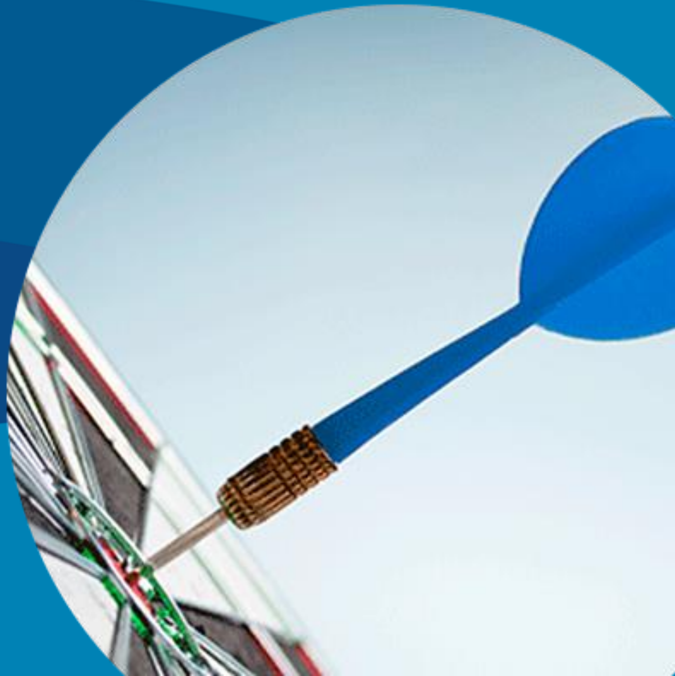
Wisconsin Retirement System

37th Annual Actuarial Valuation as of December 31, 2017 and Gain/Loss Analysis

June 2018



Funding Objectives

- Intergenerational equity with respect to plan costs
- Stable or increasing ratio of assets to liabilities
- Stable pattern of contribution rates

