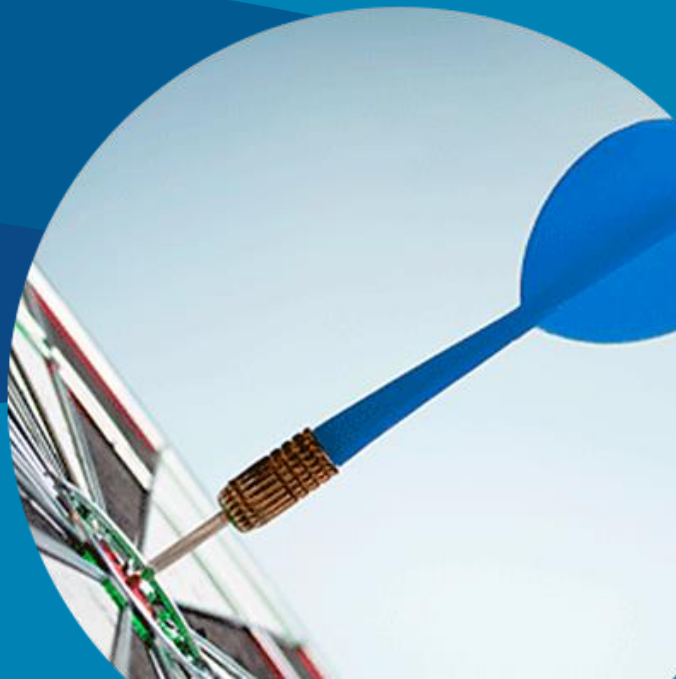
Michigan Public School Employees' Retirement System (MPSERS)

October 1, 2017 – September 30, 2022

Experience Study



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Agenda

- Introduction
- Experience Study Process
- Demographic Assumptions
- Economic Assumptions
- Actuarial Methods
- Effect on Valuation Results

INTRODUCTION

Introduction

- Each year the actuarial liabilities of MPSERS are calculated as part of the September 30th valuation
- In order to perform the valuation, we must make assumptions about the future experience of the System with regard to various risk areas
- The results of the liability calculations depend upon those assumptions

Introduction – Risk Areas

- Demographic Risk Areas
  - Rates of withdrawal
  - Rates of disability
  - Rates of retirement
  - Rates of mortality
- Economic Risk Areas
  - Investment return
  - Inflation
  - Patterns of salary increases
  - Payroll growth

Introduction

- Assumptions should be carefully chosen and continually monitored
  - Continued use of outdated assumptions can lead to ...

Introduction

- Understated costs resulting in:
  - Sharp increases in required contributions at some point in the future leading to a large burden on future taxpayers
  - In extreme cases, an inability to pay benefits when due

Introduction

- Overstated costs resulting in:
  - Benefit levels that are kept below the level that could be supported by the employer and member contribution rates
  - An unnecessarily large burden on the current generation of members, employers and taxpayers

Introduction

- No single set of assumptions will be suitable indefinitely
- Things change, and our understanding of things (whether or not they are changing) also changes
- In general, the suggested time period for reviewing assumptions is about every 4 or 5 years
- A systematic review of assumptions is called an “Experience Study”

EXPERIENCE STUDY PROCESS

Experience Study Process

- Our analysis was based upon data submitted for:
  - Non-Mortality Assumptions:
    2017 through 2022 annual valuations
  - Mortality Assumptions:
    2014 through 2019 annual valuations
- Due to COVID-19, data from fiscal years 2020, 2021, and 2022 was excluded from the mortality assumption analysis

Experience Study Process

- We compared trends with those observed in prior studies
- Generally, we give confirmed trends more credibility than non-confirmed trends
- Philosophy: Do not overreact to results from any single experience period
  - It is better to make a series of small changes in the right direction, rather than a single large change that could turn out with hindsight to be in the wrong direction

Experience Study Process – Liability-Weighting

- Decrement assumptions have traditionally been developed based on population-weighted crude rates
- In a plan with two members the same age, if one of them leaves, the rate of withdrawal at that age is 50% (very simplified example)
- However, certain decrements have continued to generate small gains or losses despite adjusting rates in previous experience studies
- Consistent with prior studies, we analyzed the data to see if this could be due to a tendency for human behavior to be influenced by the relative value of liabilities
- This concept is called liability-weighting

