for Asset Allocation

- Overall "basket assets" are capped to no more than 25% of total Plan assets

Asset Class	Legal List	Basket
US Equity	Up to 70% of which 10% can be Non-US Equity	Securities <$1B market cap
Non US Equity (Developed and EM)	Up to 10%	All assets above 10% Legal list
US Investment Grade FI	√	
High Yield FI		√
Non-US FI Developed		√
Emerging Markets Debt		√
Bank Loans		√
Hedge Funds		√
Private Equity		√
Real Estate Equity	Up to 10%	All assets above 10% Legal list
Infrastructure		√
Timber		√
Commodities		√
Real Estate Debt – Core	Up to 30%	All assets above 30% Legal List
Real Estate Debt – Non-Core		√

Rutter Associates observes that the asset allocation process used by Callan is based on modern portfolio theory, which is standard market practice and consistent with other pension systems. Callan presents NYSTRS with suggested asset allocations as various portfolios (Expected Return, Standard Deviation) pairs each consistent with maximum "possible" Expected Return at each level of Standard Deviation. NYSTRS chooses an allocation that provides an expected return of at least 6.95% and that is consistent with the System's risk preference.

The return expectations, standard deviations, and correlations for and among the asset classes, while differing slightly from the capital market assumptions from other institutions, are not inconsistent with range of capital market assumptions from other Institutions.

Rutter Associates finds no deficiencies in the assumptions, the process, and the results of the NYSTRS's asset allocation process.

[2] Rutter Associates' optimization results are using simple rate of return and are purely mathematical. NYSTRS's final asset allocation may include some institutional preferences, for example not differing too much from their previous allocation.

[3] In 2023, the basket constraints cap was increased to 35%.

(#8) Asset Valuation

The accounting firm KPMG LLP ("KPMG") performed a thorough examination of the NYSTRS Investment Portfolio listed asset values. The distribution of asset valuation methodologies as a fraction of total assets is shown below:

1. Level 1 – 56.73%
2. Level 2 – 20.70%
3. Level 3 – 5.34%
4. Measured at Net Asset Value ("NAV") – 17.74%
5. Investments not Included Above – 0.09%

KPMG has a National Pricing Desk ("NPD") to which 100% of the investment securities were submitted for independent pricing. KPMG states that the fair value of Real Estate commingled funds, private equity, private debt, private debt, real estate debt funds and real estate equity funds were determined using NAV per share. NAVs were calculated from the most recently audited financial statements for those assets listed at Net Asset Values.

KPMG states the following: "KPMG believes that sufficient audit evidence has been obtained to permit conclusion over the valuation and existence assertions of the System's investments at June 30,2021."

The KPMG partner, Jeffery Koch, stated the above statement meant the asset valuations were tested and found accurate. Rutter Associates has no reason to challenge the KPMG conclusion.

(#9) Securities Lending

A Securities Lending agreement is the loan of an owned security in return for collateral (cash or acceptable securities) with an agreement to return the collateral to the borrower in return for an identical security in the future while passing through an equivalent amount of all distributions (e.g., dividends and interest) to the lender and a borrowing fee. Title passes from borrower to lender and voting rights typically follow title. The lender has the right to call back the securities at any time.

NYSTRS, through a lending agent, lends securities to augment its investment income and limits this activity to a maximum of 20% of the market value of the System's investment portfolio. Securities may be lent to a broker-dealer or with New York State or nationally chartered banks for a period not to exceed 1 year.

The System may only lend securities that are freely traded on recognized exchanges or marketplaces in return for collateral in the form of cash, bonds, or performance letters of credit (drawn on a bank with capital, surplus and undivided earnings more than $100 million) or other interest-bearing notes and obligations *of the U.S. or federal instrumentalities eligible for investment by the System*. Initial cash and non-cash collateral received must be at least 102% of the market value of U.S. securities lent or 105% of the market value of non-U.S. securities lent, plus accrued interest, if applicable. Securities on loan and the collateral supporting the loan is marked to market each business day and the collateral required from borrowers is augmented via collateral call using the target of 102% for U.S. securities on loan and 105% for non-U.S. securities lent.

All cash collateral received is invested in the NYSTRS short-term investment fund subject to a robust set of liquidity, maturity, and credit risk guidelines including minimum credit ratings from two to the three leading NRSROs (S&P, Moody's, Fitch) for short-term issuances of A-1 / P-1 / F1 and/or long-term debt ratings not lower than A/A2/ A. Additionally, ABS must have initial ratings from Moody's or S&P of Aaa/AAA.

Rutter Associates observes that NYSTRS employs market-standard controls over its securities lending program.

(#10) Portfolio Credit Risk Metrics and Management

The Fixed Income Asset Class is composed of the following:

- Domestic Fixed Income (Long-term Bonds ("Lt Bonds") Exhibit on 2021 DFS Report – Final)
- Global Bonds
- Commercial Mortgage-Backed Securities ("CMBS")
- High Yield
- Mortgage Loans
- Private Debt
- Real Estate Alternative Debt

The Private Debt and Real Estate Alternative Debt portfolios are composed of funds and as such no credit ratings were exhibited on the portfolio data supplied. The balance percentages with no credit rating relative to the total fixed income balance is shown in the table below:

	Fixed Income Asset Class		Total Balance (Fair Value)	Balance with No Rating	% Balance with No Rating
1	Lt Bonds		$18,815,502,009	$0	0.00%
2	Global Bonds		$3,249,407,962	$101,130,639	3.11%
3	CMBS		$1,860,302,412	$74,884,240	4.03%
4	High Yield		$941,592,859	$41,592,641	4.42%
5	Mortgage Loans		$3,707,598,594	$0	0.00%
6	Private Debt		$1,163,794,312	$1,163,794,312	100.00%
7	RE Alternative Debt		$1,902,871,369	$1,902,871,369	100.00%
	Total Debt =		$31,641,069,516	$3,284,273,200	10.38%

About 10.5% of the total Fixed Income Portfolio has no assigned credit rating. Approximately 75.5% of the Fixed Income Portfolio has NRSRO ratings between Aaa and A3 and 10% have ratings between Baa1 and Baa3 (leaving 4% with NRSRO ratings in the "junk" category).

Rutter Associates suggests that the System attach internally developed letter credit ratings in S&P or Moody's format based on its own views on default probability or expected loss to credit risky securities for which there are no NRSRO ratings (generally S&P rates to a probability of first dollar loss standard and Moody's rates to an expected loss standard). That said, expected credit loss of unrated securities is not entirely ignored by the System. The Barra risk reports provided to the System do include a bond spread volatility factor that captures the impact of changes in the market's perception of an amalgam of: liquidity risk; credit risk premia; expected credit loss; and relative supply/demand conditions for each security or asset class. Bond spread volatility is a contributing factor within the calculated 1-year 99-percentile market VaR in the reports.

The NRSROs do not apply ratings to whole-loan mortgages; thus, the System employs a set of seven credit risk classifications for whole-loan mortgages raging from "Virtually no Risk of Loss" to "Immediate action required and preparation to take ownership of property should commence." This type of classification system is state of the practice and entirely appropriate.

(#11 and #12) Derivative Usage and Counterparty Credit Risk Management

Rutter Associates corresponded with NYSTRS CRO Matt Albano about derivative usage and counterparty credit risk management of any over the counter ("OTC") derivative contracts. As a large fund that necessarily "owns the market", NYSTRS itself makes *de minimis* use of derivative contracts to hedge out foreign exchange risk but some of its external managers do employ derivatives in their strategies. To the extent these include OTC contracts, those managers perform their own counterparty credit risk controls.

Nearly all NYSTRS derivative trades are executed by the external managers. NYSTRS does occasionally have to internally transact with FX forwards that are short-dated and thus have little

counterparty credit risk (no collateral posting is required). The derivatives traded by external managers are currency forwards, swaps, and futures.

For separately managed accounts, the external managers choose counterparties based on their own criteria. Once these are identified by the manager, the NYSTRS legal team together with external Counsel reviews and approves the trading agreements and negotiates for additional legal terms if needed. For investments in commingled funds that trade public equities and related derivatives, NYSTRS does not get involved with the approval of trading agreements.

There is no NYSTRS-dictated minimum counterparty credit rating for external manager derivative counterparties, but all the managers' counterparties rated A- and above. The external managers have counterparty credit teams that monitor exposures and look to empirical measures that include, for example, indicators from credit, equity and options markets and headlines. Where possible managers actively look to diversify their counterparty credit risk amongst multiple counterparties. Larger managers with the resources have gone so far as to develop scorecards and research indicators that they have found to be good early warning indicators.

NYSTRS relies on the external managers to monitor the credit worthiness of its derivative counterparties on an ongoing basis, and the managers are exchanging performance margin for derivatives as required. In cases where NYSTRS has a concern about an external manager counterparty, NYSTRS has the systems and databases to check the outstanding risk positions and initiates a dialogue with the external manager on the subject.

Rutter Associates notes no concern about NYSTRS' derivative usage and counterparty credit risk.

(#13) Asset Allocation

Callan, the System's general investment consultant, conducts the quinquennial asset/liability study. In this study, Callan provides alternative asset allocations consistent with risk/return maximization subject to basket constraints and provides a full asset-liability profile to allow NYSTRS to quantify the impacts that different allocation strategies might have on employer contribution rate, funded status, and liquidity. The analysis is comprehensive and rigorous.

NYSTRS has a risk appetite for all asset classes within the Policy Range, and the CRO continuously monitors whether the asset classes are within their Policy Ranges. Rutter Associates notes that all asset classes as of 3/15/2023, 6/30/2022 and 6/30/2021 are within the Policy Range.

The current public equity and public fixed income allocations are slightly lower than their targets but still higher than the lower bound due to the poor performance of public markets in 2022. However, NYSTRS is aware of that and continues to rebalance toward the target.

In managing the allocation to private equity investment, NYSTRS occasionally enters the secondary market to sell out of positions as the denominator effect leads to allocations outside of the policy range. In other words, NYSTRS uses the secondary market for portfolio management purposes to rebalance toward is targets while reducing legacy relationships. For example:

- At a price of 83% of 12/31/2018 NAV, NYSTRS completed a sale of an approximately $681 million NAV portfolio comprised of 28 funds across 20 general partners. Proceeds were received based on the agreed upon transfer dates which occurred during the months of September 2019, October 2019, and March 2020.
- At a price of 94.5% of 3/31/2021 NAV, NYSTRS completed a sale of an approximately $2 billion NAV portfolio comprised of 45 funds across 23 general partners. Proceeds were received based on the agreed upon transfer dates which occurred in the months of December 2021 and January 2022.
- At a price of 94.6% of 12/31/2022 NAV, NYSTRS completed a sale of an approximately $2 billion NAV portfolio comprised of 34 funds across 15 general partners. All proceeds were received on 12/29/2023.

Rutter Associates observes that NYSTRS's asset allocation target and policy ranges are consistent with maximizing risk adjusted expected return subject to basket constraints.

(#14) Background and Diligence of Investment Managers

To understand the type of due diligence performed by the asset class MD's, Rutter Associates reached out to the fixed income, private equity, public equity, and real estate teams for a description of the NYSTRS manager due diligence processes (both onboarding and manager monitoring). We report here the processes employed by the public equities team as they employ over half of the NYSTRS external managers.

Onboarding: Manager Search Workflow.

1) Download eVestment data for the specified manager universe for the specified period. Data fields should include Information ratio, Upside and Downside Capture, and Tracking error.
2) If possible, obtain and incorporate consultant ratings into the eVestment data download.
3) Filter data for Info Ratio>0, Upside Capture>Downside Capture, Tracking Error < 5% and consultant does not have a negative rating.
4) If necessary, verify ratings with consultants where highly ranked funds are not rated.

5) Managers with very small strategy and firm aum values can be screened out. An investment amount of 500 million USD should not be more than 5% of firm aum and not more than 33% of the strategy aum.
6) Determine final short list of about five managers to further analyze.
7) Ask the consultant for the most recent comprehensive reports if available for this short list of managers. Also, access the most recent ADV's for the managers on the short list. If there are no issues, request the managers to complete the RFI document.
8) Review the returned RFI and discuss with committee members to gauge which managers have the organizational support, personnel, and philosophy and process that can sustain attractive historical performance into the future.
9) Request a conference call with the managers to review questions from the RFI as well as to get a firm, philosophy, process, and performance overview. Note any discrepancies and inconsistencies.
10) After the conference call and the team review of the RFI, cull managers as necessary and schedule site visits for the remainder.
11) Forward the agenda template to the manager for the on-site meeting (about 5-6 hours) and fine tune with them. Refer to the RFI and the company website and the form ADV 2B to make sure the key decision makers are in attendance. Topics should include organization, philosophy, process, key personnel, representative names, portfolio construction, operations, trading, compliance, risk management and an office tour.
12) For those managers the RFI committee wishes to proceed with, upload holdings into Factset.
    a) Run Brinson and factor base attribution.
    b) Run historical risk decompositions of tracking error.
    c) Calculate active shares of each prospective manager on a quarterly frequency to individual existing managers and to an asset-weighted composite of all our existing managers, expanding etfs, country futures and swaps, where appropriate.
    d) Run the Barra risk model to forecast ex-ante tracking errors on a quarterly basis. Public Equities managers that have low TE (<2) and / or low active share (<60) may need to be excluded.
13) For those managers the RFI committee wishes to proceed with, update the performance "one pager" template and cross referenced to performance in eVestment.
    a) Calculate the R-squared value of the excess returns of the prospective manager to those of individual existing managers that share the same or similar benchmark, as well as against the manager composite. Do this on the full period as well as on a rolling 3 year basis.
14) Have a conference call with the consultant to understand flagged items, issues to watch or areas of concern. Also obtain their analysis on overlap of the prospective managers to existing ones.
15) Organize conference calls for reference checks. Discuss and follow up on any issues.
16) Prepare memos for the IIC review and coordinate meeting between the IIC members and the prospective manager and the consultant (by audio conference).
17) Follow-up on any IIC concerns like additional analysis or on-site visits.
18) Begin fee negotiations referencing internal or consultant fee studies, if necessary.

