2025 Annual Report to the Comptroller on
ACTUARIAL ASSUMPTIONS

Recommendations by
Aaron Schottin Young, MA, FSA, EA, MAAA
Retirement Systems Chief Actuary

This report, and the recommended assumptions herein, have been shared with the members of the Actuarial Advisory Committee (AAC) — composed of volunteers who are current or retired actuaries from major insurance companies or pension plans — for their review and commentary. The AAC members provide feedback to the New York State Comptroller Thomas P. DiNapoli, ensuring actuarial oversight of the recommendations herein. This provides the Comptroller with diverse perspectives on the assumptions' reasonableness and possible future direction.

A copy of other publications issued by the Actuarial bureau over the prior year were also provided to the committee members.

Actuarial funding is a long-term endeavor, intended to accumulate sufficient assets over the next 30 years to provide benefits that are payable over the next 100 years. Therefore, the assumptions used to establish the billing rates are similarly long term in nature. While the assumptions are reviewed annually, a change is only appropriate when the revision is considered material and expected to better forecast future outcomes.

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August 2025

Actuarial Certification

As the Actuary for the Employees' Retirement System (ERS), the Police and Fire Retirement System (PFRS) and the Group Life Insurance Plan (GLIP), known collectively as the New York State and Local Retirement System (NYSLRS) or the "System," it is my duty to ensure that the System properly funds the benefits of members, retirees, and beneficiaries.

The System uses an aggregate funding method which has a funding objective of employer contributions that, over time, are a level percentage of payroll. Every April 1st, an Actuarial Valuation is conducted to determine employer contribution requirements for the fiscal year ending two years later. In preparation for the valuation, participant data is validated by running reasonableness tests and a participant reconciliation accounting for every individual on a year-over-year basis. Financial statements are also reviewed.

Proper funding requires that liabilities and employer contribution rates are developed using reasonable actuarial assumptions and methods. Actuarial assumptions are grouped into two broad categories: demographic assumptions (rates of employee turnover, disability, mortality, and retirement) and economic assumptions (interest rates, inflation, and salary growth).

The Actuary performs annual experience studies, ascertaining how closely the System's experience is conforming to the assumptions. If significant differences occur that the Actuary believes may indicate permanent shifts, the Actuary may recommend changes to the assumption.

An Actuarial Advisory Committee (AAC), for whom this report has been prepared, meets annually to review the actuarial assumptions and the results of the Actuarial Valuation. An audit of the actuarial assumptions is also completed by an outside actuarial consultant (every 5 years), the New York State Department of Financial Services (every 5 years), and a financial statement auditor (including GASB calculations, every year). Additionally, the Comptroller's Office of the Inspector General, Office of Internal Audit, helps fulfill his fiduciary duties by periodically reviewing the Actuarial Bureau's processes.

I hereby certify that, to the best of my knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial practices which are consistent with the principles prescribed by the Actuarial Standards Board as well as the Code of Professional Conduct and Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion of the American Academy of Actuaries, of which I am a member. In addition, the assumptions and methods meet the parameters set for disclosures by Governmental Accounting Standards Board (GASB) Statements No. 67 and 68.

Aaron Schottin Young, MA, FSA, EA, MAAA
Retirement Systems Chief Actuary

8/29/2025
Dated

Table of Contents

Executive Summary

This report details the assumptions recommended for use in the Actuarial Valuation for fiscal year beginning April 1, 2025 establishing employer billing rates for bills paid February 1, 2027 (local participating employers) or March 1, 2027 (the State of New York). It serves to document the considerations and rationale underpinning the recommended assumption changes, in keeping with Actuarial Standards of Practice (ASOPs).

Should these recommendations be adopted by the New York State Comptroller, the average employer contribution rate is estimated to be 17.6% in ERS and 36.5% in PFRS.

Because funding is a long-term endeavor, NYSLRS has a history of revising major assumptions in a five-year ("quinquennial") cycle. The fiscal year ending 2025 is the fifth and final year in the current five-year experience. All major assumptions have been subject to comprehensive review, as have a selection of minor assumptions, with the intention of updating them to reflect more recent experience. Moreover, the methodology used to measure and establish assumptions has been revised in several ways.

Experience at the height of the COVID pandemic is not expected to be predictive for most assumptions. To mitigate, ten years of experience is used to develop assumptions for age-based plan salary scale and retiree mortality. Salary scale for service-based plans was set in 2021 and has been examined for reasonableness, but no revision is recommended. Due to lack of credible experience, PUB-2016 is recommended for beneficiary mortality.

NYSLRS implemented a new administrative system, motivating new actuarial techniques for measuring active-member decrements. Therefore, only five years of experience was examined for withdrawals, active member deaths, rates of disability, and service retirements for age-based plans. In addition, further complications were considered when analyzing these assumptions:

Withdrawals: The legislature changed vesting rules during the cycle. Prior experience does not reflect the current benefit structure, and only experience under five-year vesting has been examined.

Disability: The structure of the assumptions was changed. Prior experience was not considered reliable.

Age-based service retirements: The structure of the assumptions was changed. The prior experience was incompatible; obtaining the necessary data would require a burdensome effort.

Active Deaths: Rates of active death (and actuarial liability) are so low that prior experience had an immaterial impact on recommended assumptions.

I recommend maintaining all economic assumptions other than the ERS salary scale, and I recommend updating all demographic assumptions for the April 1, 2025 Actuarial Valuation. I recommend deferring any update to the PFRS salary scale assumption.

Major Assumption or Method	Last Changed in Valuation Dated	Assumption Recommended for the Actuarial Valuation dated April 1, 2025
Inflation	April 1, 2022	2.9%
Cost-of-Living Adjustment	April 1, 2022	1.5%
Liability Discount Rate (expected asset rate of return)	April 1, 2021	5.9%
PFRS Salary Scale	April 1, 2021	Based on System experience FYE 2012 – FYE 2021 (6.1% average expected for FYE 2025 cohort)
ERS Salary Scale	April 1, 2025	Based on System experience FYE 2016 – FYE 2025 (5.2% average expected for FYE 2025 cohort)
Asset Smoothing Method	April 1, 2021	8-year level smoothing of unexpected gain/(loss)
Payee Mortality	April 1, 2025	Varies by population
Retirees		Based on System experience FYE 2016 – FYE 2025
Beneficiaries		Society of Actuaries' PUB-2016
Mortality Improvement	April 1, 2022	Society of Actuaries' MP-2021 (for payees only)
Active-Member Decrements	April 1, 2025	Based on System experience, period varies by assumption
Death		FYE 2021 – FYE 2025
Withdrawal		FYE 2021 – FYE 2025
Disability Retirement		FYE 2021 – FYE 2025
Service Retirement		
Age-Based Plans		FYE 2021 – FYE 2025
Service-Based Plans		FYE 2020 assumptions, increased by 10% Based on System experience FYE 2016 – FYE 2025

Since the last actuarial valuation, new benefit plans have been created. Correction officers in one county now receive 60% of final average salary (FAS) upon attainment of 30 years of service credit. Certain state police titles may elect a plan providing 50% of FAS upon attainment of 20 years of service, plus additional hundredths for service beyond 20 years.[1] Salary reported in FYE 2026 will be billed in FYE 2027. Therefore, these plans require a billing rate in the current year's valuation. Customized assumptions were developed.

With changes to major assumptions, it is necessary to update the new entrant rates and indices, which measure the relative lucrativeness of each plan and are used to differentiate billing rates by tier and plan. Appendix B provides a summary of the updated new entrant rates.

I further recommend updates to actuarial methodology, including:

1. Developing active-member decrements as probabilities, instead of using central rates.

2. Using an overall disability assumption, replacing the use of two or three distinct assumptions, based on all disability benefit inceptions.

3. Extending active-member decrements to age 80, instead of assuming all active members retire with a service benefit at 70 years of age.

These methods, particularly the use of probabilities, better align the actuarial methods with modern actuarial practices.

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[1] Effective July 1, 2025.

Economic Assumptions

Economic assumptions include the inflation rate, cost-of-living adjustment, liability discount rate (and the investment rate of return), and salary scale assumptions. Economic assumptions are forward-looking, and therefore based more on future expectations and professional judgment than past economic experience. This gives economic assumptions a degree of subjectivity.

While actuaries are well versed in economic and investment considerations, it is not a pension actuary's primary area of expertise. For this reason, the setting of economic assumptions typically relies in part on the expertise of investment professionals and economists. NYSLRS has a team of investment professionals in the Division of Pension Investment and Cash Management (PICM) who work with RVK, an investment consultant, to develop expected returns and volatilities by asset class. RVK then applies the asset class estimates to the current and target Asset Allocation (AA) Policy for the Common Retirement Fund (CRF).

The last asset allocation study was made effective April 1, 2024. A natural consequence of any asset allocation study is recommended changes in the CRF's AA Policy and updated capital market forecasts by asset class. The investment rate of return forecasted by the 2024 AA Policy and the associated capital market assumptions serve as the primary consideration, but not the only consideration, when evaluating the liability discount rate assumption.

Economic assumptions are interconnected. Setting these assumptions often includes consideration of a "building block" approach. Based upon the recommended assumptions, the implied building block components are as follows:

Cost-of-Living Adjustment = Inflation Rate / 2   = 2.9% / 2   = 1.5%

Liability Discount Rate ≈ Investment Rate of Return

           = Inflation Rate + Risk Premium   = 2.9% + 3.0%   = 5.9%

Salary Scale = Inflation Rate + (Merit + Productivity)   = 2.9% + 3.2%   = 6.1% in PFRS

                                            = 2.9% + 2.3%   = 5.2% in ERS

Rate of Inflation

The U.S. Bureau of Labor Statistics (BLS) measures and tracks the change in prices for goods and services. Its Consumer Price Indexes (CPI) program produces monthly data on changes in the prices paid by consumers for a representative basket of goods and services. The two CPI measures of greatest interest today are the CPI for All Urban Consumers (CPI-U) and the Chained CPI for All Urban Consumers (C-CPI-U).

A general and progressive <u>in</u>crease in prices is called <u>in</u>flation.
A general and progressive <u>de</u>crease in prices is called <u>de</u>flation.

Inflation does not impact all socioeconomic levels equally. Those with marginal purchasing power are often purchasing lower-cost goods; when inflation strikes, the cost of those goods increases. In contrast, a person who purchases higher-quality goods at a premium price has the option to purchase lower-quality goods for a lower price, thereby mitigating the impact of inflation.

Similarly, shifts in the relative cost of individual goods can trigger a change in consumer behavior. For example, a spike in the cost of orange juice could trigger increased consumption of another juice where the price did not increase.

The C-CPI-U was developed to reflect shifts in consumer behavior. The C-CPI-U is considered "a closer approximation to the true cost-of-living index for the average consumer than the CPI-U" according to the BLS. Since consumer behavior tends to counteract inflation, changes in the C-CPI-U are generally moderated relative to the CPI-U.
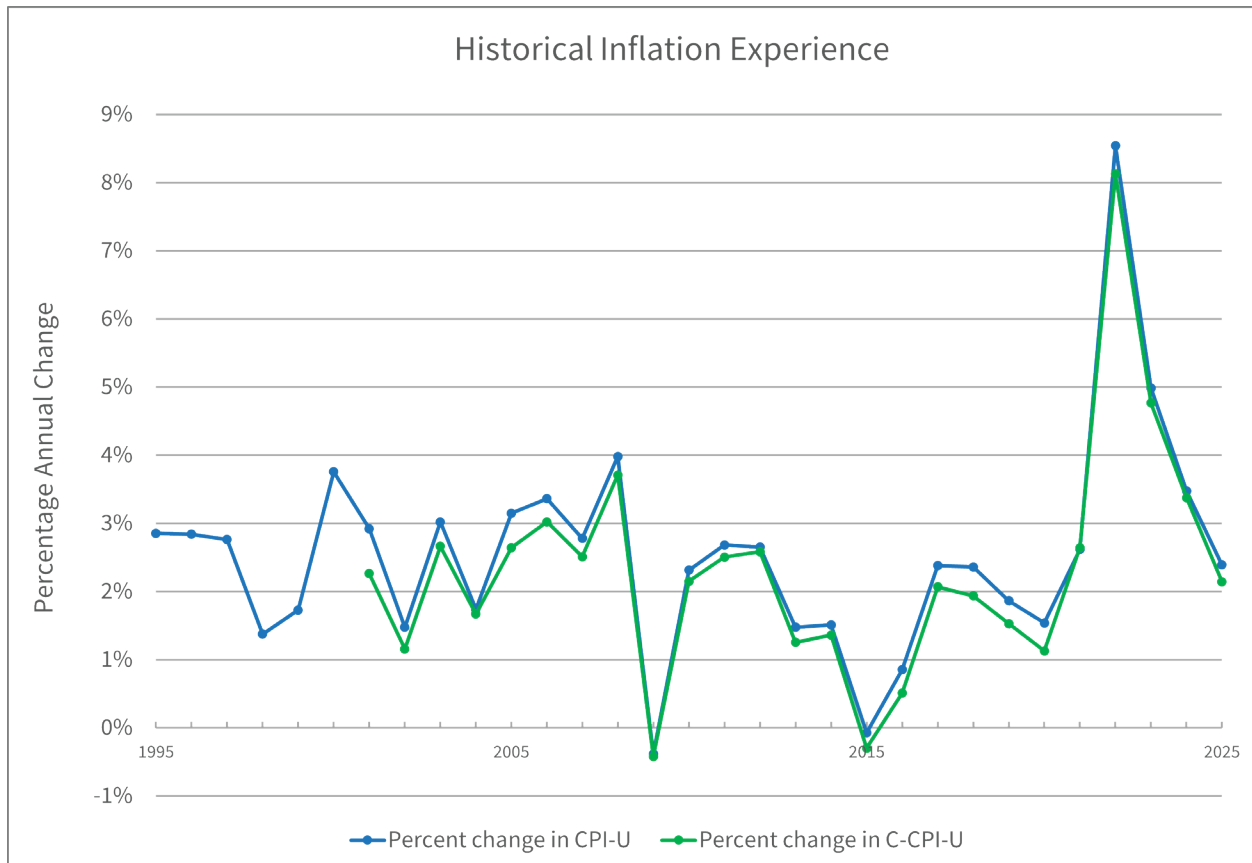
Historically, there have been varying levels of inflation, with occasional brief episodes of deflation. In FYE 2022, 2023, and 2024, inflation was elevated.

The annualized increase in the C-CPI-U over the past twenty years is given by:
$$(177.524 / 112.6)^{1/20} - 1 = 2.30\%$$

The annualized increase in the C-CPI-U over the past five years is given by:
$$(177.524 / 144.913)^{1/5} - 1 = 4.14\%$$

In addition to prior experience, consideration is given to four methods that forecast inflation.

1. **Input from the Federal Open Market Committee (FOMC)**

    The FOMC, a key entity of the Federal Reserve (the "Fed") whose membership consists of financial and economic experts, establishes monetary policy with two goals in mind: (1) to pursue maximum employment, and (2) to promote stable prices (that is, control inflation). A change in monetary policy consists of raising or lowering the federal funds rate, which is the interest rate for overnight borrowing for banks. When the economy is slowing or inflation is too low, the FOMC can ease monetary policy by decreasing the federal funds rate. In contrast, if the economy is overheating or inflation is too high, the FOMC can tighten monetary policy by increasing the federal funds rate.

    The June 20, 2025 Monetary Policy Report, issued by the Fed, acknowledged that current inflation remains above the 2.0% target and that the economic outlook is unclear due to an increase in tariffs. In the past year, the target range for the federal funds rate decreased one percent, now standing at 4.25% to 4.5%. At this level, the Fed is neutral on future adjustments, announcing a willingness (and ability) to quickly respond to changes in employment or inflation as the picture clears.

2. **Yields on US Treasury Bills (T-bills) versus Treasury Inflation-Protected Securities (TIPS)**

    When a T-bill is purchased, the buyer is promised an interest payment every six months, based on the principal and the yield, through the maturity date. At maturity, in addition to the semi-annual interest payment, the principal is paid.

    A TIPS is a T-bill where the principal increases with inflation and decreases with deflation, so the semi-annual interest payments are inflation-adjusted. At maturity, the larger of the original principal or the inflation-adjusted principal is paid.

    When inflation is higher than expected, the TIPS outperform the T-bill. When inflation is less than expected, the T-bill outperforms the TIPS. As a result, the T-bill yield minus the TIPS yield approximates investor expectations of future inflation in the open market.

Asset Duration	T-bill Yield	TIPS Yield	Breakeven Inflation (T-bill – TIPS)
5 years	3.96%	1.35%	2.61%
7 years	4.09%	1.62%	2.47%
10 years	4.23%	1.85%	2.38%
20 years	4.62%	2.17%	2.45%
30 years	4.59%	2.32%	2.27%

3. **PICM Inflation Assumption and Investment Consultant Inflation Forecasting**

   PICM assumes 2.5% inflation when forecasting asset performance, reflecting a 10-year investment horizon.

   In 2023, PICM's Investment Consultant (PICM Consultant) conducted a stochastic simulation of inflation reflecting assumptions used in the 2023 asset allocation study. The details of this model can be found in Appendix F. Using the model's output, the 20-year annual rate of inflation was 3.3%.

4. **Actuarial Bureau Multiple-State Stochastic Model for Inflation Forecasting**

   This model requires two inputs to establish the starting conditions (see Appendix F for complete details). For FYE 2025, the initial state was defined as "normalized" (reflecting the neutral, hold-steady position of the FOMC) with a current rate of inflation of 2.6% (equal to the annualized 1-month rate of inflation ending March 31, 2025). The resulting 30-year annual rate of inflation was 2.94% with a median of 2.69%.

Currently, the inflation assumption is 2.9%.

While deterministic models suggest the inflation assumption could be lower, the more robust stochastic models used to forecast inflation suggest that the assumption is well-positioned. Further, near-term inflation is expected to exceed the 2.9% assumption, and the Fed is not pursuing actions that bring inflation back toward the 2.0% target. With some indicators above and others below, I consider the assumption reasonable.

I recommend maintaining the current inflation assumption of 2.9%.

Cost-of-Living Adjustment (COLA)

Inflation reduces the buying power of consumers with a fixed income, as is often the case with payees (retirees and beneficiaries). To combat this, NYSLRS retirement benefits include an annual COLA.

Chapter 125 of the Laws of 2000 established a permanent COLA program first implemented in September 2001. The program provides an annual COLA (each September) equal to one-half of the CPI-U increase for the previous fiscal year. The COLA is rounded to the next highest 0.1%, subject to a 1% floor and a 3% ceiling. The COLA percentage is applied to the first $18,000 of a retiree's pension benefit or a beneficiary's accidental death benefit. Most spousal beneficiaries of a deceased retiree are entitled to 50% of the retiree's COLA.

The Actuarial Valuation must estimate future COLAs, which is done by means of a COLA assumption. The graph below summarizes the annual COLA percentage since the program's inception, alongside the annual rate of inflation (as measured by the percentage change in the CPI-U).
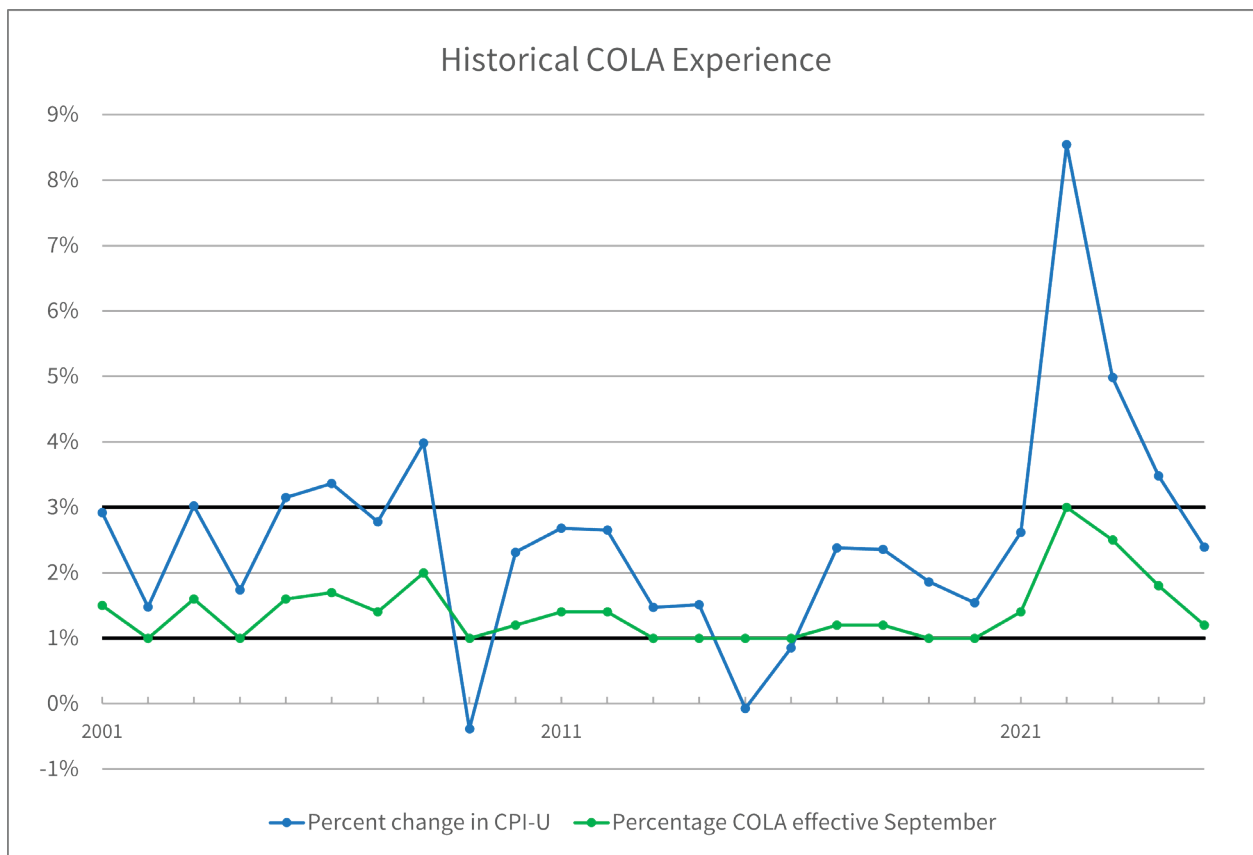
The accumulated COLA over the past 20 years is approximately 32.54%.