Experience Study Process – Liability-Weighting Example

- Consider the same plan with only two members (who are both the same age) and the withdrawal rate of 50%
- Suppose one member has liability of $10k and the other has liability of $90k
- Even though the decrement rate of withdrawal is 50%, the net gain or loss to the system will be less if the $10k liability member leaves than if the $90k liability member leaves
- Perhaps if the person with $10k liability leaves, we should set the withdrawal rate at 10% since only 10% of the liability has left

Experience Study Process – Liability-Weighting

- For example, in some systems, an analysis could indicate that people with lower liabilities are more likely to quit than other people of the same age
- Therefore, we developed some decrements (e.g., unreduced retirement, reduced retirement, and age-based withdrawal) based on a liability-weighting analysis as opposed to a population-weighting analysis

Experience Study Process – Benefits-Weighting

- An analogous benefits-weighted approach was employed in the analysis of post-retirement mortality
- The analysis seemed to indicate that people with higher accrued benefit levels generally live longer than other people of the same age
- In recognition of these results, we developed healthy post-retirement mortality rates based on a benefits-weighting analysis

Experience Study Process

- Per Section 41(1) of the MPSERS statute (Act 300 of the Public Acts of 1980, as amended), the actuarial assumptions are adopted by the Retirement Board and the Department of Technology, Management and Budget after consultation with the actuary and the State Treasurer
- The recommended changes are proposed for the September 30, 2023 and later valuations

DEMOGRAPHIC ASSUMPTIONS

Demographic Assumptions – Rates of Retirement

- The retirement assumptions were analyzed both for unreduced and reduced retirements:
  - Reduced retirements were analyzed separately for Basic and MIP employees
  - Unreduced retirements were analyzed separately for Basic/MIP/PPP and Teacher/Non-Teacher employees
  - Unreduced retirements for MIP employees were studied separately for Age 60+ retirements and 30 & Out service retirements
- Generally speaking, fewer retirements being observed over the experience study period than anticipated by the actuarial assumptions results in an actuarial gain
- Proposed assumptions for retirement are based on a liability-weighting analysis

Demographic Assumptions – Rates of Retirement

- For unreduced retirements, the following experience was observed over the experience study period on a liability-weighting basis
  - Basic Teachers: More retirements than expected
  - Basic Non-Teachers: Fewer retirements than expected
  - MIP (age 60+) Teachers: More retirements than expected
  - MIP (age 60+) Non-Teachers: Fewer retirements than expected
  - MIP (30 & Out) Teachers: Fewer retirements than expected
  - MIP (30 & Out) Non-Teachers: Fewer retirements than expected
  - PPP Teachers: Fewer retirements than expected
  - PPP Non-Teachers: Fewer retirements than expected
- Due to insufficient experience, PPP- and PPP2-specific retirement rates were not developed

Demographic Assumptions – Rates of Retirement

- For reduced retirements, there were less retirements than expected over the experience study period for both Basic and MIP employees
- The following recommendations are being made:
  - Decrease the unreduced retirement rates for MIP (30 & Out) Non-Teachers
  - No changes to the unreduced retirement rates for all other groups
  - Continue to assume the MIP age-based unreduced retirement rates apply to the PPP and the PPP2 employees
  - Decrease the reduced retirement rates for both Basic and MIP employees

Demographic Assumptions – Withdrawal

- The withdrawal assumption was analyzed based both on an age-based and service-based basis
  - The use of a service-based (i.e., first 5 years of service) and an age-based (i.e., for service greater than 5 years) approach is still reasonable
  - Service-based withdrawal was analyzed separately for Non-PPP2/PPP2, Teacher/Non-Teacher, and Full-Time/Part-Time employees
    - Non-PPP2 includes Basic Plan, MIP, and PPP
  - Age-based withdrawal was analyzed separately for Teacher/Non-Teacher and Full-Time/Part-Time employees
  - For this purpose, employees whose annual pay exceeds $20,000 are considered full-time
- Generally speaking, more withdrawals being observed over the experience study period than anticipated by the actuarial assumptions results in an actuarial gain

Demographic Assumptions – Withdrawal

- Proposed assumptions for service-based withdrawal are developed on a population-weighting basis, while proposed assumptions for aged-based withdrawal are developed on a liability-weighting basis
- While there is insufficient experience to develop PPP2-specific rates for age-based withdrawal, there is enough experience to develop PPP2-specific rates for service-based withdrawal