19) If approved by the IIC, prepare board meeting memo, and inform prospective manager and consultant to be available for the board presentation.

Ongoing review.

Holdings for the portfolios are sent by the custodian or directly from the manager to the portfolio analysis system (Factset). For commingled portfolios, holdings may be lagged to not run afoul of selective disclosure regulation.

The team mentions that portfolio holdings-level information is considered the gold standard of portfolio transparency and we agree.

FactSet generates portfolio reports that provide performance attribution (factor that drove performance) and the portfolio's risk profile (using an integrated risk model from third party providers Barra and Northfield).

A two-to-three-member analyst team reviews the portfolio's consistency with investment guidelines and with the team's understanding of the investment manager's philosophy and process.

On a monthly basis, the team completes a portfolio signoff sheet, and on a quarterly basis, the team presents the portfolio review to the larger public equities team and completes a brief portfolio writeup. The team has a quarterly call with each manager to discuss the portfolio as well as the manager's organization and team and any material changes.

The team also completes a fiscal year writeup.
It is within the public equities team's discretion to have a call intra-quarter as warranted by the manager's organization or portfolio or market developments (e.g., countries in the benchmark like China, Russia, or any other issues or concerns).

For the external strategies, each year, staff and the consultant will make a recommendation whether to "renew" the contract with the manager; this of course requires the manager to be in good standing. The consultant (Callan) provides its independent letter to the Board supporting or opposing the renewal. If approved, the Board will pass a resolution to renew. If not, in the past, the Board has requested additional due diligence to make them more comfortable with the recommendation or the Board will ask for the manager to appear before it.

In addition to reviewing the portfolio's risks and returns, the group uses an outside consultant (Abel Noser) to analyze the transaction costs of the portfolio's equities trades to make sure these, on average are reasonable. This occurs quarterly.

Rutter Associates notes no finding that external manager due diligence is other than sufficiently thorough.

(#15) Investment Fees and Expenses.

Investment fees and expenses are listed in the Annual Comprehensive Financial Reports (page 90 of the 2021 Report and page 110 of the 2022 Report). Fees are presented by asset class and expenses by type of expense and law firm for legal costs. For fiscal year 2022 total investment management fees were $387.7mm and sum of investment management fees and expenses was $399.6mm. Given total invested asset of $132billion, this amounts to 29.4 basis points (0.294%) of AUM.

Using 2021 data from the Center for Retirement Research at Boston College (the latest available) we reviewed investment expenses for public pension plans with AUM over $10 billion. Of the 74 plans in the BC database, NYSTRS ranked #47 at 22.9 basis points (the average among the 74 was 39.3bps). For comparison with other NY systems, NYSLRS was at 34.8 bps (#33), NYC Employees at 36.5 bps (#31), NYC Teachers at 53 bps (#16), NYC Fire at 54.8 bps (#15), and NYC Police at 56.7 bps (#14). Missouri Public Schools Retirement System was #1 at 2.37%.

We were provided with a 2019 NYSTRS internal audit report entitled "Schedule of Investment Fees and Expenses in the CAFR" which concluded that "the processes and controls used to capture and report investment fees and expenses are operating effectively to provide reasonable assurance that amounts on the Schedule of Investment Fees and Expenses are accurate and complete and have been paid in compliance with respective agreements." We are satisfied with the conclusion of this audit.

Monthly fees are monitored closely and reported to the Trustees in each "Consolidated Board Report."
Rutter Associates has no concerns about the level of investment expenses (NYSTRS expenses are well below its peers at the New York State and New York City public retirement systems) or about the diligence conducted in monitoring and reporting them.

(#16) Climate Risk Management

Rutter Associates observes that NYSTRS considers environmental, social and governance risks to returns on investment as part of the asset allocation and security selection process. This is simply part of prudent risk-adjusted return maximization. Any decision to "disinvest" from a particular investment is based solely on an analysis of the positive financial impact that decision will have on the portfolio. This is fully consistent with the System's fiduciary responsibility to beneficiaries (and ultimately to school taxpayers).

Rutter Associates notes that a good example of a proper analysis was recently completed by the California Public Employees' Retirement System ("CalPERS") in the wake of a Bill passed by the California State Senate in May 2023 that would force the System to divest $9 billion from fossil

fuel companies and halt further investment. CalPERS Chief Executive Officer ("CalPERS CEO") reported to the CalPERS Board of Trustees that, "If passed into law, the fossil fuel bill would result in a $9 billion divestment, the largest in CalPERS' history and result in an estimated 4.4-basis-point hit to returns per year to the plan over 10 years." The CalPERS CEO explained that over a 20-year period, CalPERS estimates that fossil fuel divestment would result in a 3.6 bps annual decline, amounting to $327.6 million per annum. The CalPERS CEO explained to the Board that the Bill would force CalPERS to violate the Board's fiduciary duty[4]. The methodology and assumptions employed to conduct this analysis were not disclosed.

Rutter Associates acknowledges that "climate risk" is a very new category in the litany of financial market risks. The science of climate risk assessment is in its infancy and managing a risk that is difficult to assess is certainly challenging. We believe that NYSTRS is making good efforts to keep up with developments in the methods used by market participants to incorporate climate risk into its investment decision-making, while being focused on its goal of maximizing risk-adjusted return.

In addition to conversations with NYSTRS Executive Director, in his capacity as CIO, and with the CRO , the Rutter Associates team joined the NYDFS climate risk team in its interview with a member of the CIO's team, who serves as the NYSTRS's "stewardship/sustainability" advisor and who started his career as a pension actuary, worked at Towers and later Mercer, and most recently was an investment advisor at Bank of America.
The NYSTRS's "stewardship/sustainability" advisor wrote the "stewardship" section of the investment policy manual and writes a quarterly "stewardship update." The System is developing a "climate risk action plan" that is written from the perspective of the NYSTRS fiduciary duty to beneficiaries and taxpayers to maximize the risk-adjusted return of its portfolio (subject to legislative basket constraints).

The CRO has developed 5 climate risk KRIs against which companies in the NYSTRS portfolio are evaluated:

1. Reduction targets: Greenhouse Gas ("GHG") reduction targets (if any) including presence of short, medium, and long-term targets and scope and coverage of targets.

2. Decarbonization strategy: Comprehensiveness around how a company intends to achieve its GHG reduction targets, if any.

3. Climate governance incentives: Presence of executive remuneration packages that incorporate climate risk performance elements.

[4] Pensions&Investments, June 22, 2023
https://www.pionline.com/esg/calpers-laser-focused-killing-state-fossil-fuel-divestment-bill?utm_source=p-i-daily-consultants&utm_medium=email&utm_campaign=20230623&utm_content=hero-headline&CSAuthResp=1687639579450%3A0%3A357769%3A391%3A24%3Asuccess%3A8AD3DBCA39872FDA2B6B56923FCADD9A#cci_r=

4. Climate governance oversight: Oversight of climate-risk related issues by board and senior management.

5. Reporting frameworks: Evidence of reporting against key climate-risk disclosure frameworks.

NYSTRS uses its proxy votes to encourage value-added climate risk policies as well.

The NYSTRS's "stewardship/sustainability" advisor raised with us that the recent performances of the XLE/VDE – type companies show well why sector or industry-level "divestiture" is not in the cards for NYSTRS (while discernment and occasional disinvestment from underperforming assets is essential) and emphasized that the System seeks to largely "own the market."

As the examination team heard from the CIO and CRO, NYSTRS uses Mercer's "Act Assessment tool" (https://www.mercer.com/newsroom/mercer-launches-new-climate-change-offering-to-help-investors-transition-to-a-climate-scenario.html) in order to gauge progress in reducing the uncompensated climate risk in its portfolio.

As the CIO had mentioned, NYSTRS has commissioned Mercer to develop a set of climate change scenarios to run through the portfolio andbelieves that these are superior to probabilistic risk assessments (Rutter Associates agrees because climate change "science" does not give us a reliable probability distribution).

Rutter Associates believes that the NYSTRS approach to incorporating climate risk into its investment decision making is state of the (rapidly developing) art and fully consistent with its fiduciary responsibility to maximize expected *risk-adjusted* return (subject to basket constraints) for the expected return being targeted.

Respectfully submitted,

Robert D. Selvaggio, Ph.D.
Rutter Associates, LLC

STATE OF NEW YORK

SS:

COUNTY OF WESTCHESTER

Robert D. Selvaggio, being duly sworn, deposes and says that the foregoing report, subscribed by him, is true to the best of his knowledge and belief.

Robert D. Selvaggio

Subscribed and sworn to before me

this 25 day of February 2026

Melissa N Vasami
Notary Public, State of New York
Reg. No. 01VA0018901
Qualified in Westchester County
Commission Expires December 19, 2027

New York State Teachers Retirement System

Actuarial Review of the June 30, 2021 Actuarial Valuation

Prepared by:

Rebecca A. Sielman, FSA
Principal and Consulting Actuary

Jennifer M. Castelhano, FSA
Principal and Consulting Actuary

John M. Chmielewski, FSA
Principal and Consulting Actuary

Table of Contents

Certification Letter

Section 1 Summary of the Findings

Purpose and Scope of the Actuarial Review

Actuarial Review Conclusions

Glossary

Section 2 Results of Each Assigned Task

Task a Review of payroll data

Task b Review of sample benefit calculations

Task c Review of coding of plan provisions and data specifications

Task d Review of sample lives and replication of liabilities

Task e Review of actuarial assumptions

Task f Review of actuarial cost method and asset valuation method

Task g Review of funding calculations and contents of valuation report

Task h Review of GASB 67/68 calculations

Task i Review of overall financial soundness of the System

Task j Review of correction procedure for over / underpayments

Task k Review of Required Minimum Distributions

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Certification

We have performed an actuarial review of the June 30, 2021 actuarial valuation of the New York State Teachers Retirement System (the System). This report presents the results of our review.

Milliman's work product was prepared exclusively for the New York State Department of Financial Services (DFS) for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of the System, and uses the System's census data, which Milliman has not audited. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions: (a) DFS may provide a copy of Milliman's work, in its entirety, to DFS's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit DFS; and (b) DFS may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law. No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs. If this report is distributed to other parties, it must be copied in its entirety, including this certification section.

In preparing this report, we relied, without audit, on information (some oral and some in writing) furnished by DFS and the System. We would like to express our appreciation to the System's staff for their assistance in supplying the data and information on which this report is based. The information supplied includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we found them to be reasonably consistent and comparable with data used for other purposes. Since the results of our review are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised. If there are material defects in the data, it is possible that they would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or for relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.

Our replication of valuation results was developed using models intended for valuations that use standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice. When reviewing the long-term investment return assumption discussed in Section 2 Task e, we relied upon a model developed by Milliman colleagues who are credential investment professionals with expertise in capital market modeling.

A valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. Future actuarial measurements may differ significantly from the current measurements presented in this analysis due to actual System experience deviating from the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the System's funded status), and changes in plan provisions, actuarial assumptions, and applicable law. An assessment of the potential range and cost effect of such differences is beyond the scope of this analysis.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Milliman's work product was prepared exclusively for the DFS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of the retirement system, and the uses of the data provided, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

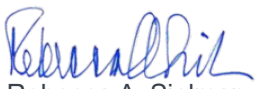
On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The signing actuaries are independent of the DFS. We are not aware of any relationship that would impair the objectivity of our work.

We look forward to having the opportunity to present this report and respond to questions regarding our review and recommendations.

Respectfully submitted,



Rebecca A. Sielman, FSA
Principal and Consulting Actuary

Jennifer M. Castelhano, FSA
Principal and Consulting Actuary

John M. Chmielewski, FSA
Principal and Consulting Actuary

Section 1 Summary of the Findings

Purpose and Scope of the Actuarial Review

The New York State Department of Financial Services engaged Milliman's services to perform an actuarial review of the New York State Teachers Retirement System. The purpose of the review is to assess the methodologies, practices, administrative efficiency, investment policies, and financial soundness in accordance with appropriate Actuarial Standards of Practice and Insurance Regulation No. 85.