The level COLA, rounded to tenths of a percent, that best matches this experience is 1.4%.

$$1.013^{20} - 1 = 29.47\%$$
$$1.014^{20} - 1 = 32.06\%$$
$$1.015^{20} - 1 = 34.69\%$$

In addition to prior experience, consideration is given to methods that forecast the COLA assumption.

1. **Actuarial Inflation Assumption**

   An inflation assumption of 2.9% would project COLAs of 1.5% for all future years:

   $$2.9\% / 2 = 1.45\% \text{ rounded up to } 1.5\%$$

2. **PICM Inflation Assumption and Investment Consultant Inflation Forecasting**

   The inflation assumption of 2.5% used by PICM in forecasting asset performance would imply a COLA of 1.3% for all future years.

   In 2023, the PICM consultant performed stochastic simulations to forecast inflation. The results of this study can be used to inform the COLA assumption by applying the COLA formula. Using the model's output, the 20-year annualized COLA was 1.83%.

3. **Actuarial Bureau Multiple-state Stochastic Model for Inflation Forecasting**

   The Actuarial Bureau's stochastic model can be used to forecast the annual COLA percentage by applying the COLA formula. Using the model's output, the 30-year annualized COLA was 1.5%, when averaged over 5,000 simulations, with median 1.5%.

Currently, the COLA assumption is 1.5%.

The results of this analysis align with the COLA assumption. I consider the COLA assumption reasonable.

I recommend maintaining the current COLA assumption of 1.5%.

Liability Discount Rate (and the Investment Rate of Return)

The actuarial liability discount rate assumption is closely related to the long-term (that is, 30-year) rate of return on pension plan assets. The liability discount rate is used to discount the value of projected contributions and projected benefits.

The concept of discounting is perhaps best understood by way of illustration. Consider the following question:

Who is older, person A, aged 50 today, or person B, aged 62 ten years from now?

We trust that you answered person B. You probably arrived at your answer by adding ten years to person A's age and comparing 60 with 62, or by subtracting ten years from person B's age, and comparing 50 with 52. In either case, you brought the data to a common date and then made your comparison. You intuitively understood the "time value of age."

The *time value of money* can be illustrated with a question:

If you have an investment fund that has an annual rate of return of 5.9%, which is worth more, $100 today or $115 three years from now?

Your intuition may have led you to select $100, as you reasoned that even at simple interest, $100 earning 5.9% per year adds $17.70 in interest, and your investment grew to $117.70 after three years.

Assuming compound returns, $100 would become $100 × (1.059 × 1.059 × 1.059) = $118.76.

Again, you likely brought the data to a common date and made your comparison. Perhaps in this case you were more likely to bring the $100 forward in time (accumulating) than you were to bring the $115 backward in time (discounting), but the idea was the same.

To solve the problem by discounting, you would divide the $115 by 1.059 three times to compare to the $100 today.

$$\frac{\$115}{(1.059 \times 1.059 \times 1.059)} = \$96.83$$

So, $100 today is more valuable than $115 three years from now.

These calculations illustrate the concept of the "time value of money." Note, however, that the answer would have been different if your investment returned only 4% annually.

The liability discount rate assumption is used to discount projected cash flows to a valuation date. If the assumption is too optimistic, then there will be more investment losses than gains, and contributions to the fund will be less timely. If the assumption is too pessimistic, then there will be more investment gains than losses and contributions to the fund will be front-loaded.

Historically, NYSLRS' returns by fiscal year (since 1981, the first year of serious commitment to equities) are as follows:

Year	Return	Year	Return	Year	Return	Year	Return	Year	Return
81	16.7%	91	11.7%	01	-8.7%	11	14.6%	21	33.6%
82	3.3%	92	10.7%	02	2.8%	12	6.0%	22	9.5%
83	21.4%	93	12.5%	03	-10.2%	13	10.4%	23	-4.1%
84	7.9%	94	6.9%	04	28.8%	14	13.0%	24	11.6%
85	13.7%	95	8.8%	05	8.5%	15	7.2%	25	5.8%
86	24.0%	96	21.8%	06	14.6%	16	0.2%		
87	17.8%	97	10.9%	07	12.6%	17	11.5%		
88	1.6%	98	30.4%	08	2.6%	18	11.4%		
89	13.4%	99	8.8%	09	-26.4%	19	5.2%		
90	13.9%	00	17.8%	10	25.9%	20	-2.7%		

This produces the following time-weighted annualized returns (gross of expenses) after consideration of benefits paid and contributions collected throughout each fiscal year:

Period ending March 31, 2025	Annualized Return
4-year*	5.5%
5-year	10.6%
10-year	7.8%
15-year	8.6%
20-year	7.4%
25-year	6.6%
30-year	8.4%
35-year	8.6%
40-year	9.3%

* There have been 4 years since the market restart of 2021 and the initiation of 8-year asset smoothing. When the annualized return since 2021 is greater than 5.9%, investment performance has exceeded expectations and is applying downward pressure on billing rates. When the annualized return since 2021 is less than 5.9%, investment performance has not met expectations and is applying upward pressure on billing rates.

In addition to prior experience, consideration is given to methods that forecast asset returns.

The Comptroller, as the trustee of the CRF, establishes the AA Policy. A portfolio's AA Policy is the single most important factor in establishing the fund's long-term rate of return. Pursuing higher returns requires more risk (volatility in returns year over year), which triggers volatility in employer contribution rates (potentially putting stress on municipal budgets). In this way, establishing the AA Policy allows the Comptroller to set the risk appetite for PICM and define the level of volatility expected in employer billing rates.

The last trustee-approved AA Policy was made effective April 1, 2024 and is based on especially robust analysis by PICM. The AA Policy reflects the following risk (*standard deviation*) and reward (*arithmetic return*) relationship by asset class.

Asset Class	(A) Allocation	(B) Arithmetic Return Assumption	Standard Deviation Assumption	(A) × (B)
Broad US Equity	25%	6.80%	16.10%	1.700%
Broad International Equity	14	9.35	18.70	1.309
US Agg Fixed Income	22	4.00	5.00	0.880
CRF Credit	4	7.93	12.45	0.317
Core Real Estate	12	7.10	16.32	0.852
CRF Private Equity	15	10.00	20.00	1.500
CRF Opportunistic	3	7.88	14.32	0.236
CRF Real Assets	4	8.34	17.01	0.334
Cash Equivalents	1	2.50	2.00	0.025
			Expected Arithmetic Return	**7.153%**

The capital market assumptions used in the report are applicable to a 10-year time frame and are net of investment fees and expenses.

The expected arithmetic return for this portfolio is 7.15%, with a standard deviation of 10.89%, for a geometric return of 6.60%. A discussion of arithmetic returns versus geometric returns can be found later in this report (see *Understanding the Difference Between Arithmetic Return and Geometric Return* in Appendix E).

Annually, PICM provides updated capital market assumptions. Based on the FYE 2025 predictions, the arithmetic return is 7.0%, standard deviation is 11.0% and geometric return is 6.5%. These results supplement the more robust analysis of the trustee-approved AA Policy.

Other considerations in setting the liability discount rate include plan maturity, cash flow needs, and the potential to worsen the credit risk of participating employers.

For funding purposes, the liability discount rate is applied in a geometric manner. To sustain this discount rate, the investments must earn a return close to the arithmetic return. Why? NYSLRS has a strongly negative net cashflow (benefit payments are more than double employer contributions), meaning that investment earnings are used to pay benefits and are not reinvested. The portion of investment earnings that are used to pay benefits do not get compounded. This inhibits the fund's ability to rebound from a market downturn. To mitigate the funding risk posed by a strongly negative annual cashflow, it is appropriate to use a liability discount rate that is lower than the geometric returns projected under the AA Policy and capital market assumptions.

The Risk Disclosure section of this report includes additional details regarding volatility in employer billing rates. For a credit rating perspective, we can look at the funding guidelines published by S&P Global Ratings. Credit rating agencies review the financial health of public entities, including states and municipalities. Like an individual's credit score, a credit rating agency's analysis of a public entity will affect the cost of issuing debt and may limit the ability to borrow altogether (for example, the interest rate paid on municipal bonds). This can have serious consequences that impact the financial health of the public entity for a prolonged period.

One consideration of S&P Global Ratings is the discount rate used to value pension plan liabilities. The guidance expects the assumption:

- To not exceed 6.0% based on current market conditions for a typical public pension plan,
- To reflect realistic performance of the target investment portfolio, and
- To be cognizant of the level of budgetary stress (contribution volatility) the participating employers can withstand.

Currently, the liability discount rate assumption is 5.9%.

With due consideration given to the 10-year PICM projections and other capital market assumptions, the implications of maturity and net cashflows, and the credit rating guidance, I consider the current assumption to be prudently placed within a reasonable range.

I recommend maintaining the current liability discount rate assumption of 5.9%, which will be used to discount future projected contributions and benefits.

The data below is taken from the National Association of State Retirement Administrators (NASRA) and represents the investment return assumption distribution for public systems in their database. Investment portfolios vary significantly from one system to another, making it impractical to rely upon the assumptions used by other systems. But a comparison to other systems can serve as a reasonability check or reveal trends across the larger group.

Investment Return Assumption	Number of Public Systems			
	July 2025	July 2020	May 2015	March 2010
< 6.00	* 3 *			
6.00	2	2		
6.01 – 6.49	5			0
6.50	14	5	4	
6.51-6.99	26	* 17 *		
7.00	47	32		1
7.01-7.49	31	38	* 43 *	21
7.50	3	26		
7.51-7.99	0	7	36	16
8.00	0	3	34	* 51 *
8.01-8.49	0	0	3	16
8.50	0	0	2	19
Median	7.00%	7.25%	7.75%	7.97%
* NYSLRS *	5.90%	6.80%	7.50%	8.00%

This table shows that there has been a steady downward shift in pension systems' investment return assumptions over the past fifteen years.

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Salary Scales

The purpose of the salary scale assumption is to project future billable salary and estimate a member's FAS and future benefits.

There are two salary scale assumptions. The first applies to ERS members who must attain age 55 to be eligible for a service retirement benefit (called an age-based plan), and the second applies to everyone else, including all PFRS members and ERS members who become retirement eligible upon attaining 20 or 25 years of service credit (called a service-based plan). In both cases, the salary increase varies by service credit. Salary scale experience over the past 5 years has exerted upward pressure on billing rates because salary grew faster than assumed (an A/E ratio greater than 1.000); however, experience over the past five years has been erratic due to COVID disruptions. Accelerated retirements and labor shortages now drive a strong labor market and have greatly increased employers' reliance on overtime compensation. Add to this an increased rate of inflation, and we see all elements of the salary scale building blocks increasing.

Fiscal Year Ending	ERS			PFRS			The Fed Median Wage Growth (Full-time)
	Actual	Expected	A/E	Actual	Expected	A/E	
2021	2.3%	4.5%	0.51	4.0%	5.9%	0.68	3.5%
2022	7.6%	4.4%	1.74	8.5%	5.6%	1.53	4.8%
2023	6.2%	4.3%	1.42	8.5%	5.6%	1.52	6.4%
2024	5.3%	4.4%	1.21	9.1%	5.8%	1.57	5.3%
2025	7.0%	4.5%	1.57	5.6%	5.9%	0.96	4.5%
Combined 2021–2025	**5.7%**	**4.4%**	**1.29**	**7.1%**	**5.7%**	**1.24**	**4.9%**

In the 2024 valuation, the ERS salary scale was based on experience from FYE 2011 through FYE 2015, subject to a 10% increase beginning with the Fiscal Year Beginning (FYB) 2018 Actuarial Valuation. This experience is now too distant to continue serving as a foundation for the salary scale assumption. However, COVID-era experience is anomalous and may not offer a good prediction of future experience.

Therefore, to balance the timeliness of the measured experience period without relying exclusively on the past five years, **I recommend updating the ERS salary scale assumption based on ten years of experience FYE 2016 through FYE 2025.**

The PFRS salary scale was developed for the FYB 2021 valuation based upon 10 years of NYSLRS experience. The 10-year lookback was necessary to balance a dramatic spike in salary in FYE 2018, later attributed to retroactive pay. If the PFRS assumption were updated this year, it would reflect the COVID-era experience and the irregular contract settlement in FYE 2018. Therefore, recent experience is likely not a superior predictor of future experience, as compared to the current assumption.

Therefore, I recommend that we maintain the PFRS salary scale assumption, with plans to revisit the assumption before 2030.

The ERS salary scale and (unchanged) PFRS salary scale are best viewed graphically.
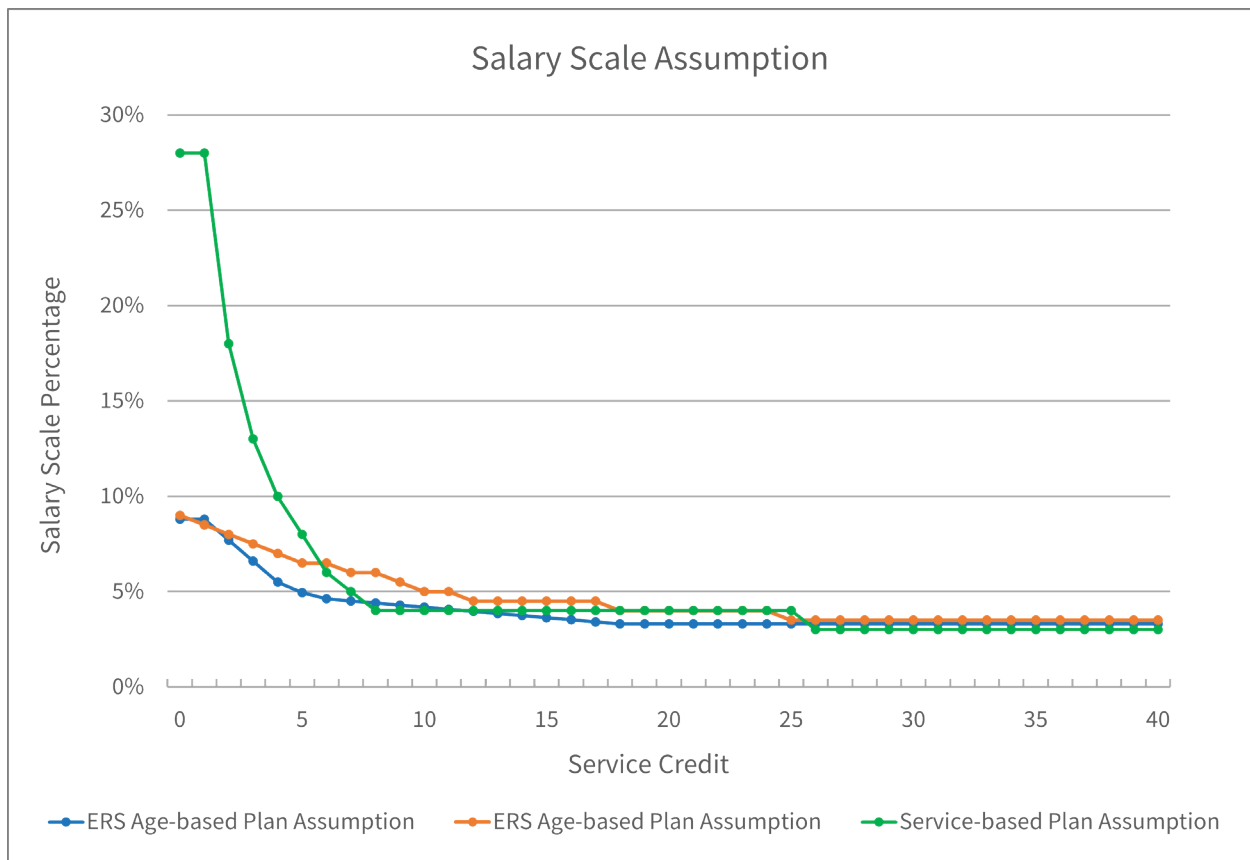
Notice that salary increases are very high for new entrants with little service credit, dropping off rather quickly over 8 years and stabilizing through retirement. The assumptions are intentionally simplistic, intended to predict the salary of the cohort, not any one individual. Predicting the general trajectory of pensionable earnings will result in accurate estimates of billable salary and average benefits for similarly positioned members at retirement. Additional granularity does not materially change results.

Asset Valuation Method

Pension fund managers could direct all assets to be invested in a fixed income portfolio. While this would greatly reduce investment income volatility, it would also increase the expected employer contribution rates.

In general, one expects to profit more as an owner (that is, an investor in equities) than as a lender (that is, an investor in bonds), especially if the equity ownership can be diversified and held. Thus, pension funds invest in equity index funds. Unfortunately, this introduces volatility in investment income.

The following basic equation governs pension funding: $C + I = B + E$

where, C = Contributions (both employer and employee)
I = Investment income
B = Benefits
E = Expenses

In NYSLRS, administrative expenses are funded independently of the benefits.

The basic funding equation highlights the fact that volatility in investment income translates to volatility in employer contributions. The right side of the equation (benefits plus expenses) is highly predicable and, barring a major change in assumptions or benefits, fluctuates little year after year. Employee contributions are defined in law and are therefore predictable year after year. As a result, any volatility in investment income is countered by a change in future employer contributions.

Asset valuation methods "smooth" the investment income volatility by phasing in both "unexpected" gains and "unexpected" losses. The amount deemed "unexpected" and the period of smoothing are defined by the method.

NYSLRS' asset valuation method was revised in 2022 and has the following features:

1. Expects a gain of the assumed rate of return on the plan net position and fiscal year cash flows.

2. Recognizes (smooths) the unexpected gain (= actual gain – expected gain) over 8 years in equal annual portions.

3. Does not apply a fair value corridor.

A fair value corridor would require the Actuarial Value of Assets (AVA) to remain within a certain range around the Fair Value of Assets (FVA). This can generate increased employer contribution requirements after experiencing market losses, and reduced employer contribution requirements after experiencing market gains. That is, it reinforces contribution rates that are cyclical with investment markets, giving rate relief when least necessary and rate increases when least affordable. This conflicts with the System's objective of smooth employer contribution rates. While many actuaries prefer an asset corridor to help optics, NYSLRS' consistent and prudent funding strategy renders it unnecessary.

I recommend no changes to the 8-year smoothing of unexpected investment returns, without an asset corridor.

The table below provides a summary of key values related to the Asset Smoothing Method and metrics related to funding progress. Definitions are provided below the table.

Fair Value of Assets (FVA) vs. Actuarial Value of Assets (AVA)[2]

FYB	FVA*	AVA	AL_{EAN}	UAL_{EAN}	Roll-forward TPL_{EAN}	GASB 67 Ratio
2015	$ 189.3	$ 184.2	$ 196.5	$ 12.4	$ 193.1	98.0%
2016	183.5	190.6	203.0	12.4	202.7	90.6
2017	197.5	198.0	210.1	12.1	209.1	94.5
2018	212.0	206.7	217.6	10.9	216.3	98.0
2019	215.2	212.8	224.0	11.2	223.9	96.1
2020	198.1	214.1	231.9	17.8	229.9	86.2
2021**	260.1	260.1	260.4	0.3	~~237.9~~ 261.9	99.3
2022	273.7	267.2	270.9	2.8	266.1	102.9
2023	249.5	269.6	281.1	11.5	276.5	90.3
2024	267.4	272.4	290.3	17.9	286.8	93.2
2025	$ 273.1	$ 276.9	$ 297.6	$ 20.7	296.3	92.2%
2026					$ 304.2	

* Financial Statement Plan Net Position (that is, Invested Assets + Receivables)

** The market restart led to recomputing the TPLEAN under new assumptions.

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[2] **Accrued Liability under the Entry Age Normal actuarial funding method (ALEAN)**

The ALEAN is a measure of the pension benefits earned by members and retirees (excluding certain dedicated liabilities) as of the valuation date, often called a past service cost. At entry, the AL is zero. At retirement, the AL equals 100% of the benefit. The actuarial funding method decides how the AL moves from zero to 100%. Under the Entry Age Normal actuarial method, the AL generally increases stably throughout a member's working career.