Demographic Assumptions – Withdrawal

- For withdrawals in the first 5 years, the following experience was observed over the experience study period (population-weighted)
  - Non-PPP2 (i.e., Basic Plan, MIP, PPP)
    - Full-Time, Teacher: Fewer withdrawals than expected
    - Full-Time, Non-Teacher: Fewer withdrawals than expected
    - Part-Time, Teacher: Fewer withdrawals than expected
    - Part-Time, Non-Teacher: More withdrawals than expected
  - PPP2
    - Full-Time, Teacher: Fewer withdrawals than expected
    - Full-Time, Non-Teacher: Fewer withdrawals than expected
    - Part-Time, Teacher: More withdrawals than expected
    - Part-Time, Non-Teacher: More withdrawals than expected

Demographic Assumptions – Withdrawal

- For withdrawals after 5 years of service, the following experience was observed over the experience study period (liability-weighted)
  - Full-Time, Teacher: Fewer withdrawals than expected
  - Full-Time, Non-Teacher: Fewer withdrawals than expected
  - Part-Time, Teacher: More withdrawals than expected
  - Part-Time, Non-Teacher: More withdrawals than expected

Demographic Assumptions – Withdrawal

- The following recommendations are being made for service-based withdrawal rates:
  - Decrease the withdrawal rates for Non-PPP2 Teachers (full-time and part-time)
  - No change to the withdrawal rates for Non-PPP2 Non-Teachers (full-time and part-time)
  - Decrease the withdrawal rates for PPP2 full-time employees (Teachers and Non-Teachers)
  - Increase the withdrawal rates for PPP2 part-time employees (Teachers and Non-Teachers)

Demographic Assumptions – Withdrawal

- The following recommendations are being made for age-based withdrawal rates:
  - Decrease the withdrawal rates for Non-PPP2 full-time employees (Teachers and Non-Teachers)
  - No change to the withdrawal rates for Non-PPP2 part-time employees (Teachers and Non-Teachers)
  - Use 67% of the proposed Non-PPP2 withdrawal rates for full-time PPP2 employees (Teachers and Non-Teachers)
  - Use 75% of the proposed Non-PPP2 withdrawal rates for part-time PPP2 employees (Teachers and Non-Teachers)

Demographic Assumptions – Disability

- There were fewer disabilities than expected directly from active status during the experience study period
- However, there were a significant number of individuals reclassified for valuation purposes as disabled from a non-active status during the experience study period
  - 259 individuals were reclassified
- Therefore, no changes are being recommended to the disability rates

Demographic Assumptions – Summary of Changes (# Counts)

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Age and Service Retirement - Population-Weighted Results				
Basic - Teachers	3,307	3,113.3	3,113.3	0.0
- Non-Teachers	3,128	3,619.7	3,619.7	0.0
MIP (age 60+) - Teachers	4,124	4,481.5	4,481.5	0.0
- Non-Teachers	10,676	13,525.3	13,525.3	0.0
MIP (30 & out) - Teachers	5,222	5,880.3	5,880.3	0.0
- Non-Teachers	1,947	2,322.6	2,035.6	(287.0)
PPP - Teachers	14	21.8	21.8	0.0
- Non-Teachers	125	185.8	185.8	0.0
Age and Service Retirement - Liability-Weighted Results [(1)]				
Basic - Teachers	12,247	11,619.6	11,619.6	0.0
- Non-Teachers	7,267	7,855.4	7,855.4	0.0
MIP (age 60+) - Teachers	12,682	12,485.9	12,485.9	0.0
- Non-Teachers	12,321	12,553.8	12,553.8	0.0
MIP (30 & out) - Teachers	27,511	31,857.9	31,857.9	0.0
- Non-Teachers	9,431	11,825.1	10,401.0	(1,424.1)
PPP - Teachers	13	21.3	21.3	0.0
- Non-Teachers	69	96.2	96.2	0.0

[(1)] *Actual and expected results and exposures for liability-weighted analysis involve a scaling factor of $100,000*

Demographic Assumptions – Summary of Changes (# Counts)

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Early Retirement - Population-Weighted Results				
Basic	232	296.5	249.2	(47.3)
MIP	2,092	2,638.9	2,233.0	(405.9)
Early Retirement - Liability-Weighted Results [(1)]				
Basic	384	552.0	462.9	(89.1)
MIP	3,684	5,280.2	4,450.4	(829.8)

[(1)] *Actual and expected results and exposures for liability-weighted analysis involve a scaling factor of $100,000*

Demographic Assumptions – Summary of Changes (# Counts)