Our actuarial review encompassed the following:

a. A comparison of sample participant data used in the valuation to the payroll data received by the System from participating employers.

b. A review of sample participant benefit calculations used in the actuarial valuation program for liability determination, in employee benefit statements, and in determination of benefits paid.

c. Verification of the plan provisions valued by the actuarial valuation program for liability calculations.

d. A review of sample participant liability calculations and a replication of the calculation of the Present Value of Future Benefits and other outputs from the actuarial valuation program for the entire System.

e. A review of the actuarial assumptions, including the results of prior experience studies, trends in actuarial gains or losses, and trends in the System's experience relative to the actuarial assumptions.

f. A review of the actuarial cost method and the actuarial asset valuation method.

g. A review of the determination of the funding contribution requirements and the contents of the actuarial valuation report.

h. A review of the Total Pension Liability and associated actuarial calculations and disclosures prepared in accordance with Governmental Accounting Standards Board Statements No. 67 and 68.

i. A review of the overall financial soundness of the System.

j. A review of the corrections procedure for benefit over / underpayments.

k. A review of required minimum distributions in accordance with Section 401(a)(9) of the Internal Revenue Code.

The scope of our actuarial review did not extend to the following:

- A review of the calculation of benefits for terminating and retiring members.
- A review of the data preparation methodology; that is, the process used to transform the raw member data into the data used by the actuarial valuation program.
- A review of the complete census data used by the actuarial valuation program.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Review of Another Actuary's Work

In pension systems as large and complex as NYSTRS, there are many operational aspects that have a bearing on the actuarial analysis of the System. The reader should recognize that many of the issues that we reviewed and which we will discuss in this report are subject to opinion and professional preference. No two actuaries (or actuarial firms) are likely to use precisely the same methods and assumptions (and, therefore, arrive at precisely the same conclusions) when presented with the exact same problem and set of historical facts. In completing our review, we have attempted to focus on those aspects of the System and its actuarial functions that could be meaningfully improved or where an alternative approach might be beneficial. In presenting our findings in this report, we have tried to limit discussion of aspects which reflect our professional preferences, but which would have minimal effect on the results and conclusions presented by the actuaries.

By its nature, a review of another professional's work product will tend to focus on those aspects where the reviewer believes some modification in current procedures would be desirable. Hence, a report such as this will devote the majority of the presentation to commentary that, even though intended to be constructive, may give the reader the impression that only problems were found. ***Therefore, we would like to state clearly up front that we found the actuarial procedures and practices to be of a high quality and in compliance with all major aspects of the applicable actuarial standards.*** While we will discuss several areas where we believe some modifications in valuation procedures, actuarial assumptions, and report content would be beneficial, that discussion should be considered within the context of an overall favorable report concerning the work performed.

Actuarial Valuation Model

NYSTRS is a complex pension system, consisting of six tiers with varying contribution rates, benefit accrual rates, retirement eligibility provisions, early retirement reductions, actuarial equivalent factors, and optional forms of benefits that members may elect upon retirement.

It is important to note that an actuarial valuation is based on a model that estimates the benefits that are expected to be paid in the future. The determination of the liabilities and contributions is then based on those projections. During this modeling, some estimates or approximations may be made by the actuary due to immateriality, inadequate data, or complexity. The use of such estimates or approximations is generally accepted within the actuarial profession.

One purpose of this actuarial review is to test the valuation model to determine if the results are reasonable and that the assumptions, estimates and approximations are appropriate. We recommend consideration of certain changes in the model that will, in our opinion, improve the "accuracy" of the model. However, overall, we believe that the calculations performed in conjunction with the June 30, 2021 actuarial valuation report are reasonable and appropriate for the intended uses of the report.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Actuarial Review Conclusions

While our report notes several suggestions for consideration or improvement, we found only one matter to note in our review. We have highlighted our concerns and suggestions as they appear throughout this report with the use of **bold orange text**. In summary, we concluded the following:

a. The participant data used in the valuation compares well to the payroll data received by the System from participating employers.

b. The participant benefit calculations are consistent across the actuarial valuation program for liability determination, employee benefit statements, and the determination of benefits paid. We did find some differences between the census data that was used to determine retirement benefits relative to the valuation census data for some recent retirees, so **we recommend that the System compare the sources of data for the two processes (benefit calculations versus valuation) to identify the sources of differences and harmonize them**.

NYSTRS responded to the above suggestion as follows:

The difference between the valuation data and the calculation data is the Automated Calculation 1 (AC1) and Automated Calculation 2 (AC2) benefit calculations. The initial benefit calculation for a retiree who is put on payroll is called the AC1. Typically, a retired member receives this amount for 9 – 12 months until their benefit has been finalized after a full review of salary and service. The finalized benefit calculation for a retiree is called AC2. The Office of the Actuary updates benefits for all retired members each year for the valuation. Over the past few years, the Office of the Actuary has been reviewing the gain/loss impact for the benefit updates between AC1 to AC2. On average over the last 3 years, the ECR has decreased by 0.01% per year and last year it increased by 0.03%.

c. The plan provisions valued by the actuarial valuation program for liability calculations are correct.

d. We successfully matched sample individual participant liability calculations and we successfully replicated the calculation of the Present Value of Future Benefits and other outputs from the actuarial valuation program for the entire System.

e. The actuarial assumptions are reasonable and consistent with the findings of the most recent experience studies and trends in the System's experience relative to the actuarial assumptions.

f. The actuarial cost method and the actuarial asset valuation method are reasonable.

g. The determination of the funding contribution requirements is correct and the contents of the actuarial valuation report comply with applicable Actuarial Standards of Practice.

h. The Total Pension Liability and associated actuarial calculations and disclosures have been prepared in accordance with Governmental Accounting Standards Board Statements No. 67 and 68.

i. If the State maintains the current contribution and funding policy, we believe the System is in a financially sound position.

j. The corrections procedure for benefit over / underpayments is appropriate and reasonable.

k. Members subject to required minimum distributions are commencing benefits in accordance with Section 401(a)(9) of the Internal Revenue Code.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Glossary

ASOP – Actuarial Standard of Practice

CCA White Paper – A White Paper was issued by the Conference of Consulting Actuaries Public Plans Community in October 2014, entitled **Actuarial Funding Policies and Practices for Public Pension Plans**. The White Paper focused on defining a Level Cost Allocation Model (LCAM) and provided detailed analysis for classifying each of the major components of a funding policy: the cost method, the asset smoothing method, and the amortization method. The classification system used the following categories:

Categories Under CCA White Paper Guidelines

Model Practices	Those practices most consistent with the LCAM.
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CCA Guidelines or acknowledge they reflect different policy objectives.
Unacceptable Practices	No description provided by the CCA White Paper, but the implication is that these should not be used.

These categories are an important yardstick which we have used in evaluating the various facets of the Funding Contribution Requirements.

Component unit – An entity whose employees are earning retirement benefits under the System.

GASB – The Governmental Accounting Standards Board issues standards that define generally accepted accounting principles for governmental entities; GASB 67 and GASB 68 are the current standards that apply to financial statement disclosures with respect to pension plans sponsored by governmental entities.

NYSTRS – New York State Teachers Retirement System

RSA – The Retirement System Actuary is Richard A. Young, ASA EA, MAAA, FCA, who is responsible for analyzing the appropriateness of the System's funding methods and assumptions (for adoption by the Retirement Board), as well as developing and communicating the System's funding contribution requirements and accounting calculations.

Subplan – The System provides benefits at six different Tier levels based on a participant's eligibility criteria.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task a Comparison of the Participant Data

Comparison of the Participant Data

The member data used by the actuary is one of the basic foundations of an actuarial valuation. It forms the basis for actuarially projecting the benefits provided to members by NYSTRS. Thus, an important step in an actuarial audit is reviewing the validity of the member data.

Data Comparisons Made

In order to complete the actuarial report, NYSTRS is given census information by the participating employers. We examined the NYSTRS procedure documents which describe the process they use to gather, scrub and create the valuation data file from the source data. We met with NYSTRS staff at the NYSTRS office to review and confirm that the documented processes were being followed. We reviewed four sample participating employers to verify that the valuation data was consistent with the source data. The majority of records directly matched. Where records did not directly match, NYSTRS staff maintains a reconciliation file for documentation as to reasons why (e.g., a member who has received earnings from two different participating employers).

A comparison of the census data for active members in aggregate is shown below:

Census Data Comparison for Active Members

	Count			Average Earnings		
Tier	NYSTRS	Milliman	% Difference	NYSTRS	Milliman	% Difference
1	169	169	0.00%	105,828	105,828	0.00%
2	202	202	0.00%	100,028	100,028	0.00%
3	1,106	1,106	0.00%	103,711	103,711	0.00%
4	162,627	162,627	0.00%	93,212	93,212	0.00%
5	12,061	12,061	0.00%	65,163	65,163	0.00%
6	82,993	82,993	0.00%	45,126	45,126	0.00%

	Average Age			Average Service		
Tier	NYSTRS	Milliman	% Difference	NYSTRS	Milliman	% Difference
1	74.9	74.9	0.00%	29.5	29.7	0.68%
2	69.9	69.9	0.00%	26.3	26.3	0.00%
3	64.4	64.4	0.00%	29.3	29.3	0.00%
4	48.8	48.8	0.00%	18.0	18.0	0.00%
5	39.8	39.8	0.00%	7.3	7.4	1.37%
6	35.9	35.9	0.00%	2.7	2.9	7.41%

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

A comparison of the census data for retired members in aggregate is shown below:

Census Data Comparison for Retired Members

	Average Age			Average Benefit		
Type	NYSTRS	Milliman	% Difference	NYSTRS	Milliman	% Difference
Service	73.5	73.5	0.00%	43,943	43,948	0.01%
Disabled	66.0	66.1	0.15%	21,895	21,969	0.34%
Beneficiary	N/A	83.2	N/A	N/A	39,160	N/A

Observations

The average service for Tier 6 active members is off by 7.41%, but this is based on members with very little service so a relatively small numerical difference translates into a relatively large percentage difference.

Conclusions

We believe the summarized data used for the valuation is reasonable.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task b Review of Sample Participant Benefit Calculations

Review of Sample Benefit Calculations

Our data review process included an extra layer of data verification through a comparison of the valuation data with the data used to calculate benefits for terminating and retiring members. The purpose of the valuation is to determine the liability for benefits that are expected to be paid in the future. Therefore, verifying the consistency between the data used for valuation purposes and the data used for benefit calculation purposes is a critical and integral component of the audit process.

Benefit Calculations Reviewed

The process of reviewing actual benefit calculations is two-fold. First, we reviewed the benefit calculations for reasonableness, consistency and compliance with the Legislative Code governing NYSTRS as well as the NYSTRS Member Handbook. Second, we reviewed the data used in the benefit calculations for consistency with the valuation data provided to the System actuary for the June 30, 2021 valuation.

We independently reviewed the calculations for a sample of members in the actuarial valuation program for liability determination and in determination of benefits paid. Our sample members consisted of:

- 6 Active members in Tier 4 of NYSTRS
- 5 Active members in Tier 6 of NYSTRS
- 3 Vested Terminated members from Tier 4 of NYSTRS
- 1 Vested Terminated member from Tier 6 of NYSTRS
- 7 Retired members from each of the most common form of payment options
    - We also requested information for 2 recent Retired members to confirm that the calculation data was consistent with the valuation data; we note that the benefit amounts from the calculations were inconsistent with the benefit amounts in the valuation
    - We reviewed an additional 10 Retired members from 4 separate employers based on information provided from SeeThroughNY: Pensions
- 1 Beneficiary and Disability Retired member

We received from NYSTRS detailed benefit calculation files for the selected members. We calculated benefits at representative future decrement ages for active members. We found that all significant benefit calculations were performed in an accurate manner. Our benefits closely matched those calculated by NYSTRS.

For the 11 Active members, we consistently matched NYSTRS on the calculation of the following items:

- Projected salary
- Final average salary
- Retirement benefit

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

- Withdrawal benefit
- COLA
- Disability benefit
- Death benefit

Observations

For one Active member, we found a discrepancy between the 2020 salary that was provided to us and what was used in the final average salary calculation for valuation purposes. The correct compensation was used in the June 30, 2021 valuation and had been updated after the June 30, 2020 valuation, but not updated in the raw data file.

For one Vested Terminated member, we requested a recent pension benefit calculation and matched the benefit from the calculation to the valuation. For the others, we accepted the benefits at retirement as provided.

The tables below display the comparison of the valuation data (Regular Benefit) compared to the pension benefit provided by SeeThroughNY : Pensions. For the two retiree calculations that we received, row IDs 47 and 448, the website matched the maximum benefit amount from these calculations.