Unfunded Accrued Liability under the Entry age Normal actuarial funding method (UALEAN)

The unfunded accrued liability is the portion of the system accrued liability that is not covered by the current Actuarial Value of Assets. Therefore, $UAL_{EAN} = AL_{EAN} - AVA$.

Total Pension Liability under the Entry age Normal actuarial funding method (TPLEAN)

The total pension liability is the sum of all accrued liabilities (for active members and those collecting benefits) plus certain dedicated liabilities. This value is rolled forward from the prior year valuation to allow auditors time to review the calculation.

Governmental Accounting Standards Board Statement No. 67 Ratio (GASB 67 Ratio)

GASB 67 amended GASB 27, changing financial reporting required by public pension plans. The GASB 67 Ratio was first reported for the fiscal year ending 2015 and is equal to the plan net position (equal to the FVA) divided by the total pension liability. Therefore, GASB 67 Ratio = $FVA \div TPL_{EAN}$.

Demographic Assumptions

Demographic assumptions include payee mortality and mortality improvement, and assumptions estimating the method and timing of an active member separating from service (called active-member decrements). While demographic assumptions are forward looking, they are generally best estimated by recent experience of similarly positioned individuals.

What is meant by *similarly positioned individuals*?

> The type of work performed by civil servants can vary widely. The careers of firefighters, correction officers, and clerks are not likely to mirror one another. When evaluating relevant experience, consideration must be given to differences in job duties and plan provisions. Accordingly, it is preferable to set assumptions based on specific retiree and member cohorts rather than to rely upon the experience of non-participants (such as Social Security recipients or the Bureau of Labor Statistics workforce measurements).

What is meant by *recent experience*?

> Member behavior is influenced by outside forces, such as legislative decisions (for example, retirement incentives) and economic forces (such as opportunities in the private sector). As conditions change, so will member behavior and demographic experience. Generally, the more recent the experience, the more reliable in predicting future experience.

> However, COVID fueled a particularly intense collection of outside forces. The workplace was in a state of flux, responding to societal changes, law changes, and the impact of unique economic conditions on the labor markets. As a result, COVID has developed a challenging environment for assumption setting.

> Ultimately, the recent COVID experience may not prove predictive of the future.

The accuracy of demographic assumptions in predicting actual experience is evaluated annually by conducting an *experience study*. Ideally, the ratio of "actual to expected" (called an A/E ratio) is close to 1.000. A large divergence suggests the assumptions are not closely predicting experience. As a result, actuarial gains or losses could lead to fluctuation in the annual billing rates, especially when assumptions are updated. For the quinquennial study, we will compare the A/E ratios under the prior assumptions to the new assumptions. The actual decrements will reflect experience during the prior 5-year period.

Payee (Retiree & Beneficiary) Mortality Experience

The most significant demographic assumption is payee mortality. NYSLRS mortality tables are not developed on a "by-number" basis, but on a "by-liability" basis.

For example, a mortality rate of 1% for age-65 retirees does not mean that we expect 1 in every 100 age-65 retirees to expire within the year, rather it means that we expect $1 in every $100 of age 65 retiree liabilities to expire within a year.

The *by-liability* method is preferred over the *by-number* method because the valuation is concerned with the cessation of benefit obligations, not necessarily the cessation of benefit recipients. Generally, mortality by number and mortality by liability should be roughly equivalent. However, experience studies have shown that retirees with more lucrative benefits enjoy better longevity than those with lesser benefits. Thus, mortality by number would undervalue the present value of future benefits.

Through the FYB 2024 valuation, the payee mortality assumption is based on NYSLRS' experience from April 1, 2015 through March 31, 2020 with mortality improvement under the SOA's MP-2021 scale. Historically, retiree mortality experience was determined to be best reflected by the recent experience of NYSLRS retirees.

COVID experience resulted in higher-than-expected mortality rates (called excess mortality), not generally expected to persist for another 30 years. Relying solely on the past 5 years of experience would be ineffective in estimating future mortality rates. It is necessary to strike a new balance between *similarly positioned individuals* and *recent experience* while awaiting more experience over the next 5 years.

Payee Deaths*	FYE 2021–2025	2020 Mortality Assumptions		2025 Mortality Assumptions	
	Actual	Expected	A/E	Expected	A/E
ERS Service (Males)	783.081	751.993	1.041	754.404	1.038
ERS Service (Females)	528.415	499.625	1.058	504.737	1.047
ERS Disability	68.915	65.050	1.059	66.050	1.043
PFRS All Plans	157.672	157.588	1.000	154.561	1.020
All Retiree Mortality	**1,538.083**	**1,474.256**	**1.043**	**1,479.753**	**1.039**
ERS & PFRS Beneficiaries	112.829	121.082	0.932	117.653	0.959
All Payee Mortality	**1,650.912**	**1,595.339**	**1.035**	**1,597.406**	**1.034**

* Retiree Mortality is studied in 10 groupings (ERS service retirees are grouped by sex identification and collar color, ERS disability retirees are grouped by sex identification, PFRS retirees are grouped by retirement type, and beneficiaries are grouped by sex identification), but these groups are combined for display purposes in this table.

The A/E for All Retiree Mortality under the 2020 Mortality Assumptions is higher than under the 2025 Mortality Assumptions, which remain greater than 1.000. The new assumptions are a partial move toward the past five years.

Therefore, I recommend updating retiree mortality assumptions based on 10 years of NYSLRS experience, beginning April 1, 2015 and ending March 31, 2025. For beneficiary mortality, I recommend adopting the SOA's PUB-2016 mortality rates.

Payee Mortality Improvement Assumption

A second feature of the retiree mortality assumption is the inclusion of a projection regarding mortality improvement. The interaction of the (static) mortality assumption and the mortality improvement assumption is best demonstrated with real-world context.

> Pretend it is 1990. How long do we expect a 65-year-old to live? Well, the Social Security Administration estimated life expectancy was 15 years for a male and 19 years for a female.

> Fast forward to 2025 and ignore the potential bias from COVID. Do we expect a 65-year-old to live longer? The SSA says yes, now expecting females to live 21 years and males to live 18.4 years.

> But in 1990, the Actuary needed to estimate the life expectancy of a 65-year-old (newly retired, perhaps) and the 25-year-old (newly hired, perhaps) who would be 65 in 2025. To do this, a mortality improvement factor is applied.

Without a mortality improvement assumption, the life expectancy of all 65-year-olds would be the same, regardless of when the person turns 65. The mortality improvement assumption addresses the fact that,

> *"given two people survive to age 65, the person that was born later in time will survive longer."*
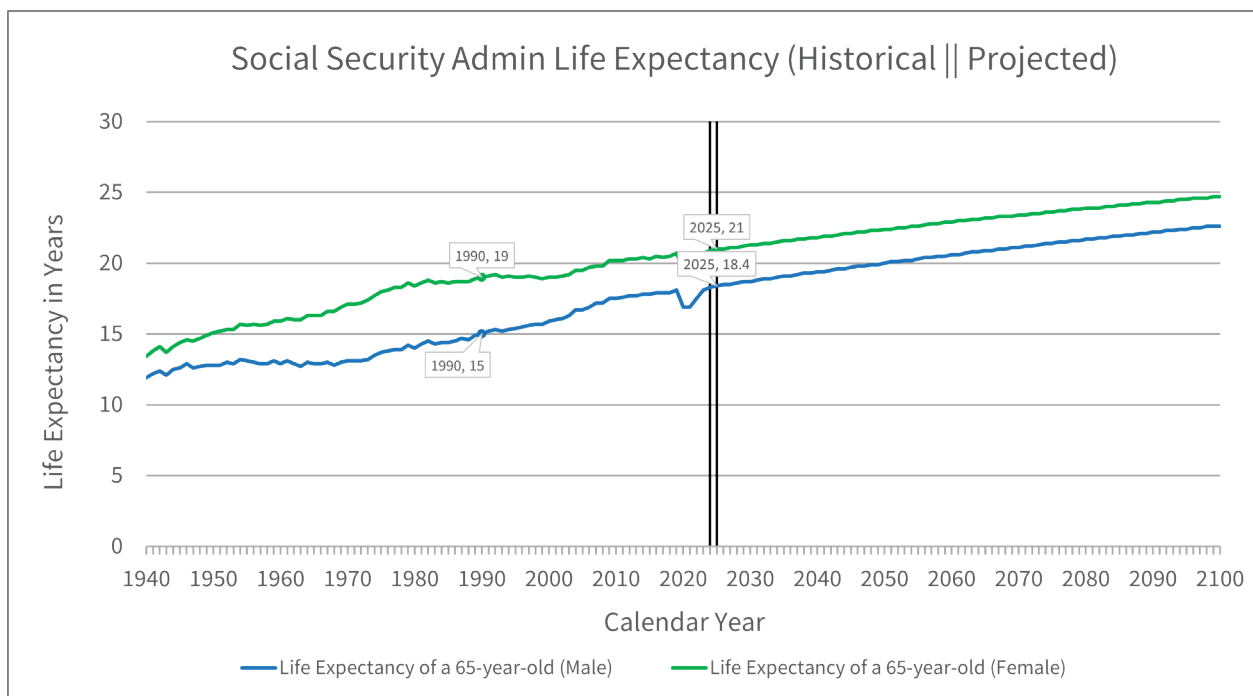
The debate about how COVID will impact future mortality experience is also fundamental to the mortality improvement assumption. Currently, NYSLRS relies upon a mortality improvement scale developed by the Society of Actuaries denoted MP-2021, which is developed by the Retirement Plans Experience Committee (RPEC). RPEC has not issued an updated MP scale since 2021 because the COVID experience generated illogical results when included in the model. RPEC's official statement said:

> *"It continues to be our opinion that it would not be appropriate to publish an MP scale reflecting a COVID adjustment, given the uncertainty regarding the effects of the pandemic on future mortality levels."*

So, the current generational mortality improvement assumption is the most recent.

Therefore, I recommend maintaining the mortality improvement assumption, which is the Society of Actuaries' Mortality Projection Scale MP-2021, applied now with a central year of October 1, 2022 in keeping with a typical 5-year study period.

An actuary might ask:

> Since base mortality studied was 2015 through 2025, why is the center for mortality improvement October 1, 2022? Shouldn't it be April 1, 2020?

The base mortality and mortality improvement assumptions are closely related and act in concert.

A center date for mortality improvement of April 1, 2020 would result in an additional 2.5 years of mortality improvement. This would lower mortality rates. Since base mortality was already adjusted downward (using complementary data), additional decreases (by way of the mortality improvement assumption) were deemed unnecessary.

For base mortality, COVID-era mortality is higher than expected in future years. Therefore, an adjustment is appropriate. Several options were considered.

1. Subtracting a constant from all ages (for example, subtracting 0.0005).
2. Scaling mortality rates at all ages (for example, multiplying by 95%).
3. Complementing the experience using additional mortality data.

The first two options (subtracting and scaling) will maintain the distribution of deaths, or the "shape" of the mortality curve by age. It has been observed that younger populations experienced a greater increase in mortality, causing the mortality curve to flatten (mortality rates at younger ages increase more significantly than at higher ages). To help correct the distribution of deaths, I considered option three most appropriate.

Two complements were readily available. First, the SOA PUB-2016 (which was used for beneficiary mortality) and second, NYSLRS own experience pre-COVID. NYSLRS has a long history of developing mortality in-house; a tradition worth maintaining. Therefore, NYSLRS COVID-era mortality experience was complemented by NYSLRS pre-COVID experience, reshaping the curve and dampening overall mortality.

It could be said that:

Retiree mortality was developed using NYSLRS experience beginning April 1, 2020 and ending March 31, 2025. This experience was supplemented by other mortality experience to dampen the impact of COVID. The complement chosen was a more historical NYSLRS experience.

In this light, the center date for mortality improvement would be October 1, 2022, matching the recommendation.

Active Member Experience

Active members separate from service in one of four ways: withdrawal, death, disablement, or retirement. These are called *decrements*. Whenever a member separates from service, they are entitled to a benefit from NYSLRS. Sometimes the benefit is simply a return of member contributions, other times a lump sum payment. In most cases, a monthly benefit is paid for life (called an annuity). The benefit amount and form of payment are defined in the Retirement and Social Security Law, but will vary by plan, service, and salary.
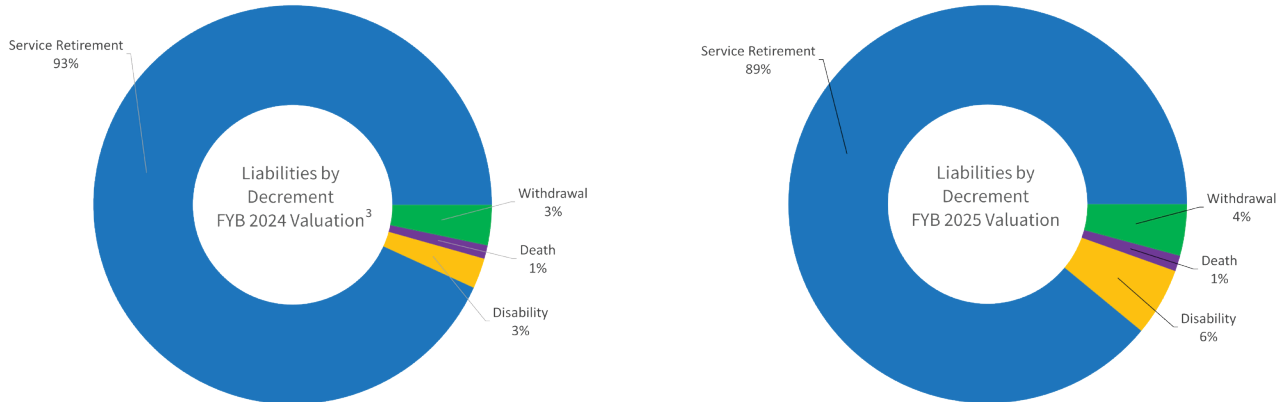
Assumptions are needed to estimate the timing and type of benefit payable under each decrement. Like retiree deaths, an annual experience study is conducted to compare the fiscal year experience to the assumptions. Unlike retiree mortality, this experience study is done on a by-number basis. That is, the number of people (not dollars) are counted.

Historically, active-member decrements were determined to be best reflected by the recent experience of NYSLRS retirees. While this is still true, as with the salary scale assumption and retiree mortality, recent COVID experience may bias results. At the same time, economic forces and labor markets can weigh heavily upon a member's decision to retire. Similarly, increased disability benefit amounts and higher rates of application approval (resulting from expansion of presumptions) will result in more members retiring with a disability benefit.

I recommend implementing active decrements as probabilities rather than "central rates" of decrement, in keeping with modern actuarial practice.

I recommend updating the active member decrement assumptions for withdrawal, disablement, and death based on NYSLRS experience beginning April 1, 2020 and ending March 31, 2025. For service retirements, I recommend updating age-based plans based on NYSLRS experience beginning April 1, 2020 and ending March 31, 2025, and I recommend increasing the current 20 and 25-year plan assumptions by 10%.

A review of each active-member decrement experience follows. Ideally, the ratio of "actual to expected" is close to 1.00. A large divergence suggests the assumptions are not closely predicting experience. As a result, actuarial gains/losses could lead to fluctuation in the annual billing rates, especially when assumptions are updated.

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[3] For comparison purposes, the April 1, 2024 valuation methods and assumptions were applied to the 2025 cohort, consistent with the April 1, 2025 valuation.

Withdrawals

When a member withdraws from active service, the form of benefit depends upon the service credit accrued. If less than 5 years, the member is not vested, and the benefit is a return of the member's contributions. If more than 10 years, the member is vested, and the benefit is a deferred annuity benefit payable after attaining age 55. A member with service credit between 5 and 10 years is allowed to choose either the non-vested benefit or the vested benefit.

Generally, when members withdraw, actuarial gains apply downward pressure on the billing rates. As shown in the table below, NYSLRS members withdrew at greater rates than expected.

Withdrawals *	FYE 2021–2025	2020 Assumptions		2025 Assumptions	
	Actual	Expected	A/E	Expected	A/E
Age-Based Plans	**101,444**	**74,025**	**1.37**	**101,589**	**1.00**
0 ≤ Service Credit < 2	60,095	38,672	1.55	60,095	1.00
2 ≤ Service Credit < 3	8,521	8,428	1.01	8,623	0.99
3 ≤ Service Credit < 4	5,882	5,392	1.09	5,912	0.99
4 ≤ Service Credit < 5	5,198	4,317	1.20	5,207	1.00
5 ≤ Service Credit < 10	13,085	10,928	1.20	13,089	1.00
10 ≤ Service Credit	8,663	6,287	1.38	8,664	1.00
Service-Based Plans Correction Officers	**4,138**	**1,368**	**3.03**	**3,269**	**1.27**
Service-Based Plans other than Correction Officers	**2,270**	**1,947**	**1.17**	**2,270**	**1.00**

* Rates of withdrawal for ERS age-based plans are defined by age and service credit while assumptions for other plans are defined by service credit. To summarize experience, similar groups are combined.

Note that Chapter 56 of the Laws of 2022 changed Tiers 5 and 6 from 10-year vesting to 5-year vesting, and the April 1, 2022 actuarial valuation revised Tiers 5 and 6 withdrawal assumptions to match earlier tiers. Accordingly, it was necessary to limit the population studied to only those with 5-year vesting.

I recommend updating the active member withdrawal assumptions to reflect NYSLRS' active member experience from April 1, 2020 through March 31, 2025. Further, I recommend that withdrawal rates for correction officers equal 200% of the withdrawal rates otherwise applicable to public safety members.

Active Member Deaths

When an active member dies, a benefit is payable to a named beneficiary or a statutory beneficiary (spouse, children, dependent parents). Ordinary death benefits are payable as a lump sum while accidental death benefits are often payable for the life of the beneficiary.

Excess deaths can result in downward pressure on the billing rates. Like retiree mortality, active member deaths have exceeded expectations, as shown in the table below.

Active Member Deaths	FYE 2021–2025	2020 Assumptions		2025 Assumptions	
	Actual	Expected	A/E	Expected	A/E
Age-Based Plans	3,197	3,039	1.06	3,342	0.96
Service-Based Plans	104	72	1.45	103	1.01

The mortality experience of the active population was not dramatically different from the prior 5-year period. Moreover, death benefits represent a very small portion of the total liability.

I recommend updating the active member mortality assumptions to reflect NYSLRS' active member experience from April 1, 2020 through March 31, 2025.

Disability Retirements

When an active member becomes permanently disabled, typically annuity (lifetime) benefits become payable. There are three types of disability, although not all plans provide all three types. An accidental disability generally requires a *sudden, fortuitous mischance, out of the ordinary and injurious on impact*. An injury emanating from risks inherent in an employee's regular duties does not constitute an accident but may suffice for a disability in the performance of duty (POD). An ordinary disability benefit is payable after a member attains 10 years of service credit.

The legislature's interest in improving or expanding disability benefits has increased. To ensure proper funding, it has become necessary to scrutinize the approval of disability benefits.

In prior experience studies, a member was only identified as a disability decrement if they moved year-over-year from active-pay status to collecting a disability benefit. A delay in approving of the disability benefit would often be captured as a withdrawal because the member leaves payroll but the disability benefit has not commenced. Similarly, if a member is service retirement eligible, they are likely to apply for both the service benefit and the disability benefit — the service benefit is generally paid faster, and the decrement looks like a service retirement.

New for the 2025 quinquennial study, the inception of a disability benefit is counted as a disability decrement, regardless of the member's prior status. The exposures were not adjusted. This increased the rate of disablement for all disability types, especially for members in 20 and 25-year plans, who more commonly apply for a service benefit concurrent with disability incidence. The new assumptions show an increase in the probability of paying an accidental or POD benefit.

Active Member Disability	FYE 2021–2025	2020 Assumptions		2025 Assumptions	
	Actual	Expected	A/E	Expected	A/E
Age-Based Plans — Ordinary	1,026	957	1.07	898	1.14
Age-Based Plans — Accidental	252	84	3.02	181	1.39
Service-Based Plans — Ordinary	133	135	0.99	153	0.87
Service-Based Plans — Accidental	725	340	2.13	812	0.89
Service-Based Plans — POD	860	370	2.33	876	0.98

There was also a change in methodology related to the allocation of disability decrements. Because certain plans offer two types of disability benefits (i.e., ordinary and accidental) while others offer three (i.e., including POD), comparability and the implementation of disability assumptions becomes very complex. Therefore, an overall probability of disability can be applied, with applicable percentages then used to categorize disability decrements into relevant types.