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Withdrawal				
First 5 Years of Service - Population-Weighted Results				
Non-PPP2 (i.e., Basic, MIP, PPP)				
Members > $20,000 Pay - Teachers	2,373	3,001.4	2,640.1	(361.3)
- Non-Teachers	2,313	2,772.4	2,772.4	0.0
Members < $20,000 Pay - Teachers	2,429	3,095.9	2,776.1	(319.8)
- Non-Teachers	31,723	30,021.3	30,021.3	0.0
PPP2				
Members > $20,000 Pay - Teachers	418	477.1	471.7	(5.4)
- Non-Teachers	416	494.9	458.5	(36.4)
Members < $20,000 Pay - Teachers	126	88.5	150.5	62.0
- Non-Teachers	2,025	1,373.9	1,743.2	369.3

(1) Actual and expected results and exposures for liability-weighted analysis involve a scaling factor of $100,000

Demographic Assumptions – Summary of Changes (# Counts)

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Withdrawal (concluded)				
Over 5 Years of Service - Population-Weighted Results[2]				
Members > $20,000 Pay - Teachers	3,716	3,399.6	2,886.9	(512.7)
- Non-Teachers	2,291	2,089.1	1,649.5	(439.6)
Members < $20,000 Pay - Teachers	1,110	916.8	916.8	0.0
- Non-Teachers	5,719	4,064.1	4,064.1	0.0
Over 5 Years of Service - Liability-Weighted Results[1],[2]				
Members > $20,000 Pay - Teachers	3,695	6,145.5	5,064.3	(1,081.2)
- Non-Teachers	1,722	3,005.8	2,294.5	(711.3)
Members < $20,000 Pay - Teachers	415	306.8	306.8	0.0
- Non-Teachers	940	740.1	740.1	0.0
Disability - Population-Weighted Results	364	701.7	701.7	0.0

[1] *Actual and expected results and exposures for liability-weighted analysis involve a scaling factor of $100,000*

[2] *Non-PPP2 (i.e., Basic, MIP, and PPP)*

Demographic Assumptions – Retiree Mortality

- Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements
- ASOP No. 35 states with regard to the mortality assumption:
  - "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement."
- Starting with the previous experience study, a "generational" approach to the mortality rates was implemented
  - Assumes that future mortality rates will continue to decline with each generation
  - Any static margin is removed from the base tables and a mortality improvement scale is applied to project rates getting lower each year in the future. This means that next year's 65-year-old will have a slightly longer life expectancy than this year's, etc.

Demographic Assumptions – Retiree Mortality

- In 2019, the Society of Actuaries (SOA) published a mortality study specific to public sector retirement systems
  - Included numerous mortality tables by classification (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit-weighted, above median, below median)
- SOA updates mortality projection scales annually
  - The latest published table is called the MP-2021 Projection Scale
  - SOA recommends use of "fully generational" (2-dimensional) projection scales
- Due to COVID-19, data from fiscal years 2020, 2021, and 2022 was excluded from the experience study
  - Replaced with data from fiscal years 2015, 2016, and 2017

Demographic Assumptions – Retiree Mortality

- Recommendation:
  - PubT-2010 Retiree Mortality Tables
    - These are Teacher member tables and are amount-weighted
  - 116% scaling for both male and female mortality tables
    - The MPSERS mortality experience during the experience study period was deemed fully credible
  - Projected with mortality improvements using the fully generational MP-2021 projection scale
    - We recommend maintaining the MP-2021 improvement scales until the next experience study

Demographic Assumptions – Retiree Life Expectancy

Sample Attained Ages	Future Life Expectancy (years)							
	Present		Proposed 2022*		Proposed 2027*		Proposed 2032*	
	Men	Women	Men	Women	Men	Women	Men	Women
45	41.73	44.81	41.73	44.02	42.11	44.38	42.50	44.73
50	36.75	39.74	36.54	38.80	36.92	39.15	37.30	39.51
55	31.91	34.72	31.44	33.67	31.82	34.02	32.19	34.37
60	27.22	29.83	26.52	28.75	26.88	29.08	27.25	29.42
65	22.74	25.14	21.82	23.97	22.14	24.27	22.49	24.58
70	18.50	20.65	17.37	19.33	17.65	19.60	17.95	19.88
75	14.55	16.42	13.27	14.96	13.49	15.19	13.74	15.44
80	10.98	12.56	9.64	11.04	9.82	11.24	10.01	11.43

** Life expectancy in future years is determined by the fully generational MP-2021 projection scale*

Demographic Assumptions – Disabled Mortality

- Disabled mortality experience during the study period was not sufficient to adjust the published tables
- Recommendation:
  - PubNS-2010 Disabled Retiree Mortality Tables
    - These are Non-Safety member tables and are amount-weighted
  - 100% scaling of both male and female mortality tables
  - Projected with mortality improvements using the fully generational MP-2021 projection scale