Row ID	Employer	Date of Retirement	Valuation Data	Calculation Data	% Difference
47	Finger Lakes Community College	9/7/2020	51,284	52,588	2.54%
996	Finger Lakes Community College	9/2/2020	41,228	42,306	2.61%
1125	Finger Lakes Community College	8/28/2020	61,458	63,331	3.05%
3939	Finger Lakes Community College	5/20/2021	10,009	10,159	1.50%
4883	Finger Lakes Community College	8/2/2020	37,450	38,319	2.32%
169378	Finger Lakes Community College	1/17/2020	5,485	5,485	0.00%
173011	Finger Lakes Community College	1/1/2020	14,471	14,471	0.00%
63336	Finger Lakes Community College	1/1/2012	37,880	37,880	0.00%
107475	Finger Lakes Community College	12/24/2012	55,708	55,708	0.00%
143201	Finger Lakes Community College	12/21/2012	9,582	9,582	0.00%

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Row ID	Employer	Date of Retirement	Valuation Data	Calculation Data	% Difference
448	Great Neck Public Schools	3/19/2021	82,649	84,750	2.54%
1230	Great Neck Public Schools	4/1/2021	49,774	51,434	3.33%
117564	Great Neck Public Schools	7/1/2019	93,423	93,423	0.00%
134727	Great Neck Public Schools	11/18/2019	77,453	77,453	0.00%
149521	Great Neck Public Schools	7/1/2019	94,817	94,817	0.00%
152815	Great Neck Public Schools	7/9/2019	86,794	86,794	0.00%
167231	Great Neck Public Schools	7/1/2019	54,373	54,373	0.00%
118600	Great Neck Public Schools	7/1/2014	92,668	92,668	0.00%
140347	Great Neck Public Schools	7/1/2014	73,401	73,401	0.00%
144323	Great Neck Public Schools	7/1/2014	65,682	65,682	0.00%

Row ID	Employer	Date of Retirement	Valuation Data	Calculation Data	% Difference
5	Bethpage Union Free Schools	8/26/2020	121,313	126,765	4.49%
601	Bethpage Union Free Schools	7/1/2020	145,804	145,804	0.00%
1706	Bethpage Union Free Schools	7/20/2020	84,477	84,477	0.00%
1716	Bethpage Union Free Schools	7/1/2020	83,769	83,769	0.00%
5940	Bethpage Union Free Schools	9/3/2020	62,144	62,144	0.00%
148363	Bethpage Union Free Schools	7/1/2020	87,295	87,295	0.00%
154742	Bethpage Union Free Schools	7/1/2020	69,083	70,887	2.61%
82549	Bethpage Union Free Schools	7/1/2010	80,558	80,558	0.00%
88724	Bethpage Union Free Schools	7/1/2010	81,040	81,040	0.00%
102934	Bethpage Union Free Schools	7/1/2010	46,105	46,105	0.00%

Row ID	Employer	Date of Retirement	Valuation Data	Calculation Data	% Difference
21	Edgemont at Greenburgh Central	7/1/2020	72,753	72,753	0.00%
55	Edgemont at Greenburgh Central	7/1/2020	195,061	195,061	0.00%
4241	Edgemont at Greenburgh Central	7/1/2020	80,228	80,228	0.00%
127975	Edgemont at Greenburgh Central	7/1/2020	121,621	121,621	0.00%
145813	Edgemont at Greenburgh Central	7/1/2020	33,418	33,418	0.00%
151382	Edgemont at Greenburgh Central	9/2/2019	20,513	20,513	0.00%
172294	Edgemont at Greenburgh Central	7/1/2020	62,250	62,250	0.00%
62548	Edgemont at Greenburgh Central	7/1/2014	76,458	76,458	0.00%
100532	Edgemont at Greenburgh Central	7/1/2014	111,841	111,841	0.00%
118018	Edgemont at Greenburgh Central	7/1/2014	93,526	93,526	0.00%

Where our review noted differences, they uniformly occurred only for dates of retirement on or after 7/1/2020. The comparisons were done based on single life annuity amounts (“Maximum”) and were not adjusted for optional forms of payment.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Conclusions

Because we found differences for some members between the actual monthly benefit amounts and the valuation census data, we recommend that the System compare the sources of data for the two processes (benefit calculations versus valuation) to identify the sources of differences and harmonize them.

Otherwise, the results of this review were positive. Specifically, we want to highlight the following:

- With few exceptions, we were able to verify the calculation of the relevant benefits for our selected samples.
- With few exceptions, we were able to verify the plan provisions as specified by law for our selected samples.
- With few exceptions, we were able to verify the calculation of the relevant liabilities for our selected samples.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task c Verification of Plan Provisions

Review of Plan Provisions

The purpose of this review is to verify that the plan provisions being reflected in the actuarial valuation match the plan provisions specified by the applicable plan documents, statutes, and other sources of authority.

The relevant portions of the New York State Retirement and Social Security Laws are Articles 11, 14, and 15. Detailed information can be found at Publications | Office of the New York State Comptroller.

We independently reviewed the plan provisions, as specified in the law, to confirm that they were reflected appropriately in the valuation. We reviewed the plan provisions regarding eligibility for participation, service determination, compensation, vesting, amount of benefits, and the eligibility for benefits applicable to the sample lives which we reviewed.

Observations

Article 15 – Coordinated Retirement Plan 608 – Final Average Salary provides that if a member's earnings during any year included in the period used to determine the final average salary exceeds that of the average of the previous 2 years (for Tiers 1-5) or 4 years (for Tier 6), by more than 10%, **the amount in excess of the 10% should be excluded from the computation of final average salary**. This provision was not included in the valuation liability calculations.

The valuation only uses three years of actual salary history, whereas System benefits are based on calculations the highest three years of salary during the member's entire pensionable earnings history. **Based on conversations with the NYSTRS actuarial team, beginning with the June 30, 2023 valuation they plan to reflect ten years of salary history instead of the current three years**.

We believe that these differences would have an immaterial impact on the valuation results.

Conclusions

We otherwise found that the plan provisions, as specified in the law, are reflected appropriately in the valuation.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task d Review of Sample Participant Liability Calculations and Replication of Valuation Results

The purpose of this review is to verify that the System is accurately applying the stated actuarial assumptions and cost method, in compliance with the plan provisions specified in the law, for purposes of calculating the Present Value of Future Benefits (PVFB), Accrued Liability (AL), and Normal Cost (NC).

Review of Sample Liability Calculations

The checking of sample lives is vital to the review of actuarial calculations. It is in the detailed review of the projected benefits of representative members in the various subplans that errors or inconsistencies can be found that might otherwise be missed in a review of the aggregate liability. Within the groups designated in our proposal, we selected individuals that represented a wide variety of age, service, and salary, as well as both males and females, and a variety of subplans.

We reviewed the detailed sample lives for the following members:

Row ID	Status	Tier	Row ID	Status	Tier
817	Active	4	16	Retiree	1
3475	Active	4	7584	Beneficiary in pay	1
6265	Active	4	20880	Retiree	1
21418	Active	4	25699	Retiree	1
126269	Active	4	44347	Retiree	1
142314	Active	4	110435	Retiree	3
175558	Active	4	121980	Disability Retiree	3
204930	Active	6	131191	Retiree	4
237207	Active	6	136599	Retiree	4
185146	Active	6	5644	Terminated Vested	4
165058	Active	6	14733	Terminated Vested	4
			15309	Terminated Vested	4
			17565	Terminated Vested	6

We received from the System detailed liability files for these selected members, actuarial valuation reports, and assumption reports. This information was supplemented with written and oral communication with the System, as well as a review of the summary plan descriptions and applicable laws. We independently reviewed the liability calculations for these individuals. Our review was limited to the plan provisions and assumptions related to these individuals. Based on a review of these sample lives, we did not find any material issues. It is possible that a more detailed audit of the valuation system would reveal additional issues, but a more detailed review was outside the scope of our assignment.

The level of consistency we found in this review provides a high level of assurance that the results of the valuation for these sample lives accurately reflect the liabilities of the System based on the plan provisions, assumptions, methods, and census and financial data.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

The comparison of the Present Value of Future Benefits (PVFB) as of June 30, 2021 for these sample are shown below:

Active Members

Row ID	NYSTRS	Milliman	% Difference
817	1,455,476	1,455,429	0.00%
3475	504,594	503,757	-0.17%
6265	810,799	809,680	-0.14%
21418	2,905,877	2,905,849	0.00%
126269	216,506	214,695	-0.84%
142314	259,053	258,634	-0.16%
175558	303,483	303,307	-0.06%
204930	334,108	334,169	0.02%
237207	168,660	167,972	-0.41%
185146	257,748	257,783	0.01%
165058	484,731	484,661	-0.01%

Members In Pay Status

Row ID	NYSTRS	Milliman	% Difference
16	965,584	965,557	0.00%
7584	105,673	105,673	0.00%
20880	698,163	696,796	-0.20%
25699	130,369	130,369	0.00%
44347	786,168	786,168	0.00%
110435	412,184	412,184	0.00%
121980	442,953	442,953	0.00%
131191	135,945	135,945	0.00%
136599	2,075,275	2,075,275	0.00%

Terminated Vested Members

Row ID	NYSTRS	Milliman	% Difference
5644	44,029	44,029	0.00%
14733	57,580	57,580	0.00%
15309	79,744	79,744	0.00%
17565	159,339	159,339	0.00%

We were able to match all of the individual PVFBs to within 1%, which is a very good outcome.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

For active members, we also replicated the Accrued Liability (AL) and Normal Cost (NC):

	AL		
Row ID	NYSTRS	Milliman	% Difference
817	1,414,616	1,414,608	0.00%
3475	469,036	461,928	-1.52%
6265	780,769	779,691	-0.14%
21418	2,788,144	2,788,147	0.00%
126269	80,418	80,005	-0.51%
142314	149,694	149,171	-0.35%
175558	227,975	227,852	-0.05%
204930	115,020	115,026	0.01%
237207	14,815	14,893	0.53%
185146	135,687	135,720	0.02%
165058	254,501	254,387	-0.04%

	NC		
Row ID	NYSTRS	Milliman	% Difference
817	14,383	14,370	-0.09%
3475	13,023	13,007	-0.12%
6265	10,953	10,938	-0.14%
21418	39,593	39,583	-0.03%
126269	10,548	10,512	-0.34%
142314	8,049	8,057	0.10%
175558	9,764	9,758	-0.07%
204930	25,241	25,248	0.03%
237207	13,411	13,481	0.52%
185146	21,050	21,050	0.00%
165058	22,894	22,898	0.02%

We were able to match all of the individual ALs to within 2% and all of the individual NCs to within 1%, which are very good outcomes.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Liability Calculations Reviewed

In addition to the individual sample lives review, we also completed a full replication of the PVFB, AL, and NC for the System as a whole. Our results are shown in the table below:

		PVFB	
Status	NYSTRS	Milliman	% Difference
Active	69,299,122,457	69,036,992,413	-0.38%
Terminated Vested	1,203,323,592	1,203,443,538	0.01%
In Pay	75,300,146,857	75,318,962,076	0.02%
Miscellaneous*	36,078,814	36,078,814	0.00%
Total	145,838,671,720	145,595,476,841	-0.17%

*Milliman did not value the Miscellaneous liabilities

		AL	
Status	NYSTRS	Milliman	% Difference
Active	53,944,295,191	53,824,026,830	-0.22%
Terminated Vested	1,203,323,592	1,203,443,538	0.01%
In Pay	75,300,146,857	75,318,962,076	0.02%
Miscellaneous*	36,078,814	36,078,814	0.00%
Total	130,483,844,454	130,382,511,258	-0.08%

		NC	
Status	NYSTRS	Milliman	% Difference
Active	1,745,820,127	1,741,118,115	-0.27%
Terminated Vested	-	-	0.00%
In Pay	-	-	0.00%
Miscellaneous*	-	-	0.00%
Total	1,745,820,127	1,741,118,115	-0.27%

Conclusions

For the sample life with Row ID 3475, we note that the prior year salary provided to us was $98,121; however, the sample life from NYSTRS used a prior year salary of $104,032. This caused the difference for this sample life to be larger than others. Due to this difference, **we believe it would be prudent for NYSTRS to verify that the correct historical salary is used for all active members**.

We otherwise found that all significant liability calculations were performed in an accurate manner and the actuarial assumptions and methods are being applied correctly. Our liabilities closely matched those calculated by the NYSTRS.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task e Review of Actuarial Assumptions

Actuarial Assumptions

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the System. To provide the best estimate of the long-term funded status of the System, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the System in a reasonable manner.

An actuarial valuation uses two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the System, or to the operation of the System itself. Demographic assumptions are based on the emergence of the specific experience of the System's members.

Choosing actuarial assumptions is highly subjective. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system as complex as NYSTRS. Even allowing for the minor variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach.