I recommend updating active member disability decrements to reflect NYSLRS' active experience from April 1, 2020 through March 31, 2025, incorporating a methodology change to apply a total probability of disability. Moreover, I recommend apportionment of these probabilities among available disability types (ordinary, accidental, and/or performance-of-duty), based on the plan type, the benefit amount, and covered population.

Service Retirements

When a member does not withdraw, die, or become disabled, they file for a service retirement benefit. Service retirement benefits represent approximately 93% of all active member liabilities, making these the most important active member assumptions. There are a variety of different assumptions based on plan provisions (such as 20-year plans, 25-year plans, and provisions for additional accruals after initial eligibility) and population (such as public safety, correction officers, and others).
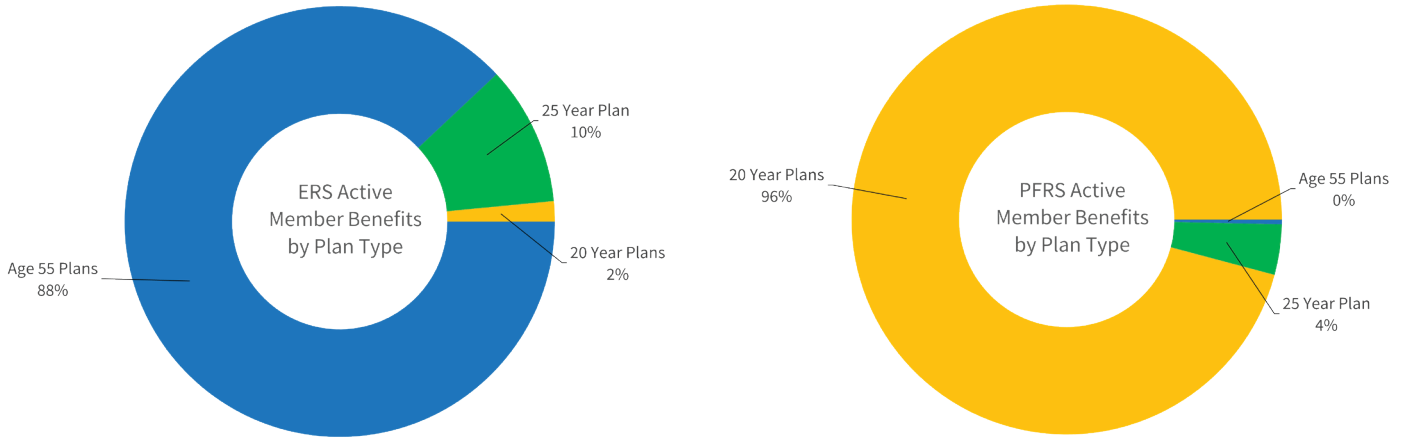
Service retirement benefits are most costly when members retire at first eligible for an unreduced benefit. Therefore, actual service retirements exceeding expectations will create an upward pressure on billing rates. As shown in the table below, NYSLRS members are retiring at greater rates than expected.

Service Retirements *	FYE 2021–2025	2020 Assumptions		2025 Assumptions	
	Actual	Expected	A/E	Expected	A/E
Age-Based Plans	**74,781**	**58,187**	**1.29**	**73,428**	**1.02**
0-19	**19,826**	**16,134**	**1.23**	**19,578**	**1.01**
20	5,187	3,457	1.50	5,550	0.93
21-29	23,147	20,612	1.12	22,781	1.02
20-29	**28,334**	**24,069**	**1.18**	**28,331**	**1.00**
30+ when not 55 & 30	15,984	12,326	1.30	15,991	1.00
55 & 30	9,079	5,658	1.60	9,528	0.95
30+	**26,621**	**17,984**	**1.48**	**25,519**	**1.04**

* Rates of service retirement for age-based plans are defined by age and attainment of service milestones (which occur upon attaining 20 years and 30 years of service credit) while assumptions for service-based plans are defined by service credit. To summarize system- level experience, different plans are combined.

For age-based plans, the experience is comprised of Tier 4 members. For Tier 4, specific adjustments are applied when the member attains the 20-year milestone (when the benefit increases from 33% to 40%) and first attainment of age 55 with 30 years of service credit (when early age reductions are eliminated).

Service retirement experience for Tier 5 and 6 members lacks sufficient credibility to be used in defining tier-specific rates. Instead, adjustments are applied to the credible experience of earlier tiers to capture differences in plan provisions. These adjustments are detailed in Appendix C.

Service Retirements	FYE 2021–2025	2020 Assumptions		2025 Assumptions	
	Actual	Expected	A/E	Expected	A/E
Service-Based Plans	**11,058**	**7,613**	**1.45**	**8,693**	**1.27**
25-Year State COs	3,041	2,000	1.52	2,339	1.30
25-Year (other than State COs)	1,124	1,061	1.06	1,172	0.96
25-Year w/ 60ths	140	127	1.10	141	0.99
All 25-Year Plans	**4,305**	**3,188**	**1.35**	**3,653**	**1.18**
20-Year	1,892	1,209	1.57	1,396	1.36
20-Year w/ 60ths	3,678	2,546	1.44	2,877	1.28
20-Year w/ 60ths State Police	1,183	670	1.77	768	1.54
All 20-Year Plans	**6,753**	**4,425**	**1.53**	**5,040**	**1.34**

For service-based plans, the experience is comprised of Tier 2 members. When limited to the 5-year experience, decrement rates were unreasonably high. When the 10-year experience was used, results did not align with plan lucrativeness (for example, a 20-year plan appears more costly than a 20-year plan with 60ths). Therefore, service-retirement decrements were increased by a fixed 10%. This brings the A/E closer to 1.00 without over-relying on the past 5 years or merging incongruous experience periods. These assumptions may need to be revisited before the next quinquennial study.

I recommend updating active member rates of service retirement to reflect NYSLRS' active experience from April 1, 2020 through March 31, 2025, as detailed in Appendix C.

Generally, for age-based plans, recommendations include new refinements based on plan structure (such as service milestones), and for service-based plans, an increase of 10% in the prior service retirement assumption plus assumptions for newly created plans.

Effect on Contributions

The table below summarizes the projected average employer contribution rates for the most recent valuations.

Valuation 4/1	Local Employer Billing Date 2/1	ERS Avg Rate (reg plan GLIP)	PFRS Avg Rate (GLIP)	Employer Contributions/ FY Benefits ($ billions)	CSP Mitigated Rates (does not apply to GLIP, ~~strikethrough~~ => no amortizing)				CSP Amort/ Reserve (billions)
					ERS		PFRS		
					Original	Alternate	Original	Alternate	
2009	2011	11.9 (0.4)	18.2 (0.1)	$ 3.6 / 8.5	9.5%		17.5%		
2010	2012	16.3 (0.4)	21.6 (0.0)	4.9 / 8.9	10.5		18.5		
2011	2013	18.9 (0.4)	25.8 (0.1)	5.5 / 9.5	11.5		19.5		$ 0.3
2012	2014	20.9 (0.4)	28.9 (0.0)	6.2 / 10.0	12.5	12.0%	20.5	20.0%	1.1
2013	2015	20.1 (0.4)	27.6 (0.1)	6.1 / 10.5	13.5	12.0	21.5	20.0	2.1
2014	2016	18.2 (0.5)	24.7 (0.0)	5.5 / 11.1	14.5	12.5	22.5	20.5	3.3
2015	2017	15.5 (0.4)	24.3 (0.0)	4.8 / 11.5	~~15.1~~	13.0	23.5	21.0	4.1
2016	2018	15.3 (0.4)	24.4 (0.1)	4.9 / 12.1	~~14.9~~	13.5	~~24.3~~	21.5	4.2
2017	2019	14.9 (0.5)	23.5 (0.0)	4.9 / 12.8	~~14.4~~	14.0	~~23.5~~	22.0	3.8 / 0.0
2018	2020	14.6 (0.4)	23.5 (0.0)	4.9 / 13.4	~~14.2~~	~~14.2~~	~~23.5~~	22.5	3.3 / 0.0
2019	2021	14.6 (0.5)	24.4 (0.0)	5.1 / 14.0	~~14.1~~	~~14.1~~	~~24.4~~	23.0	2.8 / 0.0
2020	2022	16.2 (0.4)	28.3 (0.0)	5.9 / 14.7	15.1	14.6	25.4	23.5	2.3 / 0.0
2021	2023	11.6 (0.2)	27.0 (0.0)	4.4 / 15.4	~~14.1~~	~~14.1~~	26.4	24.0	0.8 / 0.0
2022	2024	13.1 (0.7)	27.8 (0.1)	5.1 / 16.2	~~13.1~~	~~13.6~~	27.4	24.5	0.4 / 0.0
2023	2025	15.2 (0.4)	31.2 (0.1)	6.2 / 17.4	14.1	14.1	28.4	25.0	0.1 / 0.3
2024	2026	16.5 (0.4)	33.7 (0.0)	7.1 / 17.6	15.1	14.6	29.4	25.5	0.1 / 0.4
2025	2027	17.6 (0.7)	36.5 (0.0)	$ 8.2 / 18.7	16.1%	15.1%	30.4%	26.0%	$ 0.1 / 0.2

The new entrant rate for the:

- ERS A15 Tier 6 plan is 9.9% normal cost + 1.6% GLIP & Admin = 11.5% total rate
- ERS valuation cohort is 13.2% normal cost + 1.6% GLIP & Admin = 14.8% total rate

- PFRS 384D contrib Tier 6 plan is 21.9% normal cost + 0.8% GLIP & Admin = 22.7% total rate
- PFRS valuation cohort is 25.1% normal cost + 0.8% GLIP & Admin = 25.9% total rate

The March 31, 2025 Contribution Stabilization Program (CSP) amortization balance is approximately $120 million, all held by local employers, and a CSP reserve balance of $230 million, with approximately $170 million allocated to the State and $60 million with local participating employers.

Employers participating in the CSP are always required to pay their graded rate (plus GLIP and amortization payments). For FYE 2027, the graded rate is less than the system average rate under both versions of the program and in both systems. This means all employers participating in the Original or Alternate CSP will be eligible to amortize a portion of their invoice. For employers that have a reserve fund balance, the amount eligible for amortization will first be paid using the reserve fund assets, which will reduce or eliminate the amortization and the resulting installment payments in future years.

Gain/Loss Analysis

	ERS	PFRS
FYE 2026 System Average Rate (Feb 1, 2026 payment)	**16.5%**	**33.7%**
Combined Investment Performance	0.3%	0.3%
FYE 2022 (9.5% v 5.9%)	-0.3%	-0.3%
FYE 2023 (-4.4% v 5.9%)	1.1%	1.2%
FYE 2024 (11.6% v 5.9%)	-0.5%	-0.6%
FYE 2025 (5.8% v 5.9%)	0.0%	0.0%
Combined FYE 2025 Experience	0.6%	-0.1%
Member Behavior	-0.6%	0.0%
Non-Demographic	0.1%	0.5%
Salary Increases	1.4%	0.1%
New Members	-0.4%	-0.7%
Change in Administrative Rate	0.0%	0.1%
Change in GLIP Rate	0.3%	0.0%
Miscellaneous	0.1%	0.1%
SUBTOTAL: One-Year Rate Impact	**1.3%**	**0.3%**
Data Extraction Improvements	-0.8	-0.5
Disability Assumption	-0.2	2.2
Salary Scale Assumption	1.4	0.0
Service Retirement Assumption	0.2	1.3
Payee Mortality Assumption	-0.6	-0.3
Other Assumptions	-0.2	-0.2
SUBTOTAL: Quinquennial Rate Impact	**-0.2%**	**2.5%**
Net Change in System Average Billing Rate	**1.1%**	**2.8%**
FYE 2027 System Average Rate (Feb 1, 2027 Payment)	**17.6%**	**36.5%**

The fiscal year ending 2025 was marked by significant salary growth in ERS, with investment performance continuing to apply modest upward pressure on billing rates. New entrants continue to provide rate relief.

The quinquennial study period (FYE 2021 through FYE 2025) was marked by accelerated service retirements, above average salary increases, higher rates of mortality, and costly benefit improvements. As such, it is necessary to realign several key assumptions. Accelerated retirements in 20- and 25-year plans pushed rates higher, especially in PFRS which is comprised entirely of service-based plans. An updated salary scale in ERS increased rates, but the update was deferred in PFRS. Higher rates of mortality (for both payees and actives) applied downward pressure in both systems. In addition to Tier 6 benefit improvements, several pieces of legislation targeted PFRS disability benefits (providing increased benefit amounts, additional presumptions, and higher application approval rates). New disability decrement assumptions increased PFRS billing rates.

Summary of Assumptions and Methods

I recommend updates to most demographic assumptions following the quinquennial experience study.

Major Assumption or Method	Last Changed in Valuation Dated	Assumption Recommended for the Actuarial Valuation dated April 1, 2025
Inflation	April 1, 2022	2.9%
Cost-of-Living Adjustment	April 1, 2022	1.5%
Liability Discount Rate (expected asset rate of return)	April 1, 2021	5.9%
PFRS Salary Scale	April 1, 2021	Based on System experience FYE 2012 – FYE 2021 (6.1% average expected for FYE 2025 cohort)
ERS Salary Scale	April 1, 2025	Based on System experience FYE 2016 – FYE 2025 (5.2% average expected for FYE 2025 cohort)
Asset Smoothing Method	April 1, 2021	8-year level smoothing of unexpected gain/(loss)
Payee Mortality	April 1, 2025	Varies by population
Retirees		Based on System experience FYE 2016 – FYE 2025
Beneficiaries		Society of Actuaries' PUB-2016
Mortality Improvement	April 1, 2022	Society of Actuaries' MP-2021 (for payees only)
Active-Member Decrements	April 1, 2025	Based on System experience, period varies by assumption
Death		FYE 2021 – FYE 2025
Withdrawal		FYE 2021 – FYE 2025
Disability Retirement		FYE 2021 – FYE 2025
Service Retirement		
Age-Based Plans		FYE 2021 – FYE 2025
Service-Based Plans		FYE 2020 assumptions, increased by 10% Based on System experience FYE 2016 – FYE 2025

This recommendation was reviewed by the AAC in a meeting on August 6, 2025.

Historic Employer Contribution Average Rate

Average Rate		
Year	**ERS**	**PFRS**
1972	21.9	28.8
1973	20.3	31.4
1974	21.3	32.4
1975	20.4	32.9
1976	19.7	32.3
1977	19.6	33.3
1978	19.8	34.9
1979	18.8	35.1
1980	18.1	34.2
1981	17.0	33.1
1982	15.5	29.6
1983	15.1	28.7
1984	14.4	27.3
1985	14.2	26.5
1986	10.4	19.8
1987	9.4	13.3
1988	9.7	14.8
1989	3.7	8.5
1990	3.6	8.3

Average Rate		
Year	**ERS**	**PFRS**
1991	0.3	7.8
1992	0.4	11.5
1993	0.6	14.0
1994	0.7	11.3
1995	0.7	13.9
1996	2.2	13.0
1997	3.7	9.8
1998	1.7	7.0
1999	1.3	2.4
2000	0.9	1.9
2001	0.9	1.6
2002	1.2	1.6
2003	1.5	1.4
2004	5.9	5.8
2005	12.9	17.6
2006	11.3	16.3
2007	10.7	17.0
2008	9.6	16.6
2009	8.5	15.8

Average Rate		
Year	**ERS**	**PFRS**
2010	7.4	15.1
2011	11.9	18.2
2012	16.3	21.6
2013	18.9	25.8
2014	20.9	28.9
2015	20.1	27.6
2016	18.2	24.7
2017	15.5	24.3
2018	15.3	24.4
2019	14.9	23.5
2020	14.6	23.5
2021	14.6	24.4
2022	16.2	28.3
2023	11.6	27.0
2024	13.1	27.8
2025	15.2	31.2
2026	16.5	33.7
2027	17.6	36.5

Employer Billing Rate Trend
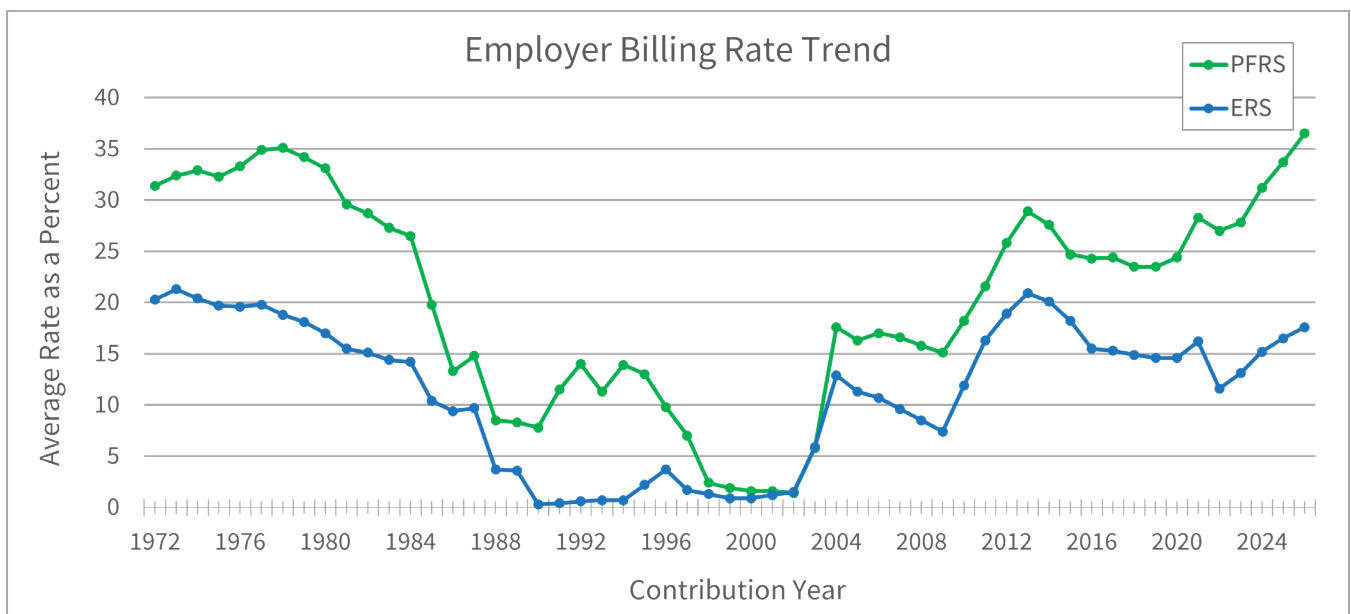
Risk Disclosures

Why should a governmental entity take on defined benefit (DB) pension risk? DB plans are an economically efficient means of attracting and retaining employees. For example, in the matter of public safety, special plans that offer half-pay at 20 or 25 years of service will guarantee income in middle age when physicality may wane while tasks remain grueling. During their career, disability and death benefits provide income protection to those who risk their lives in service to the public.

Optimizing the economic efficiencies of a DB plan requires prefunding the benefit promises, ideally by way of smooth employer contribution rates. ASOP No. 51 (Assessment and Disclosure of Risk Associated with measuring Pension Obligations and Determining Pension Plan Contributions) requires assessment and disclosure of risks inherent in the funding of DB plans. The two primary forms of risk are:

1. Insufficient employer contributions to fund the benefits, and
2. Intolerable volatility in the employer contribution rate.

Employer Contribution Sufficiency Risk

Contribution Fulfillment Risk

In New York State, employers are required to pay the actuarially determined contribution. Employers who are delinquent are pursued, and interest is charged on any late payments. Thus, there is very little risk that employer contributions will not be paid. This is the most significant component of a well-funded DB plan. Poorly funded DB plans invariably have a stretch of time when employer contributions are neglected.

Actuarial Assumptions

Actuarial assumptions and methods determine the <u>allocation</u> of benefit costs over time; they do not, however, determine the <u>ultimate</u> benefit costs. The ultimate cost of benefits is based on the lucrativeness of the promises and the performance of the assets.

A new entrant rate is the employer contribution rate that would be charged if assets equaled liabilities and all assumptions were met prospectively. As experience deviates from what was assumed, the employer billing rates deviate from the new entrant rates. When billing rates are greater than the new entrant rates, the current taxpayer is funding benefits earned in prior years. When billing rates are less than the new entrant rates, the current taxpayer is benefiting from contributions collected in prior years. The more conservative a set of assumptions, the more quickly contributions are collected, possibly levying too great a cost to current taxpayers. The less conservative a set of assumptions, the more likely contributions will increase, possibly levying too great a cost to future taxpayers. The best assumptions decrease the likelihood of deviations in one direction persisting over long periods. In so doing, governmental services are compensated by the taxpayers benefiting from those services (that is, there is intergenerational equity).