Demographic Assumptions – Active Mortality

- Active mortality experience during the study period was not sufficient to adjust the published tables
- Recommendation:
  - PubT-2010 Employee Mortality Tables
    - These are Teacher member tables and are amount-weighted
  - 100% scaling of both male and female mortality tables
  - Projected with mortality improvements using the fully generational MP-2021 projection scale

Demographic Assumptions – Summary of Mortality Experience Results

Decrement Risk Area	Actual Number	Expected Number		
		Present Assumptions	Proposed Assumptions	Change
Mortality - Population-Weighted Results [2]				
Non-Disabled Retired Lives - Male	8,353	7,157.2	7,518.4	361.2
- Female	16,159	14,050.6	15,135.1	1,084.5
Disabled Retired Lives - Male	371	328.4	286.7	(41.7)
- Female	796	701.5	667.0	(34.5)
Mortality - Benefits-Weighted Results [1],[2]				
Non-Disabled Retired Lives - Male	2,185	2,100.9	2,191.1	90.2
- Female	2,658	2,559.3	2,658.4	99.1
Disabled Retired Lives - Male	46	43.6	38.0	(5.6)
- Female	79	72.8	69.9	(2.9)

[1] Actual and expected results and exposures for benefits-weighted analysis involve a scaling factor of $100,000

[2] The study period used in the mortality analysis is for the period October 1, 2014 through September 30, 2019

Demographic Assumptions – Service Credit Accrual Assumption

- As part of prior experience studies, we identified a significant distinction in service accrual patterns between Teacher/Non-Teacher and full-time/part-time employees
- $20,000 of annual pay was established as an approximate threshold for distinguishing between full-time and part-time employees
- The results indicate higher service accrual patterns than seen in prior experience studies

Demographic Assumptions – Service Credit Accrual Assumption

- Recommendation:
  - Increase the service credit accrual assumption

	Average Service Credit Accrued Each Year		
	Actual Experience	**Present Assumption**	**Proposed Assumption**
Teachers with Pay Over $20,000	0.98 years	0.93 years	1.00 years
Non-Teachers with Pay Over $20,000	0.96	0.93	1.00
Teachers with Pay Under $20,000	0.69	0.60	0.68
Non-Teachers with Pay Under $20,000	0.68	0.65	0.68

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed demographic changes on actuarial accrued liabilities

Decrement Risk Area	Relative Liability Impact
Age and Service Retirement	
Basic - Teachers	**No Change**
- Non-Teachers	**No Change**
MIP (age 60+) - Teachers	**No Change**
- Non-Teachers	**No Change**
MIP (30 & out) - Teachers	**No Change**
- Non-Teachers	**Small Decrease**
PPP - Teachers	**No Change**
- Non-Teachers	**No Change**
Early Retirement	
Basic	**Small Increase**
MIP	**Small Increase**

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed demographic changes on actuarial accrued liabilities

Decrement Risk Area	Relative Liability Impact
Withdrawal	
First 5 Years of Service	
Non-PPP2 (i.e., Basic, MIP, PPP)	
Members > $20,000 Pay - Teachers	Small Increase
- Non-Teachers	No Change
Members < $20,000 Pay - Teachers	Small Increase
- Non-Teachers	No Change
PPP2	
Members > $20,000 Pay - Teachers	Small Increase
- Non-Teachers	Small Increase
Members < $20,000 Pay - Teachers	Small Decrease
- Non-Teachers	Small Decrease

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed demographic changes on actuarial accrued liabilities

Decrement Risk Area	Relative Liability Impact
Withdrawal	
Over 5 Years of Service	
Non-PPP2 (i.e., Basic, MIP, PPP)	
Members > $20,000 Pay - Teachers	Small Increase
- Non-Teachers	Small Increase
Members < $20,000 Pay - Teachers	No Change
- Non-Teachers	No Change
PPP2	
Members > $20,000 Pay - Teachers	Small Increase
- Non-Teachers	Small Increase
Members < $20,000 Pay - Teachers	Small Increase
- Non-Teachers	Small Increase