Actuarial Standard of Practice (ASOP) No. 35 governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

In evaluating demographic assumptions, the actuary often compares the number of members that **actually** changed status during the study period with the number of members that were **expected** to change status based on the particular demographic assumption. This comparison of "actual" to "expected" is known as the ***A/E ratio*** and is a helpful metric for summarizing the predictive power of both the current assumptions and any recommended new assumptions. If, for example, the A/E ratio for service retirements is 120%, this would indicate that the actual number of service retirements exceeded the number expected by the assumptions by 20%.

ASOP No. 27 governs the development of economic assumptions. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans, such as NYSTRS. As the future is unknown, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. ASOP 27 explicitly advises the actuary not to give undue weight to recent experience. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. After completing the selection process, the

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

actuary should review the set of economic assumptions for consistency. This may entail the actuary using the same inflation component in each of the economic assumptions selected.

An actuary's estimate with respect to a particular measurement of pension obligations may change from time to time due to changing conditions or emerging System experiences. Even if assumptions are not changed, we believe that the actuary should be satisfied that each of the assumptions selected for a particular measurement complies with ASOPs 27 and 35, unless that assumption has been prescribed by someone with the authority to do so.

Review of 2021 Recommended Actuarial Assumptions Report

The RSA typically conducts a detailed actuarial review and revision of all actuarial assumptions every five years. (According to the 2021 Assumptions Report, such a review would have been conducted in 2020 but was postponed one year due to COVID.) The 2021 Assumptions Report was based on actual System experience during July 1, 2015 through June 30, 2020 and encompassed a review of the following actuarial assumptions:

- Active member mortality
- Healthy annuitant mortality
- Disabled annuitant mortality
- Survivor and beneficiary mortality
- Service retirements
- Disability retirements
- Withdrawal
- Salary scale
- Interest rate
- Inflation
- Cost of Living Adjustments (COLA)

Active member mortality

Experience - There were 582 female active member deaths and 266 male active member deaths during the study period. The 2021 Assumptions Report characterizes these levels as generally higher than expected, with A/E ratios of 1.4442 for females and 1.1271 for males.

Methodology - The recommended active member mortality tables were developed by analyzing active member deaths by age and gender during the study period, in conjunction with the Society of Actuaries Pub-2010 tables for Teachers. The Pub-2010 tables used were the male and female active member mortality tables, using the salary-weighted rather than headcount-weighted variants and the standard salary tables rather than the above median or below median variants. The study applied the Society of Actuaries MP-2020 mortality improvement scale to adjust the Pub-2010 tables from 2010 to the midpoint of the study period (2018). With the recommended rates, the A/E ratios are 1.0122 for females and 0.9888 for males.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Our analysis indicates that the recommended rates are consistently 5% lower than the corresponding Pub-2010 tables with MP-2020 projection to 2018.

Comments - We agree that the appropriate Pub-2010 tables were referenced. The Pub-2010 family of tables are based on the most recent and robust study of public pension plan mortality experience. We concur with the selection of the Teachers salary-weighted, standard salary variant as being most appropriate for the System.

Neither the 2021 Assumptions Report nor the 2021 Actuarial Valuation Report reference the use of a mortality projection scale beyond the midpoint of the study period. There is therefore no indication in these reports that rates of mortality will improve in the future. Through our replication process, we verified that generational mortality improvement was in fact included in the preretirement mortality assumption. **The valuation report should explicitly state that generational mortality improvement was used.**

NYSTRS provides different benefits for in-service deaths versus non-service deaths. **The 2021 Actuarial Valuation Report does not indicate what proportion of active member deaths are assumed to fall into these two categories.**

Healthy annuitant mortality

Experience - There were 10,933 female healthy annuitant deaths and 7,662 male healthy annuity deaths during the study period. The 2021 Assumptions Report characterizes these levels as generally close to expected, with A/E ratios of 0.9510 for females and 0.9706 for males.

Methodology - The recommended healthy annuitant mortality tables were developed by analyzing healthy annuitant deaths by age and gender during the study period, in conjunction with the Pub-2010 tables for Teachers. The Pub-2010 tables used were the male and female healthy annuitant mortality tables, using the benefit-weighted rather than headcount-weighted variants and standard benefit tables rather than the above median or below median variants. The study applied the MP-2020 mortality improvement scale to adjust the Pub-2010 tables from 2010 to the midpoint of the study period (2018). With the recommended rates, the A/E ratios are 1.0222 for females and 1.0444 for males.

Our analysis indicates that the recommended rates are generally 7% higher for males and 2% lower for females relative to the corresponding Pub-2010 tables with MP-2020 projection to 2018; these relationships are lower at ages below 75 and higher thereafter.

In conjunction with the base mortality table described above, the recommended assumption includes use of the MP-2020 mortality improvement scale to anticipate future improvements in longevity on a continuous (“generational”) basis. The 2021 Assumptions Report includes a good discussion about the rationale for considering future mortality improvements in pension valuations.

Comments - We agree that the appropriate Pub-2010 tables were referenced. The Pub-2010 family of tables are based on the most recent and robust study of public pension plan mortality experience. We concur with the selection of the Teachers benefit-weighted, standard benefit variant as being most appropriate for the System. We also agree that projecting generational improvements using MP-2020 is appropriate.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Disabled annuitant mortality

Experience - There were 287 female disabled annuitant deaths and 111 male disabled annuity deaths during the study period. The 2021 Assumptions Report characterizes these levels as generally lower than expected, with A/E ratios of 0.7321 for females and 0.7929 for males.

Methodology - The recommended disabled annuitant mortality tables were developed by analyzing disabled annuitant deaths by age and gender during the study period, in conjunction with the Pub-2010 tables for Teachers. The Pub-2010 tables used were the male and female disabled annuitant mortality tables, using the benefit-weighted rather than headcount-weighted variants. There are no standard / above median / below median variants for Teachers disabled annuitants. The study applied the MP-2020 mortality improvement scale to adjust the Pub-2010 tables from 2010 to the midpoint of the study period (2018). With the recommended rates, the A/E ratios are 1.1255 for females and 1.1100 for males.

Our analysis indicates that the recommended rates are generally 2-4% higher than the corresponding Pub-2010 tables with MP-2020 projection to 2018.

In conjunction with the base mortality table described above, the recommended assumption includes use of the MP-2020 mortality improvement scale to anticipate future improvements in longevity on a generational basis.

Comments - We agree that the appropriate Pub-2010 tables were referenced. The Pub-2010 family of tables are based on the most recent and robust study of public pension plan mortality experience. We concur with the selection of the Teachers benefit-weighted variant as being most appropriate for the System. We also agree that projecting generational improvements using MP-2020 is appropriate.

Survivor and beneficiary mortality

Experience - There were 1,323 female survivor and beneficiary deaths and 505 male survivor and beneficiary deaths during the study period. The 2021 Assumptions Report characterizes these levels as generally higher than expected, with A/E ratios of 1.0782 for females and 1.2347 for males.

Methodology - The recommended survivor and beneficiary mortality tables were developed by analyzing survivor and beneficiary deaths by age and gender during the study period, in conjunction with the Pub-2010 tables for General Employees. The Pub-2010 tables used were the male and female contingent annuitant mortality tables, using the benefit-weighted rather than headcount-weighted variants and the above median income variants. The study applied the MP-2020 mortality improvement scale to adjust the Pub-2010 tables from 2010 to the midpoint of the study period (2018). Note that the Pub-2010 contingent annuitant tables only begin at age 45, whereas the recommended rates start at age 15. With the recommended rates, the A/E ratios are 1.0000 for females and 1.1530 for males.

Our analysis indicates that the recommended rates are 5-10% higher than the corresponding Pub-2010 active member tables below age 45, are substantially lower at ages 45 through 75, and are 10-12% higher at age 95 and above.

In conjunction with the base mortality table described above, the recommended assumption includes use of the MP-2020 mortality improvement scale to anticipate future improvements in longevity on a generational basis.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

It is not clear from the 2021 Assumptions Report or the 2021 Actuarial Valuation Report if the survivor and beneficiary mortality tables are being used while the primary annuitant is still alive or only after the primary annuitant has died and the survivor / beneficiary is collecting benefits. The Retirement Plans Experience Committee of the Society of Actuaries recommends against using the Pub-2010 Contingent Annuitant table while the primary annuitant is still alive. **We recommend that the valuation report provide clarity with respect to this issue.**

Comments – **Since Pub-2010 includes separate tables for contingent annuitants, we believe these would be appropriate for use at ages 45 and higher, with the Pub-2010 active member tables used for ages below 45.** We agree that projecting generational improvements using MP-2020 is appropriate.

Service retirements

Experience – There were a total of 28,568 service retirements from Tiers 1-4 during the study period. Most of the service retirement experience is Tier 4 members. The study did not include service retirements for Tiers 5-6 due to the small number of service retirements from those Tiers. The service retirements were studied by gender and length of service:

Years of Service	Female	Male
5-19	3,881 out of 72,168	879 out of 14,321
20-29	9,257 out of 62,921	1,663 out of 15,368
30+	9,416 out of 28,872	3,472 out of 11,342

The 2021 Assumptions Report characterizes these levels as generally higher than expected, with retirements occurring at generally younger ages than expected. A/E ratios were not included in the report.

Methodology – The service retirement assumption was restructured; according to the 2021 Assumptions Report, the prior assumption had differentiated between members retiring when they were eligible for a reduced benefit versus an unreduced benefit. The new structure of the assumption differentiates between members that have different lengths of service (see the table above), as well as varying by age and gender within each of the service tranches. The Report asserts that the new structure better fits the actual retirement experience, with A/E ratios in the range of 95.44%-99.34%.

Because there is little service retirement experience for Tier 5-6 members, the service retirement rates that were developed based on Tier 4 experience are applied as well to Tier 5-6 members.

Comments – We agree that length of service, age, and gender are all factors in member's decisions about when to retire.

Tier 5 and Tier 6 members will be eligible for retirement at different age and service combinations than the Tier 1-4 members whose service retirement experience was studied, as detailed in the table below:

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Tier	Eligibility for Reduced Retirement	Eligibility for Unreduced Retirement
1	Varies	Varies
2-4	Age 55 with 5 years of service	Age 62 with 5 years of service or Age 55 with 30 years of service
5	Age 55 with 10 years of service	Age 62 with 10 years of service or Age 57 with 30 years of service
6	Age 55 with 10 years of service	Age 63 with 10 years of service

The Tier 1-4 member experience shows high numbers of retirements occurring at age 62 across all three service tranches and both genders, as well as high numbers of retirements occurring at age 55 with 30+ years of service for both genders. It seems unlikely that Tier 5 and Tier 6 members will have identical patterns of retirement spikes, given the differences in retirement eligibility. **We believe that it would be appropriate for the service retirement assumption for Tier 5 and Tier 6 to reflect these differences.**

NYSTRS responded to the above suggestion as follows:

For the 2025 Actuarial Assumptions study, Tier 5 retirees represented approximately 0.15% and Tier 6 represented approximately 0.14% for the retired member and beneficiary population. Without sufficient experience to set separate rates for Tiers 5 and 6, all tiers were included in the assumption setting and the recommended service retirement rates apply to all tiers. As retirement experience for Tiers 5 and 6 increases, the Office of the Actuary will review separate retirement assumptions by tier.

The June 30, 2021 Actuarial Valuation Report states that terminated vested members are all assumed to retire at age 55, or immediately if they are already older than 55. This is likely a conservative assumption, insofar as age 55 is generally the earliest retirement age and the early retirement reduction factors are modestly subsidized. **For the next experience study, we suggest that the retirement patterns for this population be studied separately.**

Disability retirements

Experience – Since there are few disability retirements, the 2021 Assumptions Report incorporated data from the ten-year period July 1, 2010 to June 30, 2020. Over this period, there were a total of 798 female disability retirements and 195 male disability retirements. The Report characterizes these levels as generally higher than expected, with A/E ratios of 1.3488 for females and 1.1212 for males.

Methodology – The recommended assumption was constructed based on the System's actual experience during the study period, without reference to an external published source. Rates of disability are based on gender and age. The recommended assumption produces A/E ratios of 0.9523 for females and 0.8784 for males.

Comments – We agree that it is appropriate for disability rates to be a function of age and gender. The recommended assumption appears to fit the current study period experience moderately well.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Withdrawal

Experience - There were 29,809 female terminations and 8,736 male terminations during the study period. The 2021 Assumptions Report characterizes these levels as generally lower than expected, with A/E ratios of 0.8329 for females and 0.8930 for males.

Methodology - The recommended assumption was constructed based on the System's actual experience during the study period, without reference to an external published source. Withdrawal rates are based on gender and length of service; this is a departure from the prior assumption, which also reflected age. The rates for service years 0-4 were based exactly on experience, whereas the rates for service years 5+ were smoothed in quinquennial service groups. The recommended assumption produces A/E ratios of 0.9996 for females and 0.9947 for males.