New York State Retirement and Social Security Law requires a review of all assumptions at least once every five years. To comply, NYSLRS undertakes a quinquennial comprehensive experience study with an annual review to assess reasonability. Any emerging trends that are believed to continue in the future may warrant an assumption adjustment between quinquennial studies. Assumptions are reviewed annually by the Comptroller's AAC and quinquennially by a consulting firm. The annual online publishing of the actuarial assumptions provides transparency to interested parties.

Assumed Investment Return Expectation Risk

Employer contribution rates are most sensitive to the assumed investment return. The following table shows the FYE 2027 system average billing rates and April 1, 2025 total pension liability (actuarial accrued liability under the Entry Age Normal method + dedicated assets) for various assumed investment returns using the April 1, 2025 valuation cohort. The exceedance column shows the probability that the return on assets exceeds the assumed discount rate over a 30-year period. PICM completed a comprehensive asset/ liability analysis resulting in a new AA Policy effective as of April 1, 2024. The probability of exceedance was determined using a stochastic model, which relied upon the trustee-approved target asset allocation and PICM's 2025 capital market assumptions.

Assumed Rate	Employees' Retirement System		Police and Fire Retirement System		2025 CAPM Assumptions
	FYE 2027 System Average Billing Rate	April 1, 2025 TPL ($ in billions)	FYE 2027 System Average Billing Rate	April 1, 2025 TPL ($ in billions)	Probability of Assumed Rate Exceedance
3.90%	46.0%	$314	77.7%	$63	91.2%
4.40%	38.2%	$295	66.3%	$59	86.3%
4.90%	31.0%	$278	55.8%	$55	79.5%
5.40%	24.2%	$263	45.9%	$52	72.1%
5.90%	**17.6%**	**$248.8**	**36.5%**	**$49.1**	**61.7%**
6.90%	5.4%	$224	19.1%	$44	41.7%

ASOP No. 4 (Measuring Pension Obligations and Determining Pension Plan Costs or Contributions) requires disclosure of a Low-Default Risk Obligation Measure (LDROM). It represents the funding liability if the plan invested solely in high-quality bonds with cash flows matching future benefit payments. An all-bond investment strategy is approximated by an assumed rate of return of 3.9% resulting in a liability of approximately $314 billion in ERS and $63 billion in PFRS. Under the current discount rate, which compares to the rate of return on the plan's diversified portfolio, the pension liability is approximately $248.8 billion in ERS and $49.1 billion in PFRS. The difference between these liability measures represents the expected tax savings due to investment in the plan's diversified portfolio instead of solely in high-quality bonds. If the plan switched to investing in high-quality bonds, the lower LDROM implies higher employer contribution rates. Unnecessarily high contribution rates in the near term may not be affordable and could jeopardize the sustainability of the DB plan.

Inflation and Salary Scale Expectation Risk

The inflation assumption is used to compute COLA payments to retirees and beneficiaries. The COLA program provides payments equal to one-half of the inflation rate based on the first $18,000 of the single life allowance. A floor of 1% and a cap of 3% reduces the risk of extreme gains or losses due to inflation being different than assumed.

The salary scale assumption is used to project future increases in a member's salary to estimate the FAS at retirement and determine the billable salary over a member's career. If members receive greater salary increases than assumed, greater benefits will be paid out in the future than expected, requiring an increase in employer contributions to make up for the shortfall. Salary increases being different from assumed typically comprise the largest component of gains and losses related to active members.

Demographic Expectation Risks

Demographic assumptions estimate member behavior regarding decrements (that is, change in status) such as retiring, withdrawing or dying. Since NYSLRS is large (over 1.2 million participants), many of these assumptions are developed with a high degree of credibility using NYSLRS' own experience. Actual/Expected (A/E) ratios are displayed earlier in this report to show how actual retiree mortality and active-member decrements track expectations. Decrements vary within a relatively narrow range, so there is measured risk of significant gains or losses in this valuation component.

NYSLRS is not large enough to develop in-house mortality <u>improvement</u> assumptions and thus relies on mortality improvement scales based on nationwide experience derived from data collected from the Social Security Administration by the Society of Actuaries (SOA). This report recommends using scale MP-2021 for the April 1, 2025 valuation. Updated SOA tables gradually incorporate new data after decades of experience, and there is low risk of significant gains or losses in this valuation component.

Employer Contribution Volatility Risk

Investment Volatility Risk

Employer contribution rate smoothness is most sensitive to the investment return experience. We can evaluate exposure to investment volatility risk using the following Asset Leverage Ratio:

$$Asset\ Leverage\ Ratio\ =\ \frac{Fair\ Value\ of\ Assets\ (FVA)}{Present\ Value\ of\ Valuation\ Cohort\ Billable\ Salary\ (PVBS)}$$

The following table displays the ratio and its components in the middle of the last four decades and for the most recent year (dollar amounts in billions).

ERS

FYE	1985	1995	2005	2015	2025
FVA	$22.8	$53.3	$108.7	$161.2	$230.5
PVBS	$102.0	$158.2	$176.1	$203.1	$323.3
Asset Leverage Ratio	22%	34%	62%	79%	71%
Smoothing Period	5	5	5	5	8
Smoothed Asset Leverage Ratio	4.5%	6.7%	12.3%	15.9%	8.9%

PFRS

FYE	1985	1995	2005	2015	2025
FVA	$4.1	$9.8	$19.3	$28.2	$42.6
PVBS	$11.9	$16.5	$27.0	$30.9	$49.2
Asset Leverage Ratio	34%	59%	71%	91%	87%
Smoothing Period	5	5	5	5	8
Smoothed Asset Leverage Ratio	6.9%	11.9%	14.3%	18.3%	10.8%

The ratio is zero at plan inception but increases as assets accumulate. Poor investment performance in a new plan is not problematic as there was not much asset value to lose and there was plenty of billable salary from which to collect contributions and accumulate assets before benefits become due. In a more mature fund with a high asset leverage ratio, investment volatility has a greater impact on the employer contribution rate. NYSLRS is now a mature plan with the associated significant exposure to investment volatility risk.

Increasing Plan Maturity

Pension plans mature slowly with a regular infusion of new entrants and the release of liabilities as retirees die. A pension plan becomes mature when those collecting a benefit (payees) outweigh those contributing to the plan (active members). The following ratio of the payee actuarial accrued liability to total actuarial accrued liability shows the scales tipping in favor of the payee population.

Ratio of Payee Accrued Liability to Total Accrued Liability

FYE	1985	1995	2005	2015	2025
ERS	21%	26%	45%	54%	61%
PFRS	20%	36%	54%	58%	67%

As NYSLRS becomes more heavily steeped in payee liability shortfalls of assets will trigger a larger increase in the billing rates, as a smaller contribution base must recoup the shortfall for a larger inactive population. Since active members must support the payee liability after a market decline, it may be necessary to limit investment risk. Liquidity risk also becomes a concern if the cash contributions are not enough to pay benefit payments as they come due.

Cashflow Timing Risk

Cash assets are required to fulfill benefit promises when due. As a plan matures and more benefits are being paid out of the fund, there is a cash flow concern. The net cash flow is the difference between the cash inflows (employer contributions, member contributions, and member loan repayments) and the cash outflows (benefit payments and administrative expenses). A positive net cash flow indicates that assets are accumulating. A negative net cash flow will require the drawdown of assets (or investment gains) to pay benefits.

$$\text{Net Benefits Cash Flow Ratio} = \frac{\text{Contributions - Benefit Payments and Expenses}}{\text{Fair Value of Assets}}$$

NYSLRS has had a negative net cash flow over recent years, but this does not indicate a financial hardship. The purpose of prefunding a pension plan is to accumulate assets, which are then drawn down to settle benefits. In fact, negative net cash flows are expected when a system is well-funded, because employer contributions (the largest source of cash inflow) are relatively lower.

However, a slow and steady change in membership demographics will change a pension plan's liquidity needs and risk exposure. To monitor exposure to liquidity risk over time, we can use the Net Cash Flow Ratio.

Net Benefits Cash Flow Ratio by Fiscal Year

FYE	1995	2005	2015	2025
ERS	-3.1%	-1.8%	-2.3%	-3.8%
PFRS	-2.1%	-2.3%	-2.4%	-2.8%

Because its net cash flow is relatively small compared to its assets, the ability of NYSLRS to make timely benefit payments is not impaired and there is little concern of liquidity risk in the near term. Liquidity concerns are further mitigated by cash flows available from assets (interest, dividends, bond maturities, and rental income from real estate) and the ability to sell highly liquid assets to meet benefit requirements.

A negative Net Cash Flow Ratio does make the system more sensitive to short-term investment performance. After a market decline, it is necessary to draw down liquid assets to continue benefit payments. This can compete with an investment strategy directing the purchase of cheap equity investments in anticipation of a market recovery, potentially constraining the flexibility of the PICM division. More conservative asset allocations may limit exposure to market declines, while larger cash allocation could improve flexibility. But both would be expected to reduce the expected investment return in the long term. While higher expected returns could reduce contributions, a negative net cashflow creates a risk that is greatly reduced by a lower liability discount rate.

The negative Net Cash Flow Ratio can also be viewed in terms of continued accumulation of assets. Cash inflows are directed toward benefits, so the fund is reliant upon investment income to continue asset accumulation. This increases exposure to investment risk.

Mitigating Employer Contribution Volatility Risk

NYSLRS' Actuarial Valuation currently employs two methods to reduce employer contribution rate volatility.

First, an 8-year smoothing method is used to dampen annual investment return volatility. Any deviations from the current expected return of 5.9% are recognized as equal increments over a period of eight years. Note that 8-year smoothing in 2024 has the same impact as 5-year smoothing in the late 1990s for PFRS, and early 2000s in ERS.

Second, the Contribution Stabilization Program (CSP) was signed into law in 2010. The Alternate Contribution Stabilization Program (Alternate CSP) was signed in 2014 and had a one-year opt-in window. The CSP provides an optional additional layer of employer contribution rate smoothing. Under the CSP, on the billing date, a participating employer is required to remit a graded rate contribution and permitted to amortize over a 10-year period the balance between the actuarial contribution and the graded rate contribution (12-year period for the Alternate CSP). The graded rate increases or decreases by up to 1% each year (0.5% for the Alternate CSP) in the direction of the system's average contribution rate. During "ordinary" investment periods, the actuarial and graded rates converge. Large deviations may occur when there is extraordinary asset performance, such as after the Global Financial Crisis of 2008 or the COVID pandemic.

The graphs on the following page show the graded rates versus the system average rates over the course of both programs. The system average rates are much more volatile than the graded rates. The graded rates peak lower and later than the system average rates. Therefore, employers in the CSP experience less contribution risk due to increased stability of billing rates.

Employees' Retirement System

Police and Fire Retirement System
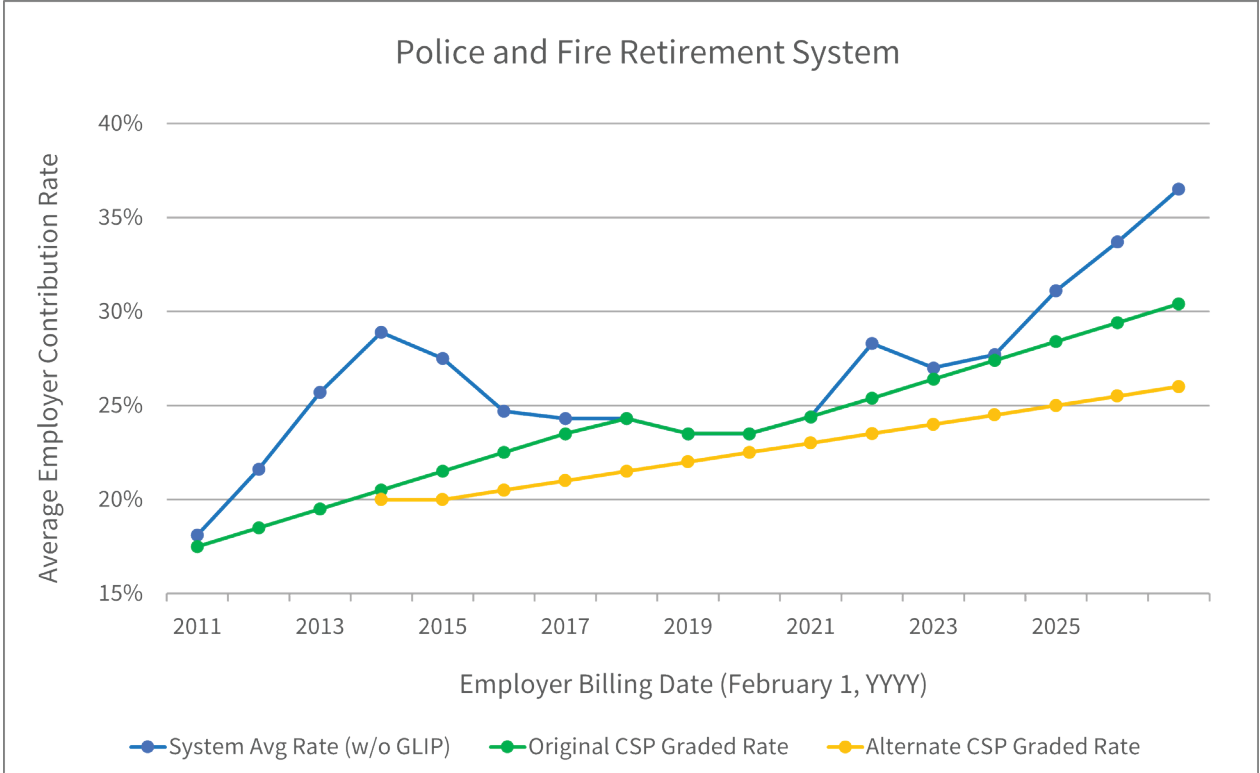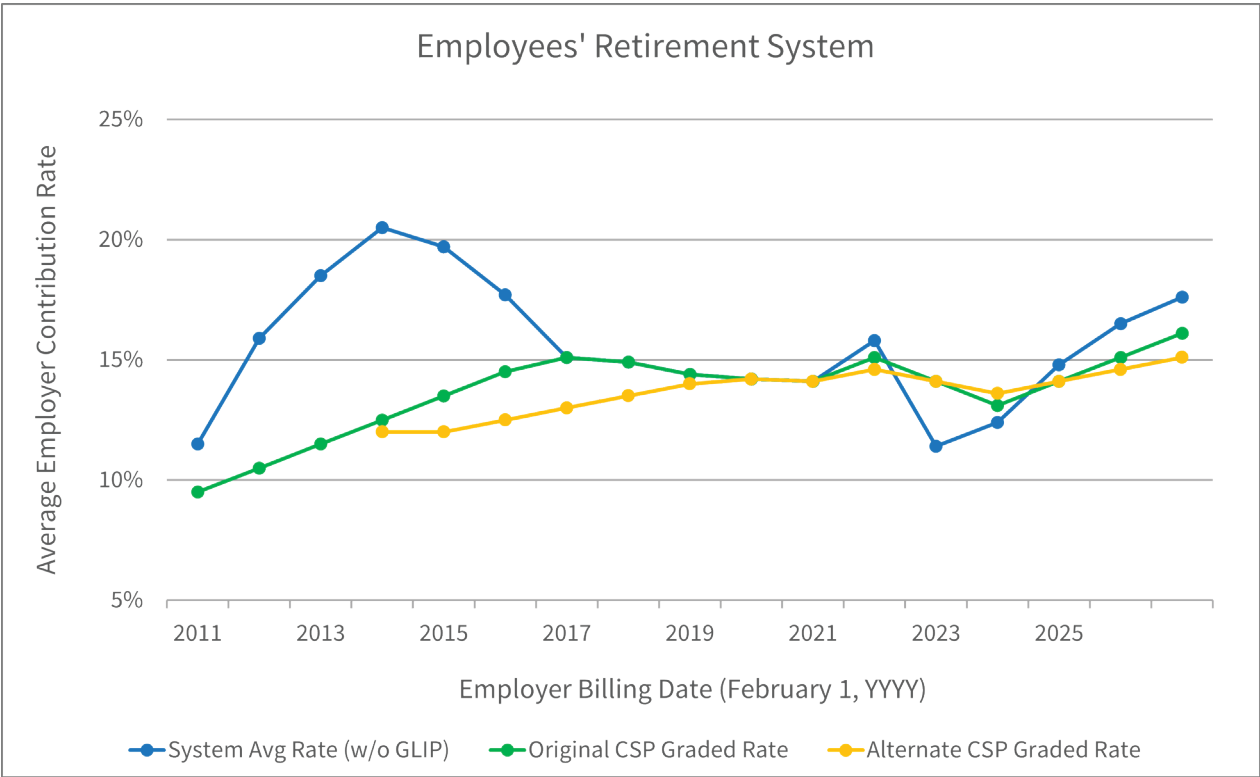
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Appendices

Appendix A: History of Cashflows, Assets, and Billing Rates

FYE 3/31	Contributions* [C] Employer	Contributions* [C] Employee	Benefits* [B]	Invested Assets* [CRF]	(C-B)/CRF	S&P 500	Assumed CRF Return	Average Employer Contribution Rate ERS	Average Employer Contribution Rate PFRS
1970	$ 299.2	$ 75.0	$ 158.2	$ 3,532.6	6.1%	89.63	4.87%	18.9%	22.2%
1971	346.0	77.4	194.3	3,888.2	5.9	100.31	4.87	19.8	23.9
1972	490.8	80.4	243.2	4,389.5	7.5	107.20	4.87	21.9	28.8
1973	553.0	73.0	287.9	5,167.8	6.5	111.52	4.87	20.3	31.4
1974	664.5	61.6	334.6	5,393.0	7.3	93.98	4.87	21.3	32.4
1975	749.3	52.9	373.4	5,915.3	7.2	83.36	5.50	20.4	32.9
1976	872.2	48.0	431.0	7,080.7	6.9	102.77	5.50	19.7	32.3
1977	981.3	41.7	461.3	7,852.0	7.2	98.42	5.50	19.6	33.3
1978	1,001.4	71.7	516.8	8,812.5	6.3	89.21	5.50	19.8	34.9
1979	1,020.6	61.2	568.8	10,326.7	5.0	101.59	5.50	18.8	35.1
1980	1,296.7	34.5	631.4	11,725.9	6.0	102.09	5.50	18.1	34.2
1981	1,296.0	47.8	695.5	14,194.6	4.6	136.00	5.50	17.0	33.1
1982	1,363.9	61.5	755.8	15,088.5	4.4	111.96	7.50	15.5	29.6
1983	1,481.3	84.0	840.3	18,626.5	3.9	152.96	7.50	15.1	28.7
1984	1,496.1	97.5	940.5	20,618.3	3.2	159.18	7.50	14.4	27.3
1985	1,610.5	116.0	1,063.4	24,062.3	2.8	180.66	7.50	14.2	26.5
1986	1,277.0	132.3	1,157.0	29,926.1	0.8	238.90	8.00	10.4	19.8
1987	1,174.0	151.2	1,275.8	35,621.8	0.1	291.70	8.00	9.4	13.3
1988	1,321.3	188.5	1,381.9	35,812.5	0.4	258.89	8.00	9.7	14.8
1989	759.4	194.7	1,624.7	40,280.6	-1.7	294.87	8.75	3.7	8.5
1990	412.2	229.9	1,670.4	45,189.3	-2.3	339.94	8.75	3.6	8.3
1991	-72.4	255.3	1,834.2	48,945.5	-3.4	375.22	8.75	0.3	7.8
1992	356.8	287.0	2,067.7	51,925.8	-2.7	403.69	8.75	0.4	11.5
1993	369.8	284.1	2,267.9	56,428.9	-2.9	451.67	8.75	0.6	14.0
1994	530.1	307.5	2,393.7	58,416.8	-2.7	445.77	8.75	0.7	11.3
1995	315.1	334.0	2,527.9	63,406.6	-3.0	500.71	8.75	0.7	13.9
1996	776.9	341.9	2,877.9	74,827.9	-2.4	645.50	8.75	2.2	13.0
1997	903.5	348.2	3,122.0	82,333.8	-2.3	757.12	8.75	3.7	9.8
1998	462.6	369.4	3,305.0	104,921.8	-2.4	1,101.75	8.50	1.7	7.0
1999	291.7	399.8	3,482.0	111,008.7	-2.5	1,286.37	8.50	1.3	2.4
2000	164.5	422.7	3,720.2	127,138.9	-2.5	1,498.58	8.50	0.9	1.9
2001	214.8	319.1	4,181.0	112,432.9	-3.2	1,160.33	8.00	0.9	1.6
2002	263.8	210.2	4,488.3	111,168.5	-3.6	1,147.39	8.00	1.2	1.6
2003	651.9	219.2	4,984.6	95,598.3	-4.3	848.18	8.00	1.5	1.4
2004	1,286.5	221.9	5,347.5	119,245.0	-3.2	1,126.21	8.00	5.9	5.8
2005	2,964.8	227.3	5,674.7	126,083.5	-2.0	1,180.59	8.00	12.9	17.6
2006	2,782.2	241.2	6,028.9	140,453.3	-2.1	1,294.87	8.00	11.3	16.3
2007	2,718.6	250.2	6,383.4	154,575.5	-2.2	1,420.86	8.00	10.7	17.0
2008	2,648.4	265.7	6,835.6	153,877.7	-2.5	1,322.70	8.00	9.6	16.6
2009	2,456.2	273.3	7,212.1	108,960.7	-4.1	797.87	8.00	8.5	15.8
2010	2,344.2	284.3	7,718.9	132,500.2	-3.8	1,169.43	8.00	7.4	15.1
2011	4,164.6	286.2	8,520.2	147,237.0	-2.8	1,325.83	7.50	11.9	18.2
2012	4,585.2	273.2	8,937.8	150,658.9	-2.7	1,408.47	7.50	16.3	21.6
2013	5,336.0	269.1	9,521.5	160,660.8	-2.4	1,569.19	7.50	18.9	25.8
2014	6,064.1	281.4	9,977.5	176,835.1	-2.1	1,872.34	7.50	20.9	28.9
2015	5,797.4	284.8	10,513.7	184,502.0	-2.4	2,067.89	7.50	20.1	27.6
2016	5,140.2	306.6	11,060.5	178,639.7	-3.1	2,059.74	7.00	18.2	24.7
2017	4,787.0	328.8	11,508.3	192,410.6	-3.3	2,362.72	7.00	15.5	24.3
2018	4,823.3	349.4	12,128.9	207,416.0	-3.4	2,640.87	7.00	15.3	24.4
2019	4,744.3	386.5	12,833.9	210,523.7	-3.7	2,834.40	6.80	14.9	23.5
2020	4,782.7	453.7	13,311.1	194,317.2	-4.2	2,584.59	6.80	14.6	23.5
2021	5,029.8	492.3	14,122.0	258,135.8	-3.3	3,972.89	6.80	14.6	24.4
2022	5,627.7	577.6	14,905.0	272,121.3	-3.4	4,530.41	5.90	16.2	28.3
2023	4,404.1	656.8	15,174.3	248,524.9	-4.1	4,109.31	5.90	11.4	27.0
2024	5,054.5	788.8	15,808.7	268,088.7	-4.0	5,243.77	5.90	13.1	27.8
2025	$ 6,206.3	$ 963.9	$ 16,425.3	$ 273,287.5	-3.4%	5,611.85	5.90%	15.2%	31.2%

* Millions of dollars

Appendix B: Long-Term New Entrant Rates

New Entrant Rates (NER) are a measurement of the Employer Contribution Rate expected, based on current assumptions, for a hypothetical new hire entering a system with no unfunded liability/asset. Basically, it represents the employer billing rate necessary to fully fund the plan benefits for an individual in a vacuum. These rates are colloquially called the "long-term rates."