Demographic Assumptions – Impact of Demographic Changes on Liability

- Impact of proposed demographic changes on actuarial accrued liability

Decrement Risk Area	Relative Liability Impact
Disability	**No Change**
Mortality	
Healthy Retired Lives - Male	**Decrease**
- Female	**Decrease**
Disabled Retired Lives - Male	**Small Increase**
- Female	**Small Increase**
Pre-Retirement Lives - Male	**Small Increase**
- Female	**Small Increase**
Service Credit Accrual Assumption	**Increase**

ECONOMIC ASSUMPTIONS

Economic Assumptions – Current

- The economic assumptions currently in place are presented below:
  - Investment Returns
    - Pension: 6.00%
    - Retiree Health: 6.00%
    - Net of investment expenses
  - Wage Inflation – 2.75%
  - Price Inflation – 2.25%
  - Payroll Growth Assumption (non-amortization purposes) – 2.75%

Economic Assumptions – ASOP No. 27

- Guidance regarding the selection of economic assumptions is governed by Actuarial Standard of Practice (ASOP) No. 27
- ASOP No. 27 requires that the selected economic assumptions be individually reasonable and consistent with one another
- That is, the selection of the price inflation assumption should be consistent with the selection of the wage inflation and investment return assumptions

Economic Assumptions – Data

- Sources of information used to establish economic assumption recommendations:
  - Price Inflation
    - Congressional Budget Office
    - Philadelphia Federal Reserve quarterly survey of Society of Professional Forecasters
    - Comparison of Treasury yields and TIPS
    - Federal Reserve Bank of Cleveland inflation expectations
  - Investment Return
    - Future capital market expectations of 11 investment firms that GRS monitors
  - Wage Inflation, Merit and Seniority, and Payroll Growth
    - Actual MPSERS experience over the experience study period (i.e., merit and seniority pay increases)
    - Historical observations of inflation statistics (both price and wage and the relationship between them) both nationally and for MPSERS

Economic Assumptions – Price Inflation

- Congressional Budget Office provides an inflation expectation for the next 10 years
  - The Budget and Economic Outlook: 2023 to 2033 report released in February 2023 indicates a 2.57% expectation
- Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters
  - 10-year inflation expectation from second quarter 2023 indicates a 2.36% inflation expectation
- A comparison of nominal Treasury yields and TIPS provided an approximation for market price inflation expectations over various time horizons (based upon data from the Federal Reserve Bank of St. Louis)
  - 10-year expectation is 2.27% (July 6, 2023)
  - 20-year expectation is 2.48% (June 2023)
  - 30-year expectation is 2.23% (June 2023)
- Federal Reserve Bank of Cleveland inflation expectations as of June 1, 2023 over various time horizons
  - 10-year expectation is 1.66%
  - 20-year expectation is 1.88%
  - 30-year expectation is 2.05%
- GRS' preferred price inflation assumption is 2.35%

Economic Assumptions – Wage Inflation

- Wage inflation consists of two components
  - A portion due to pure price inflation (i.e., increases due to changes in the CPI); and
  - Increases in average salary levels in excess of pure price inflation

Economic Assumptions – Wage Inflation

- Below shows the annual compound rate of average salary increase rate of active members [combined defined benefit (DB) and defined contribution (DC)] over various periods:
  - 5 years ending September 30, 2012: 3.04%
  - 5 years ending September 30, 2017: 0.84%
  - 5 years ending September 30, 2022: 3.57%

Economic Assumptions – Wage Inflation

- We are generally comfortable with the wage inflation assumption exceeding the price inflation assumption by 0.25% to 1.00%
- Given our preferred price inflation assumption of 2.35%, our preferred assumption is for the wage inflation assumption to exceed the price inflation assumption by 0.40%
- This would result in a wage inflation assumption of 2.75%

Economic Assumptions – Merit and Seniority

- Total pay increases for an individual consist of a portion due to wage inflation and a portion due to an individual's on the job performance (i.e., merit and seniority)
- The merit and seniority portion of the pay increase assumption was analyzed over the experience study period
- Continued use of the current age-based structure of the assumption was deemed to remain appropriate based upon the analysis performed
- No changes are being recommended to the merit and seniority assumptions based upon the observed experience

Economic Assumptions – Payroll Growth

- Historically, payroll growth is used in the determination of the amortization payments required to amortize the unfunded actuarial accrued liability (UAAL)
  - The payroll growth assumption for amortizing UAAL became a legislated assumption effective with Public Act 181 of 2018
  - A portion of Public Act 181 of 2018 outlined a scheduled transition from level percentage of payroll amortization to level dollar amortization by reducing the payroll growth assumption for amortization purposes for the Non-Hybrid and PPP portions of the plan
  - Public Act 220 of 2022 accelerated the scheduled transition from level percentage of payroll amortization to level dollar amortization
  - Public Act 92 of 2017 created the PPP2 benefit structure and mandated level dollar amortization (i.e., a 0% payroll growth amortization assumption) for that portion of the plan
- The payroll growth assumption is also the basis to project the total MPSERS (DB plus DC combined) payroll to future fiscal years for projection purposes
  - UAAL contributions for MPSERS are collected on total MPSERS payroll