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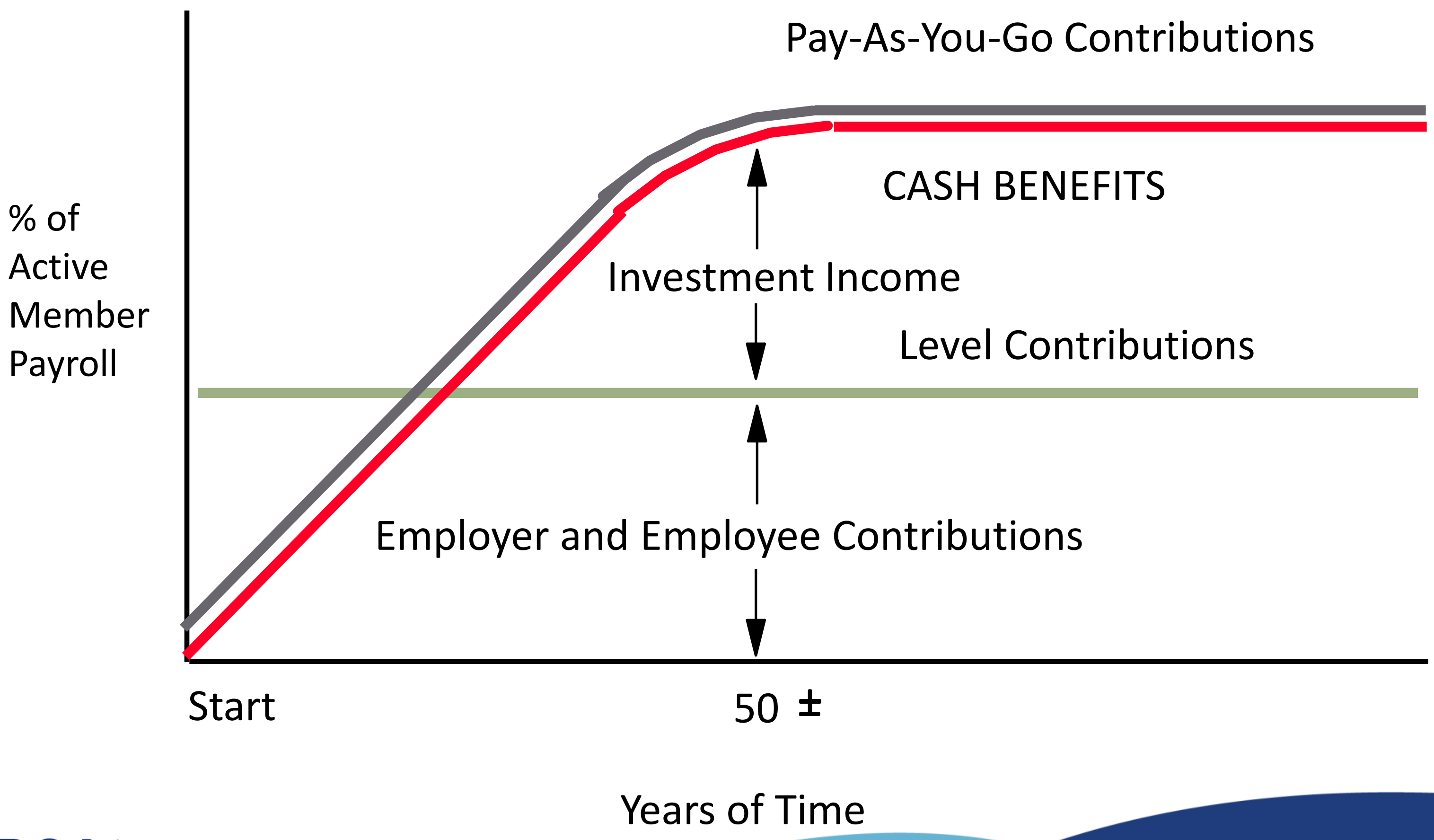
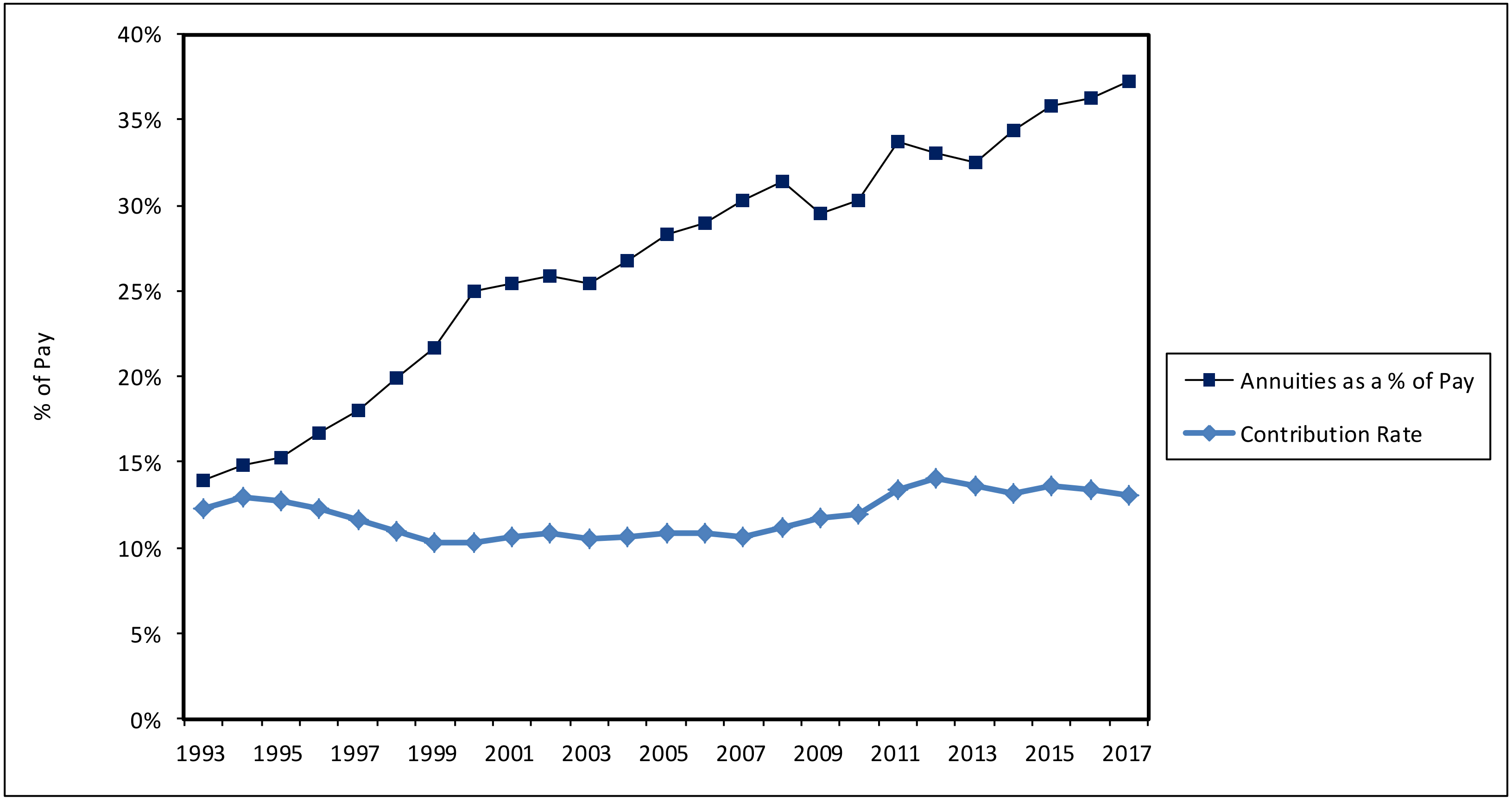
Financing Diagram