Generally, actual billing rates will be higher than the NER, with the excess used to reduce the system's unfunded liability, if any. Should the system reach fully funded status (net assets equal or exceed present value of future benefits), excess assets would *reduce* billing rates below the NER.

By comparing different plans' NER, we gain insight into the relative generosity of each plan. Plans with higher NER are more costly to employers and more lucrative to members.

At NYSLRS, one funding objective is the alignment of employer costs with value of member benefits. An employer providing lucrative benefits should contribute more than an employer offering lesser benefits. Charging all employers the same billing rate would cause a "race to the top" as superior benefits could be offered without material increases in the employer's required contributions, effectively subsidized by those offering lesser benefits. The NER is used to scale the system's "basic rate" and provide different billing rates for each plan, where more lucrative plans have higher employer billing rates.

ERS

Plan Type	Model Plan	Tier 4	Tier 6
Age 55 Retirement	Article 15	16.1%	9.9%
Age 55 Retirement (Unified Court Peace Officers)	UCPO	17.3	11.3
50% benefit at 25 years	89-p	18.5	12.8
50% benefit at 25 years (State Correction Officers)	A14CO	22.3	17.1
50% benefit at 25 years and 60% benefit at 30 years	89-f	18.7	13.4
50% benefit at 25 years and additional 60ths thereafter	89-v	19.7	14.7
50% benefit at 25 years (law enforcement only)	551	21.4	15.8
50% benefit at 20 years (law enforcement only)	552	26.7	21.5
50% benefit at 20 years and additional 60ths thereafter (law enforcement only)	553	27.0	22.3

PFRS

Plan Type	Model Plan	Tier 2	Tier 6*
Age 55 Retirement	375-i	20.3%	13.1%
Age 55 Retirement with no early age reductions	375ijp	20.6	13.4
50% benefit at 25 years	384	23.6	17.3
50% benefit at 25 years and additional 60ths thereafter	383-d	24.8	18.0
Police and Fire Article 14	PFA14	27.8**	N/A
50% benefit at 20 years	384-d	28.1	21.9
50% benefit at 20 years and additional 60ths thereafter	384-e	28.5	22.2
50% benefit at 20 years and additional 60ths thereafter	381-b	29.8	22.7

* When member contributions are required

** Tier 3

Appendix C: Assumption Details

This section strives to disclose all material assumptions, and details various decrement rates used in the valuation.

Some miscellaneous assumptions for ERS include:

- When a disability benefit is subject to a workers' compensation offset, we assume the offset is 10% of FAS. This is a change from an offset of 15% previously assumed.

- Some members can convert unused sick leave at retirement into additional service credit. We assume that 3 days are credited for each year of service for Tiers 1–5 and 2 days per year of service for Tier 6.

- Members in Tiers 5 and 6 are subject to a limitation on how much overtime can be included in FAS.

    ◦ For Tier 5, the limit increases 3% each year.

    ◦ For Tier 6, the limit is indexed to inflation.

    We assume no valuation impact.

- When calculating a Tier 6 member's FAS, each year's salary is capped at the Governor's salary, which increased to $250,000 in 2021. While it has not increased since 2021, the Governor's salary is assumed to increase annually by the assumed rate of inflation in years after the valuation date.

- For projecting the billable salary base, tier specific assumptions are used, as shown below.

Tier	1	2	3	4	5	6
Payroll Projection Factor	0.75	0.75	0.96	0.96	1.02	1.20

Some miscellaneous assumptions for PFRS include:

- When a disability benefit is subject to a workers' compensation offset, we assume the offset is 3.5% of FAS. This is a change from an offset of 5% previously assumed. For accidental death benefits, we assume the workers' compensation offset is 18% of the FAS, and we assume the social security offset is 6% of salary.

- Some members can convert unused sick leave at retirement into additional service credit. We assume that 4 days are credited for each year of service, subject to a maximum of 165 days.

- Some members are entitled to a benefit based upon a 1-year FAS. In these cases, salary is seen to increase faster than the assumed salary scale in the year prior to retirement. A factor (*OneYearFAS*) is multiplied by the plan's usual FAS calculation to estimate the 1-year FAS.

  ○ For Tier 1 members with date of membership prior to April 1, 1972, *OneYearFAS* is 1.08.

  ○ For Tiers 5 and 6, where more strict overtime limits apply, *OneYearFAS* is 1.14.

  ○ And for all others, *OneYearFAS* is 1.18.

- Members in Tiers 5 and 6 are subject to a narrower definition of how much overtime can be included in FAS. This reduces the lucrativeness of Tier 5 and 6 plans relative to earlier tiers. Therefore, in calculating plan indices, the active valuation includes an *OTLimit* factor that trims liabilities by 5% for affected plans. This factor is not used in developing valuation liabilities.

- When calculating a Tier 6 member's FAS, each year's salary is capped at the Governor's salary, which increased to $250,000 in 2021. While it has not increased since 2021, the Governor's salary is assumed to increase annually by the assumed rate of inflation in years after the valuation date.

- For projecting the billable salary base, tier specific assumptions are used, as shown below.

Tier	1	2	3	4	5	6
Payroll Projection Factor	0.50	0.90	0.90	N/A	1.05	1.20

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The remainder of this appendix provides the assumed decrement rates for retiree mortality (including beneficiary mortality) and active-member decrements (withdrawal, death, disability, service retirement) and salary scale assumptions, for both systems.

Assumption sets are presented in a series of tables organized by system and decrement type.

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[1] The base mortality (qx) is generally only changed once every five years, with the quinquennial review. We assume the base mortality is "as of" the midpoint of the experience study period (10/1/2022). The valuation projects benefits payable in the future. For each year projected forward, an additional year of mortality improvement applies. Therefore, the valuation mortality rates shown here are only illustrative of the initial value and are only applicable in the first year of the valuation.

[2] In the active valuation, it is assumed that all beneficiaries will be females with the same age as the member.

TABLE 1: Healthy Retiree Mortality Probability — ERS Age-Based Plans

Effective 10/1/2022, prior to application of MP-2021 mortality improvement

Age	White Collar "Clerks"		Blue Collar "Laborers"	
	q_x, Male	q_x, Female	q_x, Male	q_x, Female
55	0.00503	0.00328	0.00493	0.00457
56	0.00545	0.00368	0.00565	0.00503
57	0.00588	0.00407	0.00638	0.00547
58	0.00633	0.00447	0.00710	0.00588
59	0.00681	0.00460	0.00730	0.00627
60	0.00731	0.00476	0.00756	0.00664
61	0.00784	0.00497	0.00791	0.00700
62	0.00832	0.00522	0.00832	0.00736
63	0.00882	0.00554	0.00882	0.00772
64	0.00940	0.00592	0.00940	0.00810
65	0.01007	0.00639	0.01007	0.00852
66	0.01087	0.00696	0.01087	0.00901
67	0.01181	0.00763	0.01181	0.00960
68	0.01292	0.00842	0.01292	0.01033
69	0.01416	0.00934	0.01422	0.01124
70	0.01549	0.01040	0.01574	0.01235
71	0.01703	0.01161	0.01750	0.01370
72	0.01880	0.01297	0.01951	0.01529
73	0.02084	0.01450	0.02180	0.01714
74	0.02319	0.01622	0.02439	0.01924
75	0.02588	0.01816	0.02731	0.02161
76	0.02898	0.02037	0.03061	0.02427
77	0.03254	0.02288	0.03433	0.02727
78	0.03663	0.02576	0.03854	0.03067
79	0.04132	0.02907	0.04331	0.03456
80	0.04667	0.03289	0.04873	0.03904
81	0.05276	0.03729	0.05488	0.04423
82	0.05967	0.04236	0.06186	0.05023
83	0.06745	0.04815	0.06978	0.05712
84	0.07617	0.05477	0.07873	0.06498
85	0.08589	0.06228	0.08880	0.07386
86	0.09665	0.07076	0.10009	0.08377
87	0.10849	0.08027	0.11265	0.09473
88	0.12143	0.09090	0.12658	0.10671
89	0.13548	0.10268	0.14191	0.11970
90	0.15067	0.11568	0.15870	0.13367
91	0.16699	0.12995	0.17699	0.14859
92	0.18444	0.14552	0.19681	0.16446
93	0.20303	0.16243	0.21817	0.18127
94	0.22275	0.18070	0.24109	0.19901
95	0.24360	0.20037	0.26557	0.21766
96	0.26024	0.21796	0.28173	0.23487
97	0.27839	0.23715	0.29936	0.25364
98	0.29806	0.25794	0.31845	0.27398
99	0.31924	0.28033	0.33902	0.29589
100	0.34193	0.30432	0.36105	0.31936
101	0.36689	0.33071	0.38528	0.34518
102	0.39488	0.36030	0.41246	0.37412
103	0.42665	0.39388	0.44330	0.40698
104	0.46447	0.43386	0.48003	0.44610
105	0.50985	0.48184	0.52409	0.49304
106	0.56507	0.54021	0.57770	0.55015
107	0.63466	0.61378	0.64527	0.62213
108	0.72391	0.70814	0.73193	0.71444
109	0.84116	0.83208	0.84577	0.83571
110	1.00000	1.00000	1.00000	1.00000

TABLE 2: Disabled Retiree Mortality Probability — ERS Age-Based Plans
Effective 10/1/2022, prior to application of MP-2021 mortality improvement

Age	q_x, Male	q_x, Female	Age	q_x, Male	q_x, Female
15	0.00011	0.00006	63	0.02437	0.02267
16	0.00013	0.00006	64	0.02553	0.02343
17	0.00018	0.00008	65	0.02687	0.02430
18	0.00150	0.00150	66	0.02844	0.02531
19	0.00170	0.00170	67	0.03025	0.02643
20	0.00180	0.00180	68	0.03233	0.02771
21	0.00190	0.00190	69	0.03472	0.02915
22	0.00200	0.00200	70	0.03742	0.03074
23	0.00220	0.00220	71	0.04051	0.03252
24	0.00230	0.00230	72	0.04391	0.03449
25	0.00250	0.00250	73	0.04780	0.03670
26	0.00260	0.00260	74	0.05208	0.03924
27	0.00280	0.00280	75	0.05686	0.04200
28	0.00300	0.00300	76	0.06216	0.04504
29	0.00320	0.00320	77	0.06794	0.04848
30	0.00340	0.00340	78	0.07425	0.05236
31	0.00370	0.00370	79	0.08128	0.05666
32	0.00390	0.00390	80	0.08920	0.06145
33	0.00420	0.00420	81	0.09709	0.06689
34	0.00450	0.00450	82	0.10572	0.07296
35	0.00480	0.00480	83	0.11565	0.07965
36	0.00548	0.00548	84	0.12611	0.08719
37	0.00615	0.00615	85	0.13725	0.09544
38	0.00683	0.00683	86	0.14887	0.10447
39	0.00751	0.00751	87	0.16208	0.11425
40	0.00819	0.00819	88	0.17507	0.12484
41	0.00908	0.00893	89	0.18948	0.13612
42	0.00959	0.00959	90	0.20479	0.14843
43	0.01058	0.01034	91	0.22146	0.16129
44	0.01141	0.01108	92	0.23862	0.17528
45	0.01227	0.01227	93	0.25692	0.18944
46	0.01304	0.01304	94	0.27601	0.20445
47	0.01374	0.01374	95	0.29448	0.22065
48	0.01449	0.01449	96	0.31000	0.23779
49	0.01533	0.01533	97	0.32693	0.25650
50	0.01611	0.01611	98	0.34527	0.27676
51	0.01680	0.01680	99	0.36503	0.29858
52	0.01746	0.01746	100	0.38619	0.32196
53	0.01800	0.01800	101	0.40948	0.34768
54	0.01855	0.01855	102	0.43558	0.37652
55	0.01902	0.01902	103	0.46521	0.40925
56	0.01944	0.01944	104	0.50049	0.44822
57	0.02000	0.02000	105	0.54282	0.49498
58	0.02059	0.02059	106	0.59432	0.55187
59	0.02117	0.02101	107	0.65923	0.62357
60	0.02174	0.02125	108	0.74248	0.71554
61	0.02248	0.02159	109	0.85184	0.83634
62	0.02337	0.02207	110	1.00000	1.00000

TABLE 3: Service and Disabled Retiree Mortality Probability — ERS Service-Based Plans and PFRS Plans

Effective 10/1/2022, prior to application of MP-2021 mortality improvement

Age	q_x, Service Retirees	q_x, Disabled Retirees	Age	q_x, Service Retirees	q_x, Disabled Retirees
35	0.00055	0.00180	73	0.01796	0.02202
36	0.00073	0.00190	74	0.02036	0.02522
37	0.00090	0.00205	75	0.02309	0.02892
38	0.00105	0.00220	76	0.02622	0.03316
39	0.00120	0.00235	77	0.02982	0.03799
40	0.00135	0.00250	78	0.03397	0.04343
41	0.00148	0.00270	79	0.03877	0.04951
42	0.00160	0.00290	80	0.04430	0.05625
43	0.00172	0.00310	81	0.05065	0.06368
44	0.00182	0.00330	82	0.05792	0.07182
45	0.00192	0.00355	83	0.06620	0.08068
46	0.00200	0.00375	84	0.07557	0.09030
47	0.00208	0.00400	85	0.08608	0.10068
48	0.00214	0.00412	86	0.09782	0.11186
49	0.00218	0.00424	87	0.11084	0.12385
50	0.00221	0.00427	88	0.12518	0.13667
51	0.00222	0.00433	89	0.14089	0.15034
52	0.00222	0.00444	90	0.15802	0.16486
53	0.00222	0.00459	91	0.17660	0.18026
54	0.00222	0.00478	92	0.19665	0.19665
55	0.00224	0.00500	93	0.21819	0.21819
56	0.00229	0.00525	94	0.24123	0.24123
57	0.00238	0.00554	95	0.26579	0.26579
58	0.00253	0.00586	96	0.28194	0.28194
59	0.00275	0.00621	97	0.29956	0.29956
60	0.00306	0.00659	98	0.31865	0.31865
61	0.00347	0.00700	99	0.33921	0.33921
62	0.00398	0.00746	100	0.36124	0.36124
63	0.00460	0.00797	101	0.38546	0.38546
64	0.00533	0.00855	102	0.41263	0.41263
65	0.00617	0.00922	103	0.44347	0.44347
66	0.00713	0.01001	104	0.48018	0.48018
67	0.00821	0.01094	105	0.52423	0.52423
68	0.00942	0.01207	106	0.57783	0.57783
69	0.01077	0.01342	107	0.64538	0.64538
70	0.01227	0.01504	108	0.73201	0.73201
71	0.01396	0.01698	109	0.84582	0.84582
72	0.01584	0.01929	110	1.00000	1.00000

TABLE 4: Beneficiary Mortality Probability

Effective 10/1/2022, prior to further application of MP-2021 mortality improvement

Age	q_x, Male	q_x, Female	Age	q_x, Male	q_x, Female
45	0.00560	0.00245	78	0.04154	0.02687
46	0.00593	0.00248	79	0.04668	0.03016
47	0.00627	0.00252	80	0.05244	0.03395
48	0.00664	0.00257	81	0.05887	0.03832
49	0.00705	0.00262	82	0.06601	0.04332
50	0.00752	0.00269	83	0.07395	0.04900
51	0.00764	0.00287	84	0.08280	0.05545
52	0.00780	0.00308	85	0.09270	0.06269
53	0.00800	0.00331	86	0.10375	0.07078
54	0.00823	0.00357	87	0.11610	0.07982
55	0.00851	0.00386	88	0.12987	0.08989
56	0.00883	0.00419	89	0.14520	0.10108
57	0.00918	0.00454	90	0.16219	0.11347
58	0.00958	0.00494	91	0.17973	0.12686
59	0.01001	0.00535	92	0.19713	0.14103
60	0.01047	0.00580	93	0.21408	0.15594
61	0.01097	0.00626	94	0.23067	0.17144
62	0.01150	0.00674	95	0.24703	0.18761
63	0.01206	0.00725	96	0.26424	0.20493
64	0.01268	0.00778	97	0.28226	0.22315
65	0.01335	0.00836	98	0.30139	0.24227
66	0.01410	0.00896	99	0.32180	0.26221
67	0.01493	0.00963	100	0.34333	0.28297
68	0.01589	0.01038	101	0.36547	0.30422
69	0.01699	0.01122	102	0.38711	0.32563
70	0.01830	0.01217	103	0.40806	0.34694
71	0.01988	0.01324	104	0.42830	0.36802
72	0.02174	0.01447	105	0.44738	0.38869
73	0.02394	0.01587	106	0.46550	0.40867
74	0.02652	0.01748	107	0.48250	0.42796
75	0.02953	0.01936	108	0.49429	0.44634
76	0.03300	0.02152	109	0.49506	0.46374
77	0.03699	0.02400	110	1.00000	1.00000

The Society of Actuaries Pub-2016 rates of contingent annuitant mortality commence at age 45 and are centered at January 1, 2016. For ages 0–17, Pub-2016 Juvenile mortality was assumed. For ages 18–44, Pub-2016 Healthy Annuitant mortality was assumed.

In addition, to ensure these beneficiary mortality rates have the same effective date as NYSLRS other mortality assumptions, it was necessary to apply MP-2021 mortality improvement to the published Pub-2016 mortality rates (thereby advancing the center period of study from January 1, 2016 to NYSLRS center of October 1, 2022).