Economic Assumptions – Payroll Growth

- The payroll growth assumption is primarily dependent on two factors:
  - Wage inflation assumption
  - Size of the active population
- Actual MPSERS payroll growth for periods ending September 30, 2022:
  - Last 5 years: 3.2%
  - Last 10 years: 1.1%
  - Last 15 years: -0.2%
  - Last 20 years: -0.1%
  - Last 25 years: 0.7%
- The actual payroll growth for fiscal year 2022 was approximately 7.9%
  - Significantly higher than any other year in the last 25 years
  - A 5-year average of the actual payroll growth for MPSERS ending September 30, 2021 was only 1.6%

Economic Assumptions – Payroll Growth

- Decline in the MPSERS active population is primary factor in the realized payroll growth
- If the Board and DTMB expect that the active membership will not decline from its current level going forward, we would be comfortable with a payroll growth assumption up to the wage inflation assumption of 2.75% for payroll projection purposes
- No change is being recommended to the current payroll growth assumption for purposes of projecting the combined (DB plus DC) MPSERS payroll for projection purposes

Economic Assumptions – Investment Return

- The investment return assumption is the actuarial assumption that has the largest effect on actuarial valuation results
- Since one of public plans' fundamental financial objectives is the receipt of level contributions as a % of payroll over time to finance the additional benefits that members accrue, the discount rate assumption is based upon the investment return assumption

Economic Assumptions – Investment Return

- GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations
- Based upon the current target asset allocations, future return expectations of various investment firms that GRS monitors were analyzed using the GRS Capital Market Assumptions Modeler (CMAM)
- The next slide shows the results of the analysis
  - Capital market expectations are already net of passive investment expenses
  - A contribution for administrative expenses (based upon the actual administrative expenses incurred during the previous year) is included in the normal cost
  - Final expected nominal investment return results are based upon the recommended 2.35% price inflation assumption

Economic Assumptions – Investment Return

Summary of GRS 2023 CMAM Analysis	
10-Year Capital Market Expectations Average of 11 Investment Firms	
1-Year Expected Return	7.94%
Standard Deviation of 1-Year Expected Return	13.03%
Short-Term Expected Median Return (i.e., 50th Percentile)	7.16%
20- to 30-Year Capital Market Expectations Average of 7 Investment Firms	
Long-Term Expected Median Return (i.e., 50th Percentile)	7.43%

Economic Assumptions – Investment Return – ASOP No. 27

- The preferred assumption in the actuarial community is the expected median return (i.e., 50th percentile) over a particular time horizon
  - Based on the average of the calendar year 2023 results for each of the investment firms, this would lead to an investment return assumption of:
    - 7.16% (based upon short-term expectations)
    - 7.43% (based upon long-term expectations)

Economic Assumptions – Investment Return

- One item to note is that the 10-year expected median return based upon calendar year 2023 capital market expectations has increased significantly over the past few years
  - 10-year expected median return based upon capital market assumptions in calendar year 2019 through 2023:

    2019 – 6.81%
    2020 – 6.36%
    2021 – 6.02%
    2022 – 5.81%
    2023 – 7.16%

Economic Assumptions – Investment Return

- While it is true that retirement plans are generally long-term investors, MPSERS has significant liability commitments over the next 10-15 years
  - Total Present Value of Future Pension Benefits for MPSERS as of September 30, 2022: $108 billion
    - Approximately 24% associated with benefit payments in the first 5 years
    - Approximately 44% associated with benefit payments in the first 10 years
    - Approximately 60% associated with benefit payments in the first 15 years
  - As a result of observations, we tend to put more weight on the short-term expectations

Economic Assumptions – Investment Return

- In accordance with modifications to the Dedicated Gains Policy, the Dedicated Gains Policy cannot lower the investment return assumption below 6.00%
- Based upon the results of analysis and the current elevated levels of future capital market expectations (i.e., 2023 capital market expectations versus those in 2019 through 2022), we believe that the current pension investment return assumption of 6.00% and the current OPEB investment return assumption of 6.00% are reasonable
  - Recommending no change in the pension or OPEB investment return assumptions