Comments - We agree that it is appropriate for withdrawal rates to be a function of service and gender. The recommended assumption appears to fit the current study period experience very well, but does not appear to reflect any of the experience from the prior study. Actuaries commonly put some weight on experience observed from prior periods, particularly when no external published source is referenced in the development of updated assumptions. **We suggest that the next experience study reflect both recent and prior experience.**

NYSTRS responded to the above suggestion as follows:

The Office of the Actuary uses statistical methods to fit assumptions to experience. The period of experience is typically a five year period, but it is adjusted due to experience or atypical events. Prior periods are only considered if deemed statistically relevant to predict future expectations.

Salary scale

Experience – Salary increases during the study period were slightly higher than expected, with an overall A/E ratio of 1.004.

Methodology – The recommended assumption was constructed by blending the current period experience with the prior assumption on a 50/50 basis. The 2021 Assumptions Report discusses several external factors that have impacted teacher salaries before, during, and after the study period (the global financial crisis leading to budget difficulties, the catch-up raises in subsequent years, and the impact of COVID) as the basis for this blended approach. The recommended salary growth rates are based on length of service only, with rates above 10% in the first year or two of service, dropping down to under 6% by year 4, under 4% by year 13, and under 2% by year 34. The recommended assumption produces an A/E ratio of 1.0021.

Comments – The rationale for blending the experience during the study period with the experience from the prior study is reasonable. It is reasonable to use salary growth rates that reflect length of service and not age or gender. Note that for service beyond 27 years, the recommended assumption is lower than the 2.4% inflation assumption. While this outcome is supported by the study data, wage growth is typically equal to or somewhat higher than price inflation, and **we would therefore expect to see the salary growth assumption at the later years to be either at or a bit higher than the inflation assumption.** This anomaly may be possible over a shorter period but it would seem unsustainable for the members of NYSTRS to realize real wage losses (cost inflation in excess of wage inflation) over the long term and continue to work in the same position.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

NYSTRS responded to the above suggestion as follows:

The Office of the Actuary uses statistical methods to fit assumptions to experience. The rates are graduated, or smoothed, using the power smoothing method. Salary experience supports that annual salary increases for members with particularly long service continue to be lower than inflation. The Office of the Actuary monitors this assumption each year.

Interest rate

The interest rate assumption is one of the primary determinants in the calculation of the expected cost of NYSTRS's benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculation of the present value of future benefits and the present value of future salaries, and hence the normal cost rate.

Experience – Actual investment returns during the study period should not have a bearing on the selection of the interest rate assumption, which should rather be based on a forward-looking analysis of expected future returns for the current target asset allocation. The target asset allocation, as reported in the 2021 Assumptions Report, is shown below:

Asset Class	Target Allocation
Domestic Equity	33%
International Equity	16%
Global Equity	4%
Private Equity	8%
Real Estate Equity	11%
Private Debt	2%
Domestic Fixed Income	16%
High Yield Bonds	1%
Global Bonds	2%
Real Estate Debt	6%
Cash Equivalents	1%

Methodology – Both the System's investment consultant, Callan Associates, and actuarial consulting firm Cheiron provided analysis.

Callan prepared both 20- and 30-year projections of the expected returns of the System's target asset allocation, based on their Capital Market Assumptions and inflation assumption. Capital Market Assumptions include assumptions for expected real returns and the variability of those returns for each of the asset classes in which the System is invested based on the current target asset allocation, as well as the correlation of returns among different asset classes. These assumptions are not based on historical returns, but instead are based on a forward-looking capital market economic model. Using the "building block" approach, an assumption about future inflation levels is

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

added to the expected real return to arrive at the expected nominal return for the portfolio, and the interest rate assumption is set based on this result.

Based on the target allocation and Callan's investment return assumptions for each of the asset classes, their expected geometric annual return was 6.8% over a 20-year horizon and 7.3% over a 30-year horizon. We agree that the geometric annual return is the appropriate measure. Cheiron also studied the expected return based on the Horizon Actuarial Services 2021 Survey of Capital Market Assumptions 20-year horizon and determined a 50th percentile geometric annual return of 6.7%. Based on these results, the 2021 Assumptions Report recommended a reduction in the interest rate assumption from 7.10% to 6.95%.

Note that Callan's analysis, according to Cheiron's report, included an inflation assumption of 2.0%. This is lower than the recommended inflation assumption of 2.4% developed elsewhere in the 2021 Assumptions Report. An interest rate assumption of 6.95% coupled with an inflation assumption of 2.4% indicates an expected real return of 4.44% [1.0695 ÷ 1.024 = 1.0444]

Comments - We performed a similar analysis using Milliman's June 30, 2021 Capital Market Assumptions. Our analysis shows a 30-year expected median geometric real return of 4.27%, which is close to the recommended real return of 4.44%. Coupled with the 2.4% inflation assumption (discussed below), our analysis results in an expected annual geometric return of 6.77% [1.0427 x 1.024 = 1.0677]. We therefore find the 6.95% interest rate assumption to be somewhat high but reasonable for funding and financial reporting purposes.

Inflation

Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for the interest rate, future cost of living adjustments, and salary growth.

There is expected to be a long-term relationship between inflation and the interest rate assumption. The basic principle is that investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

Experience - Actual inflation levels during the study period should not have a bearing on the selection of the inflation assumption, which should rather be based on a forward-looking analysis. Actuaries typically look at external sources of information with respect to expected future levels of inflation.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Methodology – The recommended increase in the inflation assumption from 2.2% to 2.4% was based on the long-term inflation assumptions from several sources:

Source	Long-Term Inflation Assumption
Social Security OASDI 2021 Trustees' Report	2.4%
Callan Associates	2.0%
Horizon Survey	2.2%
August 2021 Federal Reserve Bank of New York Survey of Consumer Expectations	4.0%

Comments – We agree that an inflation assumption of 2.4% is reasonable.

Cost of Living Adjustments (COLA)

Annual increases are provided to the first $18,000 of annual benefit based on 50% of the annual increase in CPI; the resulting COLA cannot be more than 3% nor less than 1%.

Experience and Methodology – Over the 21-year period during which the COLA has been provided, the study found that the average COLA over the entire period was 1.27% and the average increase over the last 5 years was 1.16%. On this basis, the recommendation was to keep the COLA assumption unchanged at 1.3%.

Comments – Neither the 2021 Assumptions Report nor the June 30, 2021 actuarial valuation report specify which month is used to determine COLAs (e.g., the change in CPI from August of the prior year to August of the current year, or some other calendar month). Likewise, the reports do not identify the specific CPI metric used. Many systems use the national CPI-U, but some systems use a local or regional CPI-U, CPI-W, or some other CPI metric. **We recommend that the report specify the details of the metrics used to determine the COLA.** Using CPI-U with August-to-August increases, we were able to replicate the 2021 Assumptions Report results reasonably well, and we agree that a COLA assumption of 1.3% is reasonable.

Tier 3 Benefits

Page 79 of the June 30, 2021 Actuarial Valuation Report notes that Tier 3 members are assumed to receive the Tier 4 benefit at retirement, "as that is generally always the larger benefit". **Since this is an actuarial assumption, it would be helpful to note if this assumption has been studied recently.**

Review of Trends in Gains / Losses

The financial reporting disclosures required per GASB Statement No. 67 include determining the annual impact of System experience that is different than expected based on the actuarial assumptions. For this purpose, gains or losses are measured using the Total Pension Obligation, which is the Accrued Liability as measured using the Entry Age Normal cost method. As reported in the June 30, 2021 GASB 67 report, the System's experience gains / losses for the past nine FYs were:

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

FYE June 30	Experience (gains) / losses ($ 000s)
2013	$(128,194)
2014	(181,834)
2015	(161,043)
2016	(111,652)
2017	727,895
2018	964,258
2019	753,802
2020	1,169,842
2021	558,905

The recent pattern of five straight years with experience losses indicates that the actuarial assumptions in use for the valuations performed on June 30, 2016 through June 30, 2020 were understating the System's accrued liability. This is consistent with the analysis contained in the 2021 Assumptions Report, which indicated that the recommended actuarial assumptions would result in an increase in liability.

Conclusions

The ultimate purpose of any actuarial experience study is to provide a basis for setting the actuarial assumptions for future valuations. We found that the methodologies used to prepare the experience study were generally appropriate and that the assumptions developed generally comply with the guidance provided by ASOPs 27 and 35. We note the following areas where we suggest consideration of modifications:

- Revision of the valuation report to explicitly state the application of generational projection of mortality improvements for the active member mortality assumption.
- Use of the Teachers variant of Pub-2010, rather than the General variant, for survivor and beneficiary mortality, and clarification or modification, as necessary, of the use of such tables while the primary annuitant is alive.
- Modification of the service retirement rates for Tier 5 and Tier 6 to reflect the specific age and service requirements for retirement eligibility, relative to those for Tier 4.

We have also offered a few suggestions for the contents of the Actuarial Valuation Report and some considerations for future experience studies.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task f Review of Actuarial Cost Method and Actuarial Asset Valuation Method

Actuarial Cost Method

The purpose of an actuarial cost method is to allocate the cost of future benefits to specific time periods, typically during a member's projected working career. As explained in **Pension Mathematics for Actuaries**, A.W. Anderson, second edition, 1990, pages 5 and 6:

> "The painful lesson which has been learned over and over again in the last century by various types of employers – first private employers, and later public employers – is that the cost of a pension plan must be recognized during the working lifetimes of the employees who are ultimately going to receive pensions, preferably by actually funding amounts sufficient to provide completely for each employee's life annuity at the time of retirement."

> "This is where actuaries come into the picture, … The actuary can … assign to each fiscal year a portion of the present value of future benefit payments in such a way as generally to accrue costs over the working lifetimes of employees. Any scheme for making such an assignment of costs is called an actuarial cost method – which we shall henceforth refer to simply as a 'cost method'."

An actuarial cost method should satisfy the guidelines of ASOP 4, **Measuring Pension Obligations and Determining Pension Plan Costs or Contributions**. The Normal Cost, or cost attributed to each year of service, should be reasonably related to the manner in which benefits accrue, or be reasonably related to compensation or length of service. The period over which Normal Costs are allocated should begin no earlier than each participant's hire date and extend no later than the last assumed retirement date. If all assumptions are realized, then a reasonable cost method should result in the full funding of each benefit by the expected retirement date. An appropriate cost method for a pay-related benefit structure should reflect the expected compensation at the anticipated retirement date. Expenses should be considered when determining the contribution amount either by a load to the Normal Cost or an adjustment to the investment return assumption.

The GASB 67/68 financial reporting standards require plans to disclose pension liabilities calculated using the Entry Age cost method. However, GASB 67/68 apply only to financial reporting, not to funding calculations. Retirement systems are free to select other actuarial cost methods for purposes of determining funding contribution amounts.

The actuarial cost method used by NYSTRS, as described in Appendix 17 of the 2021 Actuarial Valuation Report, is the Aggregate Cost Method, which is mandated by Section 517 of the New York State Education Law. Under the Aggregate Cost Method, the annual contribution is calculated by multiplying payroll by a Normal Rate. The Normal Rate is defined as the level percentage of pay that is necessary to fund the difference between the present value of all future benefits for current members and the actuarial value of assets over the future working lifetime of active plan members. When actual experience is better or worse than expected, the Normal Rate in subsequent years will go down or up, respectively.

The calculation of the Normal Rate is found in Appendix 5 of the June 30, 2021 Actuarial Valuation Report. Functionally, the determination of the Normal Rate starts by calculating the present value of all future benefits expected to be received by all current plan members. Note that this quantity is referred to in Appendix 5 as "Liability"; this is a generic term that could be interpreted to mean the present value of accrued benefits, the Total Pension Obligation mandated by GASB 67/68 financial reporting, or any one of a number of other metrics. We

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

recommend that Appendix 5 use the specific term Actuarial Present Value of Future Benefits, to be consistent with the term used in Appendix 3.

Once the Present Value of Future Benefits has been determined, the Present Value of Future Contributions is calculated by subtracting the Actuarial Value of Assets, receivable employer contributions for FY 2022-23, and the present value of future Tier 5 and Tier 6 member contributions. Each of these subtractive items is discussed in more detail below.

The Actuarial Value of Assets is calculated as:

a. The market value of assets on the valuation date, excluding employes and member contributions for FY 2020-21 that were received on September 15, October 15, and November 15 of 2021 (these are excluded because they are added in below on a discounted basis).

b. **Less** the market values of the Expense Fund and the Group Life Insurance Fund, since expenses and Group Life Insurance benefits are funded via a separate employer Rate. **Note that the market value of the Excess Benefit Plan Fund should also be subtracted**, but as this is a small dollar value, this omission is immaterial, but may grow over time.

c. **Plus** employer and member contributions for FY 2020-21 that were received on September 15, October 15, and November 15 of 2021, discounted by 3½ months of interest to reflect the average time lag between the date of payment and the valuation date.

d. **Plus** a smoothing adjustment that recognizes market gains or losses non-asymptotically over a five-year period (see below for more analysis of the smoothing mechanism).