TABLE 5: Active Death and Total Disability Probability (Population Average)

Age	ERS Age-Based Plans			ERS Service-Based Plans* and PFRS Plans		
	Ordinary Death	Accidental Death	Total Disability** (no POD)	Ordinary Death	Accidental Death	Total Disability** (with POD)
15	0.00013	0.00001	0.00003	0.00010	0.00001	0.00047
16	0.00014	0.00001	0.00003	0.00011	0.00001	0.00047
17	0.00014	0.00001	0.00004	0.00011	0.00001	0.00047
18	0.00015	0.00001	0.00004	0.00011	0.00001	0.00047
19	0.00017	0.00001	0.00005	0.00013	0.00001	0.00047
20	0.00018	0.00001	0.00005	0.00014	0.00001	0.00047
21	0.00019	0.00001	0.00006	0.00014	0.00001	0.00047
22	0.00020	0.00001	0.00007	0.00015	0.00001	0.00047
23	0.00022	0.00001	0.00008	0.00017	0.00001	0.00047
24	0.00023	0.00001	0.00009	0.00017	0.00001	0.00047
25	0.00025	0.00001	0.00010	0.00019	0.00001	0.00047
26	0.00026	0.00001	0.00011	0.00020	0.00001	0.00047
27	0.00028	0.00001	0.00013	0.00021	0.00001	0.00047
28	0.00030	0.00001	0.00014	0.00023	0.00001	0.00047
29	0.00032	0.00001	0.00016	0.00024	0.00001	0.00047
30	0.00034	0.00001	0.00019	0.00026	0.00001	0.00047
31	0.00037	0.00001	0.00021	0.00028	0.00001	0.00068
32	0.00039	0.00001	0.00024	0.00029	0.00001	0.00093
33	0.00042	0.00001	0.00027	0.00032	0.00001	0.00124
34	0.00045	0.00001	0.00030	0.00034	0.00001	0.00159
35	0.00048	0.00001	0.00034	0.00036	0.00001	0.00198
36	0.00051	0.00001	0.00039	0.00038	0.00001	0.00241
37	0.00055	0.00001	0.00044	0.00041	0.00001	0.00289
38	0.00059	0.00001	0.00050	0.00044	0.00001	0.00342
39	0.00063	0.00001	0.00057	0.00047	0.00001	0.00401
40	0.00067	0.00001	0.00064	0.00050	0.00001	0.00467
41	0.00072	0.00001	0.00073	0.00054	0.00001	0.00541
42	0.00077	0.00001	0.00082	0.00058	0.00001	0.00624
43	0.00082	0.00001	0.00093	0.00062	0.00003	0.00715
44	0.00088	0.00001	0.00105	0.00066	0.00003	0.00813
45	0.00094	0.00001	0.00119	0.00071	0.00003	0.00915
46	0.00100	0.00001	0.00135	0.00075	0.00003	0.01017
47	0.00107	0.00001	0.00153	0.00080	0.00003	0.01117
48	0.00115	0.00001	0.00173	0.00086	0.00003	0.01210
49	0.00123	0.00001	0.00196	0.00092	0.00003	0.01293
50	0.00131	0.00001	0.00222	0.00098	0.00003	0.01363
51	0.00140	0.00001	0.00251	0.00105	0.00003	0.01418
52	0.00150	0.00001	0.00284	0.00113	0.00003	0.01457
53	0.00160	0.00001	0.00322	0.00120	0.00003	0.01478
54	0.00171	0.00001	0.00365	0.00128	0.00003	0.01483
55	0.00183	0.00001	0.00413	0.00137	0.00003	0.01483
56	0.00196	0.00001	0.00467	0.00147	0.00003	0.01483
57	0.00209	0.00001	0.00529	0.00157	0.00003	0.01483
58	0.00223	0.00001	0.00599	0.00167	0.00003	0.01483
59	0.00239	0.00001	0.00678	0.00179	0.00003	0.01483
60	0.00255	0.00001	0.00768	0.00191	0.00003	0.01483
61	0.00273	0.00001	0.00870	0.00205	0.00003	0.01483
62	0.00292	0.00001	0.00985	0.00219	0.00003	0.01483
63	0.00312	0.00001	0.01115	0.00234	0.00003	0.01483
64	0.00334	0.00001	0.01262	0.00251	0.00003	0.01483
65	0.00367	0.00001	0.01429	0.00276	0.00003	0.01483
66	0.00404	0.00001	0.01618	0.00304	0.00003	0.01483
67	0.00444	0.00001	0.01832	0.00334	0.00003	0.01483
68	0.00488	0.00001	0.02074	0.00367	0.00003	0.01483
69	0.00537	0.00001	0.02349	0.00404	0.00003	0.01483
70	0.00591	0.00001	0.02349	0.00444	0.00003	0.01483
71	0.00650	0.00001	0.02349	0.00488	0.00003	0.01483
72	0.00715	0.00001	0.02349	0.00537	0.00003	0.01483
73	0.00787	0.00001	0.02349	0.00591	0.00003	0.01483
74	0.00866	0.00001	0.02349	0.00650	0.00003	0.01483
75	0.00953	0.00001	0.02349	0.00715	0.00003	0.01483
76	0.01048	0.00001	0.02349	0.00787	0.00003	0.01483
77	0.01153	0.00001	0.02349	0.00866	0.00003	0.01483
78	0.01268	0.00001	0.02349	0.00953	0.00003	0.01483
79	0.01395	0.00001	0.02349	0.01048	0.00003	0.01483
80	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

* Security Hospital Treatment Assistants (SHTAs) employed by the State of New York are covered under plans that provide a 75% POD benefit and are therefore assigned the same disability decrement probability as PFRS members.

**Total Disability is further broken down by plan type in Table 6.

TABLE 6: Segmented Disability Factors by Disability Type and Retirement Plan

Experience shows that there are distinct disability incidence patterns based on the availability of a Performance of Duty (POD) benefit.

Total Disability is proportioned to three types of disability benefits: Ordinary, Accidental, and POD. The proportions vary by plan based on the benefit amount and job titles typically covered under the plan.

For plans with above average benefits or job titles with a high propensity for disability, the proportions will sum to more than 100%.

For plans with below average benefits or job titles with a low propensity for disability, the proportions will sum to less than 100%.

Where a POD benefit is greater than or equal to the Accidental benefit, any instance of an accidental disability is assumed to be paid under the POD benefit. Therefore, the Accidental Proportion is merged with the POD Proportion and zeroed out; the Ordinary Proportion is unaffected.

ERS Age-Based Plans

System	Plan	Ordinary Proportion	Accidental Proportion	POD Proportion	Total as a Percentage of Population Average
ERS	Article 15 Plan	84%	21%	N/A	105%
ERS	Unified Court Peace Officers Plan	320%	80%	N/A	400%
ERS	Age-Based Plans, Tiers 1-2	84%	48%	N/A	132%

ERS Service-Based Plans and PFRS Plans

System	Plan	Ordinary Proportion	Accidental Proportion	POD Proportion	Total as a Percentage of Population Average
ERS	Article 14-B Deputy Sheriff Plans, Tiers 1-2	10%	45%	45%	100%
ERS	Article 14-B Deputy Sheriff Plans, Tiers 3-6	10%	40%	45%	95%
ERS	Article 14-B Deputy Sheriff Plans, Tiers 3-6, with 75% POD*	10%	0%	85%	95%
ERS	County Plans, Tiers 1-2	8%	36%	N/A	44%
ERS	County Plans, Tiers 3-6	8%	16%	N/A	24%
ERS	County Plans, Tiers 3-6, with 75% POD*	8%	0%	90%	98%
ERS	State Correction Officers & SHTA Plans, Tiers 1-2	8%	36%	N/A	44%
ERS	State Correction Officers & SHTA Plans, Tiers 3-6*	8%	0%	90%	98%
ERS	State SHTA Plan, with 75% POD*	10%	0%	113%	123%
ERS	Nassau County Fire Marshals	10%	45%	45%	100%
ERS	Nassau County Police Department Ambulance Medical Technicians	11%	50%	50%	111%
ERS	Town of Tonawanda Paramedics	11%	22%	N/A	33%
ERS	Rockland County District Attorney Investigators	10%	20%	N/A	30%
ERS	Westchester County District Attorney Investigators	10%	45%	45%	100%
PFRS	State Trooper and State Police Plans	13%	59%	59%	131%
PFRS	Other Plans	13%	57%	57%	127%

*The POD benefit is superior to the Accidental benefit.

TABLE 7: Withdrawal Probability — ERS Age-Based Plans

Age	0 ≤ Service < 2	2 ≤ Service < 3	3 ≤ Service < 4	4 ≤ Service < 5	5 ≤ Service < 10	10 ≤ Service
15	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
16	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
17	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
18	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
19	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
20	0.30703	0.14225	0.12070	0.09387	0.06393	0.03285
21	0.30613	0.14225	0.12070	0.09387	0.06393	0.03285
22	0.30206	0.14225	0.12070	0.09387	0.06393	0.03285
23	0.29534	0.14225	0.12070	0.09387	0.06393	0.03285
24	0.28662	0.14225	0.12070	0.09387	0.06393	0.03285
25	0.27660	0.14225	0.12070	0.09387	0.06393	0.03285
26	0.26600	0.14454	0.12070	0.09525	0.06393	0.03285
27	0.25546	0.14483	0.12070	0.09606	0.06393	0.03285
28	0.24549	0.14350	0.12070	0.09634	0.06393	0.03285
29	0.23643	0.14085	0.12070	0.09613	0.06393	0.03285
30	0.22841	0.13715	0.12070	0.09546	0.06393	0.03285
31	0.22146	0.13265	0.11910	0.09435	0.06310	0.03220
32	0.21548	0.12763	0.11717	0.09283	0.06232	0.03151
33	0.21036	0.12236	0.11496	0.09096	0.06158	0.03081
34	0.20599	0.11717	0.11246	0.08883	0.06083	0.03011
35	0.20227	0.11237	0.10962	0.08657	0.06003	0.02942
36	0.19911	0.10823	0.10641	0.08432	0.05917	0.02877
37	0.19643	0.10490	0.10286	0.08221	0.05825	0.02814
38	0.19414	0.10241	0.09906	0.08032	0.05727	0.02755
39	0.19215	0.10064	0.09522	0.07870	0.05628	0.02700
40	0.19035	0.09936	0.09159	0.07732	0.05532	0.02649
41	0.18867	0.09829	0.08841	0.07610	0.05444	0.02600
42	0.18704	0.09718	0.08584	0.07496	0.05369	0.02553
43	0.18542	0.09590	0.08395	0.07383	0.05310	0.02503
44	0.18385	0.09443	0.08267	0.07262	0.05268	0.02447
45	0.18237	0.09289	0.08179	0.07133	0.05242	0.02380
46	0.18106	0.09145	0.08109	0.06993	0.05226	0.02300
47	0.17998	0.09026	0.08034	0.06845	0.05211	0.02207
48	0.17916	0.08941	0.07941	0.06690	0.05188	0.02108
49	0.17860	0.08891	0.07827	0.06533	0.05143	0.02008
50	0.17827	0.08864	0.07701	0.06377	0.05062	0.01917
51	0.17827	0.08847	0.07577	0.06224	0.04935	0.01840
52	0.17827	0.08826	0.07473	0.06079	0.04754	0.01780
53	0.17827	0.08793	0.07406	0.05946	0.04518	0.01738
54	0.17827	0.08752	0.07385	0.05829	0.04236	0.01712
55	0.17827	0.08712	0.07413	0.05736	0.03922	0.01698
56	0.17827	0.08690	0.07489	0.05671	0.03597	0.01694
57	0.17827	0.08703	0.07606	0.05641	0.03283	0.01696
58	0.17827	0.08766	0.07758	0.05650	0.02998	0.01703
59	0.17827	0.08884	0.07938	0.05699	0.02757	0.01713
60	0.17827	0.09057	0.08139	0.05789	0.02564	0.01724
61	0.17827	0.09275	0.08358	0.05917	0.02419	0.01735
62	0.17827	0.09526	0.08591	0.06083	0.02316	0.01746
63	0.17827	0.09796	0.08836	0.06285	0.02247	0.01757
64	0.17827	0.10073	0.09092	0.06519	0.02206	0.01766
65	0.17827	0.10347	0.09359	0.06787	0.02187	0.01774
66	0.17827	0.10614	0.09636	0.07085	0.02187	0.01780
67	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
68	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
69	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
70	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
71	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
72	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
73	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
74	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
75	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
76	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
77	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
78	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
79	0.17827	0.10872	0.09922	0.07416	0.02205	0.01785
80	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 8: Withdrawal Probability — ERS Service-Based Plans and PFRS Plans

Years of Service Credit	Probability
0	0.06343
1	0.04027
2	0.02479
3	0.01588
4	0.01161
5	0.00997
6	0.00943
7	0.00908
8	0.00862
9	0.00805
10	0.00745
11	0.00684
12	0.00621
13	0.00552
14	0.00474
15	0.00389
16	0.00306
17	0.00238
18	0.00188
19	0.00156
20	0.00409
21	0.00443
22	0.00464
23	0.00426
24	0.00310
≥ 25	0.00310

Correction Officers are subject to assumed withdrawal at double the rates above.

TABLE 9: Service Retirement Probability — ERS Age-Based Plans

Age	Service < 20	Service = 20*	20 < Service < 30	30 ≤ Service
55	0.057	0.095	0.068	0.255
56	0.046	0.081	0.058	0.242
57	0.046	0.083	0.059	0.209
58	0.048	0.085	0.061	0.206
59	0.049	0.098	0.070	0.208
60	0.056	0.115	0.082	0.220
61	0.092	0.245	0.175	0.243
62	0.159	0.463	0.331	0.315
63	0.123	0.298	0.213	0.253
64	0.134	0.297	0.212	0.256
65	0.181	0.371	0.265	0.278
66	0.210	0.423	0.302	0.300
67	0.196	0.374	0.267	0.260
68	0.167	0.357	0.255	0.232
69	0.186	0.350	0.250	0.248
70	0.250	0.350	0.250	0.250
71	0.300	0.420	0.300	0.300
72	0.350	0.490	0.350	0.350
73	0.400	0.560	0.400	0.400
74	0.450	0.630	0.450	0.450
75	0.500	0.700	0.500	0.500
76	0.500	0.700	0.500	0.500
77	0.500	0.700	0.500	0.500
78	0.500	0.700	0.500	0.500
79	0.500	0.700	0.500	0.500
80	1.000	1.000	1.000	1.000

* Rates at 20 years of service are 140% of the rates from 21–29 years of service. These rates are applied unrounded to plans that include a benefit increase from 31.67% to 40.00% upon reaching 20 years of service (for example, ERS Tiers 4 and 5 but not Tier 6). When the benefit does not increase to 40% at 20 years, no adjustment is applied to the 21–29 year rates.

Rates at ages 70–75 are graded from 25% to 50%, which is assumed until the ultimate active retirement age of 80.

When an unreduced benefit is payable before attaining age 62, the probability of retirement is increased by adding 0.20.

Otherwise, these rates are not modified for ERS Tiers 1–4 and PFRS Tiers 1–5. ERS Tier 5 and all Tier 6 retirements are modified as described below.

Age	ERS Tier 5 Modifications			ERS and PFRS Tier 6 Modifications		
	Service < 20	20 ≤ Service < 30	30 ≤ Service	Service < 20	20 ≤ Service < 30	30 ≤ Service
< 62	× 0.8	× 0.8	× 0.8	× 0.8	× 0.8	Svc 20-30 Rates
62	+ 0.05	+ 0.07**	+ 0.15	× 0.8 - 0.05	× 0.8 - 0.10	Svc 20-30 Rates - 0.10
63	none	none	none	× 0.8 + 0.15	× 0.8 + 0.15	Svc 20-30 Rates + 0.15
64–70	none	none	none	× 0.8	× 0.8	Svc 20-30 Rates
> 70	none	none	none	none	none	none

** Other than at the 20 years of service milestone.

TABLE 10: Service Retirement Probabilities — ERS Service-Based Plans and PFRS Plans

Years of Service Credit	20-Year Plan State Police (OR20SP)	20-Year Plans non-State (OR20)	20-Year Plans with add'l 60ths (OR20p60)	25-Year Plan State COs (OR25SC)	25-Year Plans non-State (OR25)	25-Year Plans with add'l 60ths (OR25p60)
20	0.10508	0.29929	0.11080			
21	0.07884	0.15258	0.06787			
22	0.08199	0.13184	0.06259			
23	0.07148	0.13429	0.07261			
24	0.10420	0.10776	0.08952			
25	0.13063	0.10507	0.09739	0.32880	0.36505	0.20829
26	0.12025	0.08136	0.08789	0.20535	0.14322	0.21922
27	0.13858	0.12192	0.09662	0.17896	0.13151	0.22174
28	0.12584	0.10194	0.13070	0.17725	0.06604	0.21654
29	0.14939	0.08604	0.13270	0.18380	0.12959	0.20285
30	0.21709	0.08012	0.17931	0.24452	0.29564	0.18186
31	0.36947	0.13151	0.26874	0.23660	0.22000	0.15954
32	0.46225	0.15808	0.35164	0.22553	0.22464	0.16095
33	0.42945	0.12693	0.27565	0.19304	0.27887	0.18325
34	0.29333	0.12821	0.26934	0.21255	0.37885	0.20507
35	0.30800	0.15715	0.24801	0.23393	0.36502	0.22750
36	0.30800	0.14453	0.31513	0.28058	0.36502	0.26247
37	0.30800	0.14252	0.27867	0.31192	0.36502	0.31325
38	0.30800	0.14252	0.27867	0.31192	0.36502	0.35318
39	0.30800	0.14252	0.27867	0.31192	0.36502	0.35940
40	0.30800	0.14252	0.27867	0.31192	0.36502	0.35940
≥ 41	0.30800	0.14252	0.27867	0.31192	0.36502	0.35940

New in 2025: A **20-Year Plan with add'l 100ths (OR20p100)**, which is valued with 120% of the retirement rates shown in OR20p60 above.

TABLE 11: Salary Scale Assumptions

Years of Service Credit	ERS Age-Based Plans	ERS Service-Based Plans and PFRS Plans
0	9.0%	28.0%
1	8.5%	28.0%
2	8.0%	18.0%
3	7.5%	13.0%
4	7.0%	10.0%
5	6.5%	8.0%
6	6.5%	6.0%
7	6.0%	5.0%
8	6.0%	4.0%
9	5.5%	4.0%
10	5.0%	4.0%
11	5.0%	4.0%
12	4.5%	4.0%
13	4.5%	4.0%
14	4.5%	4.0%
15	4.5%	4.0%
16	4.5%	4.0%
17	4.5%	4.0%
18	4.0%	4.0%
19	4.0%	4.0%
20	4.0%	4.0%
21	4.0%	4.0%
22	4.0%	4.0%
23	4.0%	4.0%
24	4.0%	4.0%
25	3.5%	4.0%
26	3.5%	3.0%
≥ 27	3.5%	3.0%

Appendix D: Assumed Number of Decrements Per 1,000 Members [3]

Table 1   Age-Based Plan — Article 15, Tier 4

Table 2   Age-Based Plan — Article 15, Tier 6

Table 3   25-Year Service-Based Plan — County Correction Officers

Table 4   25-Year Service-Based Plan with additional 60ths — State Police (non-Troopers) and Firefighters

Table 5   20-Year Service-Based Plan — Municipal Police and Firefighters

Table 6   20-Year Service-Based Plan with additional 60ths — Municipal Police and Firefighters

Table 7   20-Year Service-Based Plan with additional 60ths — State Police (Troopers)

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[3] All tables use a hypothetical new member aged 28 years. Some assumptions are based only on a member's age. Others are based only on a member's service credit. Where assumptions vary by age and service, the results presented would differ for members that are not age 28 at entry.