ACTUARIAL METHODS

Actuarial Methods – Recommendations

- Actuarial Funding Method
  - Continue use of the entry age actuarial cost method for all benefits
- No change to the amortization policy
  - Presumes the Office of Retirement Services is working with each of the Systems to adopt a funding policy that addresses the amortization policy
- Continue use of the current asset valuation method with a 30% corridor for pension and OPEB valuation purposes
- Consider adopting PPP2 employer and member contribution rates of 6.00% of payroll until the next 5-year experience study, pending legal review

EFFECT ON VALUATION RESULTS

Effect on Valuation Results

- In this section, September 30, 2022 pension and retiree health (i.e., OPEB) actuarial valuation results are presented based on the proposed demographic assumptions and economic assumptions
- It is our expectation that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation

Effect on Valuation Results – Pension Valuation as of September 30, 2022

	Present Assumptions	Alternate Assumptions
Investment Return Assumption	**6.00%**	**6.00%**
Wage Inflation Assumption	**2.75%**	**2.75%**
All Other Assumptions	**Present**	**Proposed**
Total Normal Cost of Benefits % (as a % of member pay)[(1),(2)]	13.26%	14.49%
Member Contribution % (weighted average)	5.16%	5.14%
Employer Normal Cost %	8.10%	9.35%
Employer Normal Cost $ (in millions)	$688.8	$795.6
Total Actuarial Accrued Liability (in millions)	$98,142.1	$94,881.8
Funding Value of Assets (in millions)	63,075.0	63,075.0
Unfunded Actuarial Accrued Liability (in millions)	35,067.1	31,806.8
Funded Percentage - Total	64.3%	66.5%
Funded Percentage - Pension Plus 2 Plan Only	105.9%	105.5%
Total Amortization Payment %[(1)]	30.62%	27.32%
Total Amortization Payment $ (in millions)	$3,187.0	$2,844.8
Total Computed Employer Contribution $ (in millions)[(3)]	$3,875.7	$3,640.4

(1) The employer normal cost percent is expressed as a percentage of the defined benefit payroll, while the amortization payment is expressed as a percentage of total payroll (i.e., including both DB and DC active member payroll).

(2) Includes administrative expense load.

(3) Contribution amounts presented above would be for fiscal year (FY) 2025 but are illustrative only. Actual FY 2025 contribution amounts are based upon pre-experience study results. Our expectation is that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation.

Effect on Valuation Results – OPEB Valuation as of September 30, 2022

	Present Assumptions	Alternate Assumptions
Investment Return Assumption	**6.00%**	**6.00%**
Wage Inflation Assumption	**2.75%**	**2.75%**
All Other Assumptions	**Present**	**Proposed**
Total Normal Cost of Benefits % (as a % of member pay)[(1),(2)]	4.08%	4.07%
Member Contribution % (weighted average)	3.00%	3.00%
Employer Normal Cost %	1.08%	1.07%
Employer Normal Cost $ (in millions)	$65.3	$64.7
Total Actuarial Accrued Liability (in millions)	$11,508.1	$11,060.3
Funding Value of Assets (in millions)	11,419.6	11,419.6
Unfunded Actuarial Accrued Liability (in millions)	88.6	(359.3)
Funded Percentage	99.2%	103.3%
Total Amortization Payment %[(1)]	0.00%	0.00%
Total Amortization Payment $ (in millions)	$0.0	$0.0
Total Computed Employer Contribution $ (in millions)[(2)]	$65.3	$64.7

(1) The employer normal cost percent is expressed as a percentage of the defined benefit OPEB payroll, while the amortization payment is expressed as a percentage of total payroll (i.e., including both DB and DC active member payroll).

(2) Includes administrative expense load.

(3) Contribution amounts presented above would be for fiscal year (FY) 2025 but are illustrative only. Actual FY 2025 contribution amounts are based upon pre-experience study results. Our expectation is that the proposed set of actuarial assumptions would first be used for the September 30, 2023 valuation.

Disclosures

- This presentation shall not be construed to provide tax advice, legal advice or investment advice
- Mita Drazilov and Louise Gates are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein
- Additional information regarding actuarial assumptions and methods, and important additional disclosures are provided in the report titled “Michigan Public School Employees’ Retirement System 5-Year Experience Study – October 1, 2017 through September 30, 2022”
- If you need additional information to make an informed decision about the contents of this presentation, or if anything appears to be missing or incomplete please contact us before using this presentation