Employer contributions based on the Normal Rate for FY 2021-22 will be received by the System in the fall of FY 2022-23. The June 30, 2021 valuation determines the Normal Rate for FY 2022-23, which will be received in the fall of FY 2023-24. It is appropriate to exclude the FY 2021-22 receivable contributions on a discounted basis when determining the Normal Rate for FY 2022-23. **Note that the formula on page 19 describing the discounting is incorrect; the exponent should be negative (that is, the numerical result is correct, but the text of the formula is incorrect).**

Tier 5 and 6 members make contributions towards the cost of their NYSTRS pension benefits. The Normal Rate determines the contributions to be made by **employers**, so it is appropriate to exclude the present value of future member contributions in order to determine the present value of future employer contributions.

The Normal Rate is determined by spreading the present value of future contributions payable by employers over the present value of future member salaries:

Normal Rate = Present Value of Future Contributions ÷ Present Value of Future Salaries

As with the discussion above with respect to the receivable employer contributions for FY 2022-23, the Present Value of Future Salaries similarly and appropriately excludes the discounted value of FY 2021-22 member salaries.

Three additional employer contribution rates are added to the Normal Rate to fund specific items:

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

1. The **Expense Rate** is a figure determined during the budget process sufficient to fund the administrative cost of the System. It is typical for administrative expenses to be funded in this manner, based on an estimate of the level of expenses expected to be incurred in the FY.
2. The **Group Life Insurance Rate** is determined as the percentage of salaries needed to fund the associated benefit payments (the first $50,000 of member death benefits) that are expected to be paid in FY 2023-24. This represents a "term funding" approach, where each year's benefits are funded in that year and there is no prefunding of expected future benefits.
3. The **Excess Benefit Pay Rate** is similarly determined as the percentage of salaries need to fund the associated benefit payments (pension benefits in excess of IRC Section 415 limits) that are expected to be paid in FY 2023-24. This represents a "term funding" approach, where each year's benefits are funded in that year and there is no prefunding of expected future benefits.

For these three items, to the extent employer contributions received for a fiscal year are greater or less than the actual payments made in that year, the applicable Fund is increased or decreased by the difference. As of June 30, 2021, the three funds had accumulated the following market values:

Expense Fund	$62,806,524
Group Life Insurance Fund	453,669,551
Excess Benefit Plan Fund	2,847,550

Appendix 5 contains some discussion and analysis with respect to the Expense Fund Rate, but **more information on how the Group Life Insurance Rate and the Excess Benefit Pay Rate were set would be helpful to the reader**.

NYSTRS responded to the above suggestion as follows:

The valuation uses the total monthly benefit in determining liabilities; therefore, the associated liability for the Excess Benefit portion is included with the regular retirement liability. As a result, the market value of the Excess Benefit Plan Fund is not subtracted in the Actuarial Value of Assets calculation. This approach ensures that the associated benefits are not overstated.

Conclusion

We believe the actuarial cost method used to calculate the NYSTRS contribution rate is reasonable and consistent with ASOP 4. The Aggregate Cost Method is categorized as "Acceptable" by the CCA White Paper.

The Aggregate Cost Method provides excellent "demographic matching," which is to say benefits are funded over the working lifetimes of the members receiving them. It is also excellent at avoiding "agency risk" issues, which means use of the Aggregate Cost Method makes it very difficult to push the cost of benefits for current members onto future generations. The Aggregate Cost Method's primary shortcoming is that it passes all gains and losses through to the Normal Rate, which means they are financed over the comparatively short, although very reasonable, period of the active members' projected remaining working lifetimes. The downside of this is that it can decrease the stability of short-term costs.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Asset Smoothing Method

Asset smoothing is used to reduce the volatility of the actuarial value of assets in response to short-term fluctuations in financial markets while maintaining the overall movement of the System's market value of assets. The actuarial value of assets is used in determining the funding contribution requirement; a less volatile actuarial value of assets generally contributes to less variability in the funding contribution requirement.

An appropriate asset smoothing method should satisfy the guidelines of ASOP 44, **Selection and Use of Asset Valuation Methods for Pension Valuations.** The guidelines specify that the actuarial value of assets should converge to market value within a reasonably short period of time and that the actuarial value of assets has a high likelihood of staying within a sufficiently small range of the market value. A reasonable asset smoothing method should also be applied consistently regardless of market performance. That is, the actuarial value of assets should not be reset to market whenever the market value is greater than the actuarial value, and the same smoothing mechanism should be applied to both market gains and market losses.

Asset smoothing methods consist of three components:

- The **recognition period**, which is the number of years over which market gains or losses are recognized; recognition periods are typically 3 to 5 years long. A longer recognition period results in potentially more dampening of market gains or losses, but can also result in the actuarial value of assets diverging considerably from the market value in periods of prolonged or unusually large market climbs or declines. A 5 year smoothing method is the most commonly used method among large public retirement systems. According to the FY 2021 Public Fund Survey conducted by the National Association of State Retirement Administrators, two-thirds of public plans surveyed used 5 year smoothing. The next most common recognition period for public plans was 4 years, which was used by 17% of plans surveyed.
- The **recognition method**, which refers to how each year's market gains or losses are recognized over the smoothing period. Recognition methods are typically either asymptotic (a fixed percentage of any previously unrecognized market gains or losses is recognized each year) or non-asymptotic (a fixed percentage of each year's market gains or losses is recognized each year). To illustrate with a 5 year recognition period and a January 2021 valuation date, an asymptotic approach would recognize 20% of the 2020 market gain or loss for the 2021 valuation, 20% x (1-20%) = 16% of the 2020 market gain or loss for the 2022 valuation, and a similarly declining percentage for succeeding valuations; a non-asymptotic approach would recognize 20% of the 2020 market gain or loss for each of the 2021 through 2025 valuations.
- A **corridor** around the market value of assets that constrains the actuarial value of assets to stay within the corridor. With a 20% corridor, for example, the actuarial value of assets could not be greater than 120% of the market value or less than 80% of the market value. Corridors are typically 15% to 25%, with 20% being very common. The corridor mechanism prevents the actuarial value of assets from diverging too much from the market value. The potential downside of using a corridor is that when it applies it disrupts the smoothing process, as any market gains or losses outside of the corridor are immediately recognized rather than recognized over a period of years.

These components cannot be viewed in isolation from one another. For instance, a longer recognition period is often paired with a corridor to prevent the actuarial value from diverging considerably from market value, whereas a shorter recognition period might not warrant any corridor.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

The CCA White Paper includes the following policy objectives and considerations for an asset smoothing method:

- All components of the asset method are specified: the return that is subject to smoothing, the smoothing period, the corridor, and the method of recognizing deferred amounts.
- It is unbiased relative to market value.
- It does not selectively reset to market when market value is greater than actuarial value.
- Realized and unrealized gains and losses are treated the same way.
- It is consistent with the ASOP 44 concept of being likely to return to market in a reasonable period and likely to stay within a reasonable range of market value.

The method used by NYSTRS to determine the actuarial value of assets is described in Appendix 17 of the 2021 actuarial valuation report. Although the terminology outlined above is not used in the report, the NYSTRS method uses a **5 year** recognition period, a **non-asymptotic** recognition method, and **no** corridor. This combination of characteristics falls into the "Acceptable Practices" category of the CCA White Paper and we believe that its use is in compliance with ASOP 44.

We independently calculated the actuarial value of assets based on financial information provided in the 2021 actuarial valuation report. Verifying the dollar amounts of the inputs was beyond the scope of this review and no source data was received in order to do so.

Note that the Group Life Insurance Fund and the Excess Benefit Plan Fund are held at market value; given the small size of these funds, this has an immaterial impact on the development of the contribution rate.

The market value of System assets is adjusted to reflect discounted accrued contributions from employers and members that relate to prior fiscal years but are received after the valuation date. We believe that the discounting is appropriate, and we were able to verify the discounting calculations.

We found some of the presentation of asset-related information in the valuation report to be difficult to follow:

- The market value of assets shown on page 11 (reconciliation of the market value of assets) does not match the starting market value of assets at the top of page 19, because the former includes receivable employer and member contributions and the latter does not; it would be helpful to explicitly show how the two numbers are connected to one another. For instance, the reconciliation on page 11 could be expanded to have separate columns showing the reconciliation of assets on a cash basis, the employer receivables, the member receivables, and the resulting accrual-basis total.
- It would be helpful to provide more information with respect to the receivable contributions, for instance in a tabular presentation of dates and amounts.
- No reconciliation of the Expense Fund is provided, nor is a source provided for the balance of the Expense Fund shown on page 19.
- On page 22, the Estimated GLIF Balance is referenced; this should be Estimated Excess Benefit Plan Balance.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Conclusion

We believe the use of an asset smoothing method is appropriate, and we generally recommend its use to our clients. We believe that the specific method used by NYSTRS is a reasonable approach to asset smoothing, is in compliance with ASOP 44, and falls into the "Acceptable Practices" category of the CCA White Paper.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task g Review of the Funding Contribution Requirement Calculations and Actuarial Valuation Report

Funding Contribution Requirement Calculations

Appendix 5 of the June 30, 2021 Actuarial Valuation Report computes the employer contribution rate for FY 2022-23. The mechanics of the calculation are discussed in more detail above under Task f. We generally agreed that the calculations were correct and appropriate, but **note the following**:

- We suggest that Appendix 5 use the term Actuarial Present Value of Future Benefits in place of the more generic term Liabilities, to be more precise and to be consistent with the terminology used in Appendix 3.
- The market value of the Excess Benefit Plan Fund should be subtracted from the Assets for Valuation.
- The formula on page 19 describing the discounting of the receivable employer contributions is incorrect; the exponent should be negative (that is, the numerical result is correct, but the text of the formula is incorrect).
- More substantive detail with respect to how the Group Life Insurance Rate and the Excess Benefit Plan Rate were set would be helpful.
- The market value of assets shown on page 11 (reconciliation of the market value of assets) does not match the starting market value of assets at the top of page 19, because the former includes receivable employer and member contributions and the latter does not; it would be helpful to explicitly show how the two numbers are connected to one another. For instance, the reconciliation on page 11 could be expanded to have separate columns showing the reconciliation of assets on a cash basis, the employer receivables, the member receivables, and the resulting accrual-basis total.
- It would be helpful to provide more information with respect to the receivable contributions, for instance in a tabular presentation of dates and amounts.
- No reconciliation of the Expense Fund is provided, nor is a source provided for the balance of the Expense Fund shown on page 19.
- On page 22, the Estimated GLIF Balance is referenced; this should be Estimated Excess Benefit Plan Balance.

Conclusion

Based on the Present Value of Future Benefits, Present Value of Future Salaries, and Actuarial Value of Assets contained in the 2021 Actuarial Valuation Report, we were able to match the calculation of the employer contribution rate.

Actuarial Valuation Report

The purpose of an actuarial valuation report is to summarize and clearly communicate the results, methods and assumptions, and conclusions of calculations which support actuarial statements of opinion. Due to the technical and complex nature of the actuarial models which need to be addressed in an actuarial valuation report, clear communication can often be challenging.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

An actuarial valuation report should satisfy the guidelines of ASOP 41, **Actuarial Communications**. Each actuarial valuation report should state the conclusions or findings and describe the data, assumptions, methods, and procedures used to arrive at the stated findings. The information contained in the actuarial valuation report should be stated with "sufficient clarity" that another qualified actuary with expertise in the same practice area could make an objective appraisal of the reasonableness of the work presented in the report (ASOP 41, Section 3.2). In addition, a number of other ASOPs require the actuary to provide certain information in their reports:

- ASOP 4: Measuring Pension Obligations and Determining Pension Plan Costs or Contributions (note that a recent revision to ASOP 4 will require additional report disclosures starting with the June 30, 2023 valuation report)
- ASOP 23: Data Quality
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 41: Actuarial Communications
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations
- ASOP 51: Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
- ASOP 56: Modeling

NYSTRS Actuarial Valuation Report

ASOP 4: This ASOP provides guidance to actuaries when preparing pension valuations, as well as certain other Statements of Actuarial Opinion. The ASOP requires the actuary to include a number of items in the actuarial report, including the purpose of the measurement, a summary of the plan provisions, information about the member data, a summary of the actuarial methods and assumptions, as well as certain additional information. The June 30, 2021 Actuarial Valuation Report included all of the required information; however, we note the following:

Summary of Plan Provisions - Appendix 19 of the June 30, 2021 Actuarial Valuation Report provides a robust summary of the applicable plan provisions, but:

- **The COLA section should specify which month of CPI is used to determine COLAs and which specific CPI metric is used for this purpose.**

Summary of Actuarial Assumptions - Appendix 18 of the June 30, 2021 Actuarial Valuation Report provides a detailed summary of the actuarial assumptions, but we note:

- **The timing of decrements should be disclosed.**
- **There is no indication of how the active member mortality rates are split between in-service and non-service deaths, and whether projection is included in the mortality assumption.**
- **There should be a discussion of any assumptions that were made to reflect any missing or incomplete member data.**

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

ASOP 23: This ASOP provides guidance to actuaries when selecting, reviewing, using, or relying on data supplied by others, when performing actuarial services. The ASOP requires the actuary to disclose the source of the data, whether the actuary reviewed the data, and to indicate any concerns about the data and if there are any limitations on the actuarial work product as a result of those concerns.