Table 1: Age-Based Plan — Article 15, Tier 4

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		189	0	0		246	0	0
29	1		181	0	0		237	0	0
30	2		148	0	0		137	0	0
31	3		117	0	0		119	0	0
32	4		102	0	0		93	0	0
33	5		59	0	1		62	0	0
34	6		59	0	1		61	0	0
35	7		59	0	1		60	0	0
36	8		58	0	1		59	0	1
37	9		58	0	1		59	0	1
38	10		20	1	1		28	1	1
39	11		20	1	1		27	1	1
40	12		19	1	1		26	1	1
41	13		19	1	1		26	1	1
42	14		19	1	1		26	1	1
43	15		19	1	1		25	1	1
44	16		19	1	1		24	1	1
45	17		19	1	1		24	1	1
46	18		18	2	1		23	1	1
47	19		17	2	1		22	2	1
48	20		16	2	1		21	2	1
49	21		15	2	1		20	2	1
50	22		14	2	1		19	2	1
51	23		13	3	1		18	3	1
52	24		13	3	2		18	3	2
53	25		13	3	2		17	3	2
54	26		13	4	2		17	4	2
55	27	82	-	0	2	68	-	1	2
56	28	48	-	0	2	58	-	1	2
57	29	51	-	0	2	59	-	1	2
58	30	158	-	0	2	406	-	1	2
59	31	168	-	0	2	208	-	1	2
60	32	176	-	0	2	220	-	2	3
61	33	209	-	0	2	243	-	2	3
62	34	258	-	0	2	315	-	2	3
63	35	194	-	0	3	253	-	2	3
64	36	189	-	0	3	256	-	3	3
65	37	218	-	0	3	278	-	3	4
66	38	255	-	0	3	300	-	3	4
67	39	221	-	0	3	260	-	4	4
68	40	193	-	0	4	232	-	4	5
69	41	191	-	0	4	248	-	5	5
70	42	1,000				250	-	5	6
71	43					300	-	5	7
72	44					350	-	5	7
73	45					400	-	5	8
74	46					450	-	5	9
75	47					500	-	5	10
76	48					500	-	5	10
77	49					500	-	5	12
78	50					500	-	5	13
79	51					500	-	5	14
80	52					1,000			

Table 2: Age-Based Plan — Article 15, Tier 6

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		189	0	0		246	0	0
29	1		181	0	0		237	0	0
30	2		148	0	0		137	0	0
31	3		117	0	0		119	0	0
32	4		102	0	0		93	0	0
33	5		59	0	1		62	0	0
34	6		59	0	1		61	0	0
35	7		59	0	1		60	0	0
36	8		58	0	1		59	0	1
37	9		58	0	1		59	0	1
38	10		20	1	1		28	1	1
39	11		20	1	1		27	1	1
40	12		19	1	1		26	1	1
41	13		19	1	1		26	1	1
42	14		19	1	1		26	1	1
43	15		19	1	1		25	1	1
44	16		19	1	1		24	1	1
45	17		19	1	1		24	1	1
46	18		18	2	1		23	1	1
47	19		17	2	1		22	2	1
48	20		16	2	1		21	2	1
49	21		15	2	1		20	2	1
50	22		14	2	1		19	2	1
51	23		13	3	1		18	3	1
52	24		13	3	2		18	3	2
53	25		13	3	2		17	3	2
54	26		13	4	2		17	4	2
55	27	66	-	0	2	68	-	1	2
56	28	39	-	0	2	46	-	1	2
57	29	41	-	0	2	47	-	1	2
58	30	53	-	0	2	61	-	1	2
59	31	60	-	0	2	70	-	1	2
60	32	71	-	0	2	82	-	2	3
61	33	153	-	0	2	175	-	2	3
62	34	179	-	0	2	231	-	2	3
63	35	715	-	0	2	363	-	2	3
64	36	189	-	0	3	212	-	3	3
65	37	218	-	0	3	265	-	3	4
66	38	255	-	0	3	302	-	3	4
67	39	221	-	0	3	267	-	4	4
68	40	193	-	0	4	255	-	4	5
69	41	191	-	0	4	250	-	5	5
70	42	1,000				250	-	5	6
71	43					300	-	5	7
72	44					350	-	5	7
73	45					400	-	5	8
74	46					450	-	5	9
75	47					500	-	5	10
76	48					500	-	5	10
77	49					500	-	5	12
78	50					500	-	5	13
79	51					500	-	5	14
80	52					1,000			

Table 3: 25-Year Service-Based Plan — County Correction Officers

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		71	0	0		127	0	0
29	1		39	0	0		81	0	0
30	2		21	0	0		50	0	0
31	3		13	0	0		32	0	0
32	4		11	0	0		23	0	0
33	5		11	0	0		20	0	0
34	6		11	0	0		19	0	0
35	7		10	0	0		18	0	0
36	8		9	1	0		17	0	0
37	9		8	2	0		16	0	0
38	10		7	3	0		15	1	0
39	11		5	4	0		14	1	0
40	12		4	4	0		12	1	1
41	13		3	5	0		11	1	1
42	14		3	6	0		9	1	1
43	15		3	6	0		8	2	1
44	16		2	7	1		6	2	1
45	17		2	8	1		5	2	1
46	18		2	8	1		4	2	1
47	19		2	8	1		3	3	1
48	20		2	8	1		8	3	1
49	21		2	8	1		9	3	1
50	22		2	9	1		9	3	1
51	23		2	9	1		9	3	1
52	24		2	9	1		6	3	1
53	25	298	-	5	1	365	-	2	1
54	26	186	-	6	1	143	-	2	1
55	27	162	-	6	1	132	-	2	1
56	28	161	-	6	1	66	-	2	2
57	29	167	-	6	1	130	-	2	2
58	30	222	-	6	1	296	-	2	2
59	31	214	-	6	1	220	-	2	2
60	32	204	-	6	1	225	-	2	2
61	33	175	-	6	1	279	-	2	2
62	34	193	-	6	1	379	-	2	2
63	35	212	-	6	1	365	-	2	2
64	36	254	-	6	1	365	-	2	3
65	37	283	-	5	1	365	-	2	3
66	38	283	-	5	2	365	-	2	3
67	39	283	-	5	2	365	-	2	3
68	40	283	-	5	2	365	-	2	4
69	41	282	-	5	2	365	-	2	4
70	42	1,000				365	-	2	4
71	43					365	-	2	5
72	44					365	-	2	5
73	45					365	-	2	6
74	46					365	-	2	7
75	47					365	-	2	7
76	48					365	-	2	8
77	49					365	-	2	9
78	50					365	-	2	10
79	51					365	-	2	11
80	52					1,000			

Table 4: 25-Year Service-Based Plan with additional 60ths — State Police (non-Troopers) and Firefighters

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		71	0	0		63	1	0
29	1		39	0	0		40	1	0
30	2		21	0	0		25	1	0
31	3		13	0	0		16	1	0
32	4		11	0	0		12	1	0
33	5		11	0	0		10	2	0
34	6		11	0	0		9	2	0
35	7		10	0	0		9	3	0
36	8		9	1	0		9	3	0
37	9		8	2	0		8	4	0
38	10		7	2	0		7	4	0
39	11		5	3	0		7	5	0
40	12		4	4	0		6	6	1
41	13		3	4	0		6	7	1
42	14		3	5	0		5	8	1
43	15		3	5	0		4	9	1
44	16		2	6	1		3	11	1
45	17		2	7	1		2	12	1
46	18		2	7	1		2	13	1
47	19		2	7	1		2	15	1
48	20		2	7	1		4	16	1
49	21		2	7	1		4	17	1
50	22		2	7	1		5	18	1
51	23		2	7	1		4	19	1
52	24		2	7	1		3	19	1
53	25	189	-	6	1	208	-	17	1
54	26	199	-	6	1	219	-	17	1
55	27	201	-	6	1	222	-	17	1
56	28	196	-	6	1	217	-	17	2
57	29	184	-	6	1	203	-	17	2
58	30	165	-	6	1	182	-	17	2
59	31	145	-	6	1	160	-	17	2
60	32	146	-	6	1	161	-	17	2
61	33	166	-	6	1	183	-	17	2
62	34	186	-	6	1	205	-	17	2
63	35	206	-	6	1	228	-	17	2
64	36	238	-	6	1	262	-	17	3
65	37	284	-	5	1	313	-	17	3
66	38	320	-	5	2	353	-	17	3
67	39	326	-	5	2	359	-	17	3
68	40	326	-	5	2	359	-	17	4
69	41	326	-	5	2	359	-	17	4
70	42	1,000				359	-	17	4
71	43					359	-	17	5
72	44					359	-	17	5
73	45					359	-	17	6
74	46					359	-	17	7
75	47					359	-	17	7
76	48					359	-	17	8
77	49					359	-	17	9
78	50					359	-	17	10
79	51					359	-	17	11
80	52					1,000			

Table 5: 20-Year Service-Based Plan — Municipal Police and Firefighters

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		71	0	0		63	1	0
29	1		39	0	0		40	1	0
30	2		21	0	0		25	1	0
31	3		13	0	0		16	1	0
32	4		11	0	0		12	1	0
33	5		11	0	0		10	1	0
34	6		11	0	0		10	2	0
35	7		10	0	0		9	2	0
36	8		9	1	0		9	3	0
37	9		8	2	0		8	3	0
38	10		7	2	0		7	4	0
39	11		5	3	0		7	5	0
40	12		4	4	0		6	6	1
41	13		3	4	0		6	7	1
42	14		3	5	0		5	8	1
43	15		3	5	0		4	9	1
44	16		2	6	1		3	10	1
45	17		2	7	1		2	12	1
46	18		2	7	1		2	13	1
47	19		2	7	1		2	14	1
48	20	271	-	6	1	299	-	14	1
49	21	138	-	6	1	153	-	15	1
50	22	119	-	6	1	132	-	16	1
51	23	122	-	6	1	134	-	16	1
52	24	98	-	6	1	108	-	17	1
53	25	95	-	6	1	105	-	17	1
54	26	74	-	6	1	81	-	17	1
55	27	110	-	6	1	122	-	17	1
56	28	92	-	6	1	102	-	17	2
57	29	78	-	6	1	86	-	17	2
58	30	73	-	6	1	80	-	17	2
59	31	119	-	6	1	132	-	17	2
60	32	143	-	6	1	158	-	17	2
61	33	115	-	6	1	127	-	17	2
62	34	116	-	6	1	128	-	17	2
63	35	142	-	6	1	157	-	17	2
64	36	131	-	6	1	145	-	17	3
65	37	1,000				1,000			

Table 6: 20-Year Service-Based Plan with additional 60ths — Municipal Police and Firefighters

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		71	0	0		63	1	0
29	1		39	0	0		40	1	0
30	2		21	0	0		25	1	0
31	3		13	0	0		16	1	0
32	4		11	0	0		12	1	0
33	5		11	0	0		10	1	0
34	6		11	0	0		9	2	0
35	7		10	0	0		9	2	0
36	8		9	1	0		9	3	0
37	9		8	2	0		8	3	0
38	10		7	2	0		7	4	0
39	11		5	3	0		7	5	0
40	12		4	4	0		6	6	1
41	13		3	4	0		6	7	1
42	14		3	5	0		5	8	1
43	15		3	5	0		4	9	1
44	16		2	6	1		3	10	1
45	17		2	7	1		2	12	1
46	18		2	7	1		2	13	1
47	19		2	7	1		2	14	1
48	20	100	-	6	1	111	-	14	1
49	21	61	-	6	1	68	-	15	1
50	22	57	-	6	1	63	-	16	1
51	23	66	-	6	1	73	-	16	1
52	24	81	-	6	1	90	-	17	1
53	25	88	-	6	1	97	-	17	1
54	26	80	-	6	1	88	-	17	1
55	27	88	-	6	1	97	-	17	1
56	28	118	-	6	1	131	-	17	2
57	29	120	-	6	1	133	-	17	2
58	30	162	-	6	1	179	-	17	2
59	31	244	-	6	1	269	-	17	2
60	32	319	-	5	1	352	-	17	2
61	33	250	-	6	1	276	-	17	2
62	34	244	-	6	1	269	-	17	2
63	35	225	-	6	1	248	-	17	2
64	36	286	-	5	1	315	-	17	3
65	37	1,000				1,000			

Table 7: 20-Year Service-Based Plan with additional 60ths — State Police (Troopers)

Age	Service	2024 Assumptions				2025 Assumptions			
		Service Retirement	Withdrawal	Disability Retirement	Death	Service Retirement	Withdrawal	Disability Retirement	Death
28	0		71	0	0		63	1	0
29	1		39	0	0		40	1	0
30	2		21	0	0		25	1	0
31	3		13	0	0		16	1	0
32	4		11	0	0		12	1	0
33	5		11	0	0		10	2	0
34	6		11	0	0		9	2	0
35	7		10	0	0		9	3	0
36	8		9	1	0		9	3	0
37	9		8	2	0		8	4	0
38	10		7	2	0		7	4	0
39	11		5	3	0		7	5	0
40	12		4	4	0		6	6	1
41	13		3	4	0		6	7	1
42	14		3	5	0		5	8	1
43	15		3	5	0		4	9	1
44	16		2	6	1		3	11	1
45	17		2	7	1		2	12	1
46	18		2	7	1		2	13	1
47	19		2	7	1		2	15	1
48	20	95	-	6	1	105	-	14	1
49	21	71	-	6	1	79	-	15	1
50	22	74	-	6	1	82	-	16	1
51	23	65	-	6	1	71	-	17	1
52	24	94	-	6	1	104	-	17	1
53	25	118	-	6	1	131	-	17	1
54	26	109	-	6	1	120	-	17	1
55	27	126	-	6	1	139	-	17	1
56	28	114	-	6	1	126	-	17	2
57	29	135	-	6	1	149	-	17	2
58	30	197	-	6	1	217	-	17	2
59	31	335	-	5	1	369	-	17	2
60	32	1,000				462	-	17	2
61	33					429	-	17	2
62	34					293	-	17	2
63	35					1,000			

Appendix E: Additional Considerations in Setting the Liability Discount Rate (and the Investment Rate of Return Assumption)

The AA Policy analysis is heavily reliant upon the asset class return assumptions adopted by PICM. While the target asset allocation is typically reviewed in five-year cycles, the forecasted asset class return assumptions are updated annually. Generally, the annual update of capital market assumptions is less scrutinized than those used to set the AA Policy. A shift in expectations may reflect a divergence from the risk/reward balance preferred by the Trustee, which would be corrected with the next quinquennial review of the AA Policy. Therefore, while informative and deserving mention, the annual updates do not necessarily change the long-term expectation.

We close this appendix with two discussions. The first explains the difference between arithmetic return and geometric return. The second provides an illustration of the cyclical relationship between the investment rate of return and the liability discount rate assumption.

Understanding the Difference Between Arithmetic Return and Geometric Return

A full discussion comparing the arithmetic return and the geometric return is beyond the scope of this report. But the geometric return is generally regarded as the appropriate target for the assumed investment rate of return to be consistent with the application of compound interest.

Arithmetic Return (AR) is the average of each year's annual return over a number of years.

Geometric Return (GR) is the annualized compound return expected over a number of years.

The different meaning of AR versus GR is best illustrated by example. In FY 2009, NYSLRS investment return was -26.4%. In the year that followed it was 25.9%. The arithmetic average of these two years is approximately 0%. This does not mean, however, that FY 2010 recovered all the FY 2009 losses. The GR for the two years was (1 – 26.4%) × (1 + 25.9%) – 1 = -7.3%, or -3.7% annually. This better characterizes the change in asset value over the two years.

The geometric return is always less than the arithmetic return. The more volatile the annual returns, the greater the difference. The arithmetic return "rewards" risk-taking more than the geometric return. To visualize this, the graph below plots both returns for 10 asset allocations presented in the 2024 AA Policy. The square marker represents the 2024 trustee-approved AA Policy and the triangle marker represents the 2020 AA Policy. All possible portfolios reflect the most up-to-date capital market assumptions.

Notice how the geometric return is flatter than the arithmetic return as the risk increases.

Comparison of Arithmetic vs Geometric Return Expectations
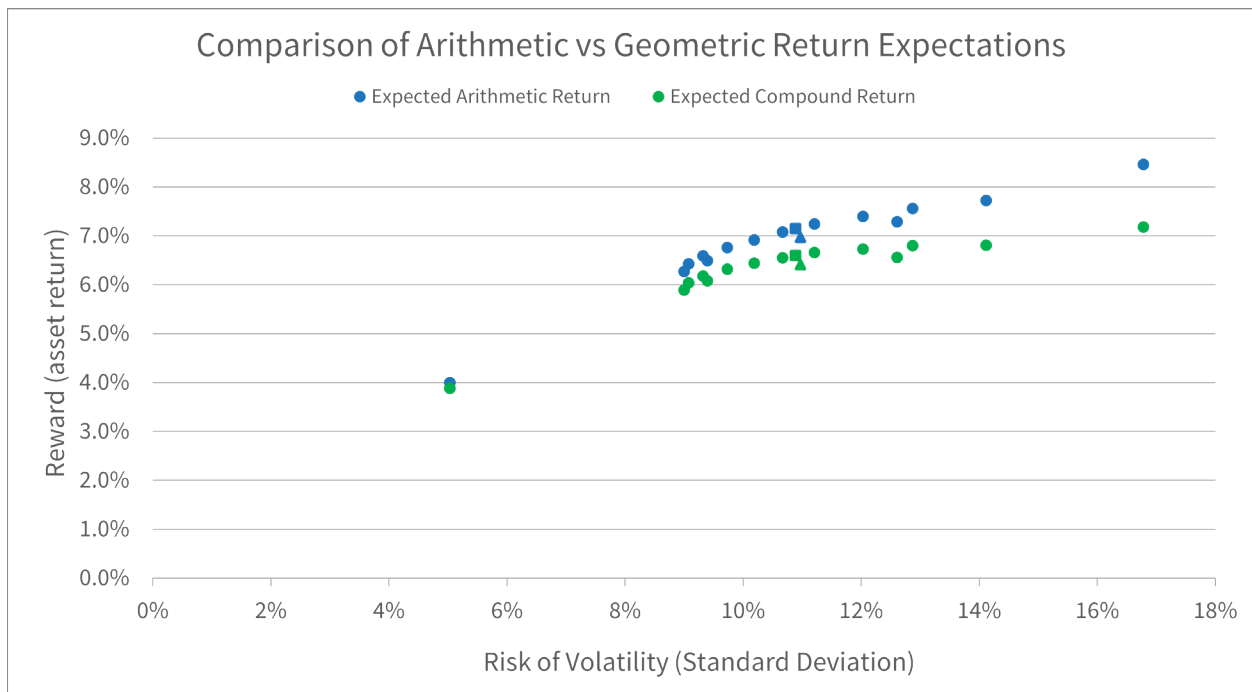
## Understanding How the Assumed Rate of Return is Developed

CHIEF INVESTMENT OFFICER (CIO)

The **CIO** periodically analyzes the investment landscape to determine the optimal asset allocation. Their recommendation is guided by internal staff, external consultants, and the Investment Advisory Committee, and must be mindful of projected benefit payouts and the sensitivity of employer contributions to investment performance.

Feedback

Stimulus

Following **Comptroller** approval of the recommended rate of return assumption, the **CIO** is so informed. After each annual actuarial valuation, the **Actuary** provides the projected benefit payouts for retirees and beneficiaries.

Following **Comptroller** approval of the AA Policy, the **Actuary** is informed of the AA Policy and the asset class capital market assumptions and correlations.
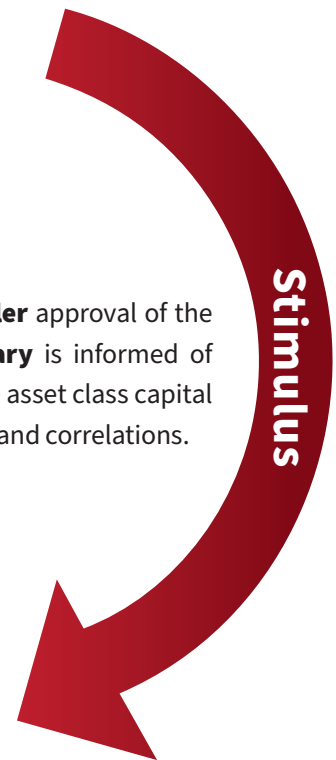
ACTUARY

Using stochastic modeling, the **Actuary** determines/confirms the assumed rate of return of the AA Policy given the asset class capital market assumptions and correlations. The recommendation for the liability discount rate is guided by internal staff, an external consultant, and the AAC, and must be mindful of the impact on employer contributions and the objective of smooth contribution rates.

Appendix F: Stochastic Models of Future Inflation

The model developed by the PICM Consultant provided data for 2,000 simulations. The model used ProVal to project annual inflation over 20 years. Model inputs, as of June 30, 2022 included an initial inflation rate of 9.06%, a long-term target of 2.5% with standard deviation of 2.5%, and a serial correlation coefficient of 0.70 based on historical analysis of the CPI-U.

This model was used to validate the multiple-state stochastic model developed by the Actuarial Bureau.

The Actuarial Bureau's model used three possible states:

Increasing	inflation is rising, causing an increase in annual inflation of 2.0%
Normalized	inflation is well managed and gliding toward Fed target of 2.0%
Decreasing	inflation is falling, potentially due to Fed combating high inflation

Each year, the modeled state at the beginning of the year (BOY) will influence the modeled state at the end of the year (EOY). A random variable is used to determine the state at EOY according to transition probabilities.

Transition Probabilities		EOY		
		Increasing	Normalized	Decreasing
BOY	Increasing	50%	25%	25%
	Normalized	20%	60%	20%
	Decreasing	10%	60%	30%

The change in the rate of inflation is then determined using prescribed rules intended to reflect different scenarios and the historical average change in the CPI-U, especially the standard deviation of average annual change in the CPI-U (SD_Annual), which is 2.0%.

EOY	Change in Rate of Inflation
Increasing	Rate of inflation increases by 2%, the SD_Annual
Normalized	Rate of inflation moves half the distance toward the FED long-term target
Decreasing	BOY state of *Increasing* indicates decrease is triggered by Fed Involvement. Rate of inflation decreases by 4%, double the SD_Annual.
	BOY state of *Normalized* indicates the decrease is naturally occurring. Rate of Inflation decreases 1%, half the SD_Annual.
	BOY state of *Decreasing* could mean decrease is natural or triggered by Fed. Rate of inflation decreases half the distance toward 0%, generating a large change when inflation is high and minimal change when inflation is low.