The Certification section of the June 30, 2021 Actuarial Valuation Report indicates the source of the data and notes that while the actuary checked for year to year consistency, they did not audit the data. This approach is consistent with the requirements of the ASOP and general actuarial practice.

ASOP 27: This ASOP provides guidance to actuaries when selecting economic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions. As discussed above under Task e, the economic assumptions selected appear to be reasonable and appropriate. In addition, the June 30, 2021 Actuarial Valuation Report contains a description of the assumptions used, and the 2021 Assumptions Report referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation report is in compliance with ASOP 27. Please refer to Task e above for our specific comments on the economic assumptions.

ASOP 35: This ASOP provides guidance to actuaries when selecting demographic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions. As discussed above under Task e, the demographic assumptions selected appear to be reasonable and appropriate. In addition, the June 30, 2021 Actuarial Valuation Report contains a description of the assumptions used, and the 2021 Assumptions Report referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation report is largely in compliance with ASOP 35. However:

- **The description of the mortality assumptions should indicate whether or not a margin for future longevity improvements has been included (ASOP 35, Section 4.1.1).**
- **The use of beneficiary and survivor mortality prior to the death of the primary annuitant should be clarified.**

Please refer to Task e above for our comments on the demographic assumptions.

ASOP 41: This ASOP provides guidance to actuaries when issuing actuarial communications. The ASOP requires actuaries to include various disclosure items in the actuarial report including the intended user, scope, purpose, actuarial qualifications. The June 30, 2021 Actuarial Valuation Report included the required information. Therefore, the valuation report is in compliance with ASOP 41.

ASOP 44: This ASOP provides guidance to actuaries when selecting an asset valuation method for an actuarial valuation. As discussed above under Task f, the asset smoothing method used appears to be reasonable and appropriate. Therefore, the valuation report is in compliance with ASOP 44. Please refer to Task f above for our specific comments on the asset smoothing method.

ASOP 51: This ASOP provides guidance to actuaries on the assessment and disclosure of the risks that future measurements may differ from that which is expected. Appendix 14 of the June 30, 2021 Actuarial Valuation Report provides a robust presentation of risk in accordance with ASOP 51, including a detailed discussion of the risks that

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

can impact the System's future financial condition. The Appendix presents several different System maturity measurements including detailed historical information, as well as sensitivity analysis around the key actuarial assumptions. Therefore, the report is in compliance with ASOP 51.

ASOP 56: This ASOP provides guidance to actuaries when performing actuarial services that require the use of actuarial models. The ASOP requires certain disclosures including the intended purpose of the model, any material limitations or known weaknesses of the model, and the extent of any reliance on a third-party model. Appendix 18 of the June 30, 2021 Actuarial Valuation Report includes information and discussion about the actuarial valuation software used to calculate liabilities. Therefore, the report is in compliance with ASOP 56.

Conclusion

The June 30, 2021 Actuarial Valuation Report is substantially complaint with all applicable ASOPs; we have noted just a few areas where modifications are necessary for full compliance or should be considered for clarity and completeness.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task h Review of GASB 67/68 Calculations and Report

Financial Reporting Per GASB 67/68

GASB Statement No. 67 (Financial Reporting for Pension Plans) and GASB Statement No. 68 (Accounting and Financial Reporting for Pensions) set for the information that must be disclosed in financial statements by governmental pension plans and governmental plan sponsors, respectively. NYSTRS is a governmental pension plan which provides pension benefits to the employees of hundreds of individual employers. NYSTRS must therefore provide information so that it may comply with GASB 67, as well as information that the participating employers need so that they may comply with GASB 68.

We reviewed the June 30, 2021 GASB 67 disclosure letter dated October 14, 2021 that was prepared by NYSTRS. We did not receive or review information that NYSTRS might develop and provide to participating employers to satisfy their own GASB 68 reporting needs.

Observations

We were able to verify the reasonableness of all calculated items, and we found the GASB 67 disclosure letter to be clear and complete.

Pages 4-7 of the disclosure letter, titled **Valuation on a page**, include a projection of certain metrics based on the GASB-specified methodology for determining if a depletion date exists. We **believe that performing this projection is not necessary** if there is (a) a history of participating employers paying 100% of the Actuarially Determined Contribution, and (b) the Actuarially Determined Contribution has been determined using sound actuarial methods and assumptions that are designed to bring or keep the plan at or above a fully funded position. We believe that NYSTRS meets both of these criteria. We were able to reasonably match this projection, although we were puzzled in some instances where the Group Life Insurance Plan and/or the Excess Benefit Plan were variously included or not included in some columns.

Conclusion

The June 30, 2021 GASB 67 disclosure letter is substantially compliant with GASB Statement No. 67 and all applicable ASOPs.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task i Review of the System's Financial Soundness

Financial Soundness

The financial soundness of a plan is measured by comparing the plan's current assets to the plan's accrued liability.

The Aggregate Cost Method used by NYSTRS to determine contribution amounts does not involve the calculation of an accrued liability for the System, however Appendix 4 of the June 30, 2021 Actuarial Valuation Report provides historical funded status information comparing the System's assets to its accrued liabilities. Note that page 6 of the report specifies that the Entry Age Normal cost method was used to determine the accrued liability figures; **it would be helpful to state this in Appendix 17 (Actuarial Valuation Information) as well**. The following funded status information was disclosed as of June 30, 2021:

$000,000s	
Accrued Liability	$131,077.4
Market Value of Assets	148,148.5
Funded Ratio	113.0%

In addition, GASB 67/68 requires disclosure of accrued liabilities determined using the Entry Age Normal cost method. The following funded status information was disclosed in the GASB 67 report for FYE June 30, 2021 dated October 14, 2021:

$000s	
Total Pension Liability (i.e. Entry Age Normal Accrued Liability)	$130,819,415
Fiduciary Net Position (i.e. Market Value of Assets)	148,148,457
Funded Ratio	113.2%

According to the **2021 Milliman Public Pension Funding Study**, the aggregate funded ratio for the 100 largest public pension plans in the United States was estimated to be 85.0% as of June 30, 2021, as measured using the Entry Age Normal cost method. NYSTRS was well above this level and there are only a handful of plans in this universe that have higher funded ratios for GASB 67/68 financial reporting purposes.

Conclusion

As of June 30, 2021, NYSTRS was well-funded. The Aggregate Cost Method is designed to fund benefits over the future working lifetimes of current active members, ensuring that there will be funds on hand to pay benefits for members. In our opinion, if the State maintains the current contribution and funding policy, we believe the System is in a financially sound position.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task j Review of Corrections Procedure for Over / Underpayments

Corrections Procedure for Over/ Underpayments

The purpose of this review is to evaluate the System's corrections procedure and the process for returning or collecting benefit payments when an error is identified in a member's retirement calculation. We compiled the information below based on our discussions with TRS staff as well as a review of their Administrative Policy Manual dated June 21, 2023 and their summary file named **Retirement File Processing.docx**.

Error Identification Process

Based on the spreadsheet that DFS provided to us named **NYSTRS Under or Over Payments Fab 2022 Thru Nov 2022 – Deidentified.xlsx**, a total of 75 errors were identified and correction procedures were implemented. A summary of these errors is shown below:

	Overpayments	Underpayments	Total
Count	51	24	75
Total amount	$(231,835.52)	$49,563.61	$(182,271.91)
Average amount	(4,545.79)	2,065.15	(2,430.29)

The errors were categorized by type of calculation as follows:

Type of Calculation	Error Count
Automated	41
Manual	29
Manual / Automated	5
Total	75

And the types of errors that were identified were:

Type of Error	Error Count
Service Credit	30
Article 19	0
Final Average Salary	40
Pension Factor	1
Disability Earnings	0
Service Credit / Final Average Salary	4
Total	75

We did not undertake an independent verification of this information.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

NYSTRS established a new Quality Assurance (QA) department, which has primary responsibility for reviewing benefit calculations to assure adherence to the established procedures of the Member Relations Division.

On a monthly basis, QA now reviews 10% of all finalized service retirement calculations, and pre-audits 100% of all De Minimis Lump Sum files before payment is made. Additionally, they review benefit calculations identified on the "mismatch report" and all Tier 1 benefits paid. Calculations for classes of retirees with specific features in which there was concern that an error may have been made have been reviewed and corrections made where necessary. NYSTRS has no plans to re-open the files of all 178,000+ retirees and beneficiaries to check for errors.

When an error has been identified, numerous queries are created and analyzed to determine if there are other similarly situated members that may also be impacted. If an existing coding or procedure needs to be changed once an error is discovered, it is corrected or amended as soon as possible. The summary file the System provided documents some examples of processing changes that have already been implemented:

- The Article 19 flag in PS was locked down. Now only staff who perform transfer-ins have rights to update this flag.
- Any override to a benefit calculation is reviewed each month by the Benefits Floor Supervisor, the Assistant Manager of Benefits, and the Deputy Chief Customer officer.
- Option factors and the date of retirement for calcs are all locked down now and cannot be altered, including the date of retirement on the calc creation page.
- Service retirement created a thorough checklist to be used on each file at initial review and another checklist to be used in the final review of the file.
- QA created an independent checklist to ensure they review each file consistently.
- Enhanced service credit edits and warnings messages on the monthly employer reports were implemented in 2008, and we continue to analyze the effectiveness of each edit. When reporting errors are discovered, corrections for all impacted members are requested from the employer.
- QA, Benefits, MES and MR Deputy meeting monthly to discuss any errors discovered. The causes of the errors are reviewed, training issues and areas for improvement are identified.
- We have expanded our district training efforts and district training sessions are scheduled with all new school district employer reporting contacts, as well as being available for seasoned district staff.

Corrections Procedure

If an error is identified and a member is due an additional payment, that member will receive funds as soon as possible and generally within 30 days.

The procedure for addressing overpayment corrections is laid out in the Retiree Accounts Receivables section of the Administrative Policy Manual:

> Amounts due from retirees will be collected as a deduction from their monthly retirement benefit; this is known as a goal recovery. The rate of collection for overpayments, except those related to exceeding earnings after retirement limits, will generally be 10% of the gross corrected monthly benefit until paid in full. Alternatively, a member can opt for 24 equal payments until paid in full or a lump sum payment of the full balance due. If the

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

retiree passes away before the amount due to the System is recovered, the amount due will be collected as a deceased retiree accounts receivable. For overpayments related to exceeding earnings after retirement limits, the rates of collection will be:

- Chapter 212 Earnings after Retirement: generally up to 50% of the monthly benefit; however may be greater than 50% so as not to exceed a recovery period of six months.
- Chapter 211 Earnings after Retirement: up to 100% of the monthly benefit until the balance due is recovered, as required by Chapter 211.3 of the Education Law.

Deviations from these collections amounts and periods must be approved by the management of the Finance and Benefits departments.

Conclusion

We have reviewed the error identification process and corrections procedures and we believe them to be sound methods for ensuring that NYSTRS is largely paying the correct benefit amounts to its members. The improvements to the procedures and controls that have been made to date should reduce the risk of calculation errors going forward. **We encourage continued rigorous auditing and sampling efforts to identify systematic data and/or calculation errors that have not yet come to light. We believe that the process of reviewing 10% of all finalized calculations will gradually surface issues that have not yet been identified, allowing the benefits for affected members to be corrected and for future calculations to be accurate.**

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Section 2 Task k Review of Required Minimum Distributions

Process for Identifying Required Minimum Distributions (RMD)

The purpose of this review is to evaluate the System's process for identifying members who are required to commence their benefits under Section 401(a)(9) of the Internal Revenue Code, which are known as Required Minimum Distributions or RMDs. The System provided us with a document named **401(a)(9) procedures 2023.doc** outlining the procedures they have in place for checking for RMDs. The procedures have been updated for the new RMD-related requirements that were recently enacted as part of the federal SECURE 2.0 legislation. To verify that the System is following the documented procedures, we examined the 30 members who were either:

1) in deferred vested status on 3/31/2018 and required to begin RMDs on 4/1/2018; or
2) in deferred vested status on 3/31/2019 and required to begin RMDs on 4/1/2019.

Of the 30 members who met the conditions above, 22 correctly began their RMDs on either 4/1/2018 or 4/1/2019 and 8 failed to begin their RMDs as of the required start date - resulting in an error rate of 8 out of 30 or 26.67%. After discussion with the System regarding the failed RMDs, the System reviewed the population and corrected the failed distributions by issuing retroactive lump sum distributions to the affected members. In addition, the System made improvements to their RMD process to prevent these errors from occurring in the future.

Conclusion

We believe that the updated process that the System has in place to identify members who are subject to Required Minimum Distributions and to initiate their benefits in a timely fashion is sufficient to satisfy the requirement of Section 401(a)(9) of the Internal Revenue Code.

This work product was prepared solely for the New York State Department of Financial Services for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.