Annuities as a % of Payroll and WRS Average Total Contribution Rate*



Annuities are expected to continue to increase as a percent of payroll for several more decades.

**Average total rate shown is for General Participants.*

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Active Participants

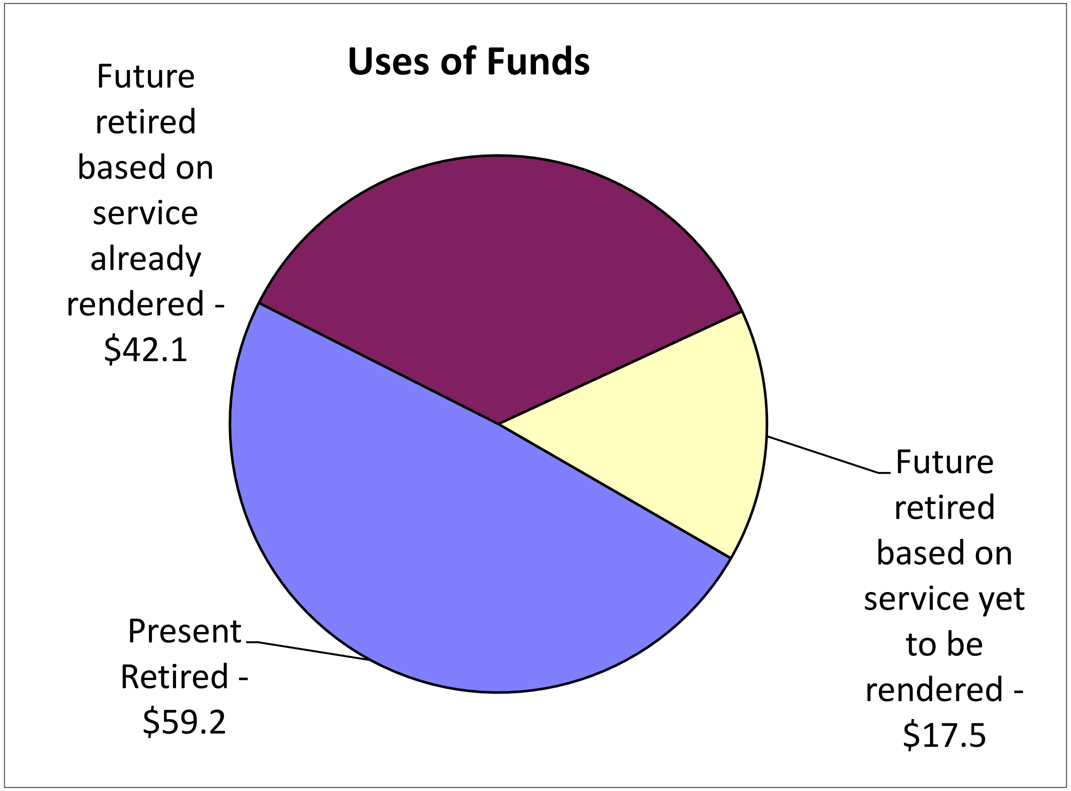
Valuation Group	Number	Annual Earnings ($Millions)	Group Averages			
			Earnings	Age	Years of Service	Contribs.
General	232,874	$12,167.4	$52,249	45.5	11.3	$57,538
Executive Group & Elected Officials	1,335	107.3	80,366	55.1	13.5	103,845
Protective Occupation with Social Security	19,431	1,227.0	63,145	40.2	12.5	67,493
Protective Occupation without Social Security	2,743	218.8	79,753	41.0	14.1	83,856
Total Active Participants	**256,383**	**$13,720.5**	**$53,515**	**45.1**	**11.5**	**$58,815**
Prior Year	256,208	$13,486.0	$52,637	45.2	11.5	$56,427

All Participants

Valuation Group	Number	Average Annual Earnings/Benefits*
Actives	256,383	$53,515
Inactives	165,051	$15,774
Retirees & Beneficiaries	203,202	$25,181
Total Participants	**624,636**	

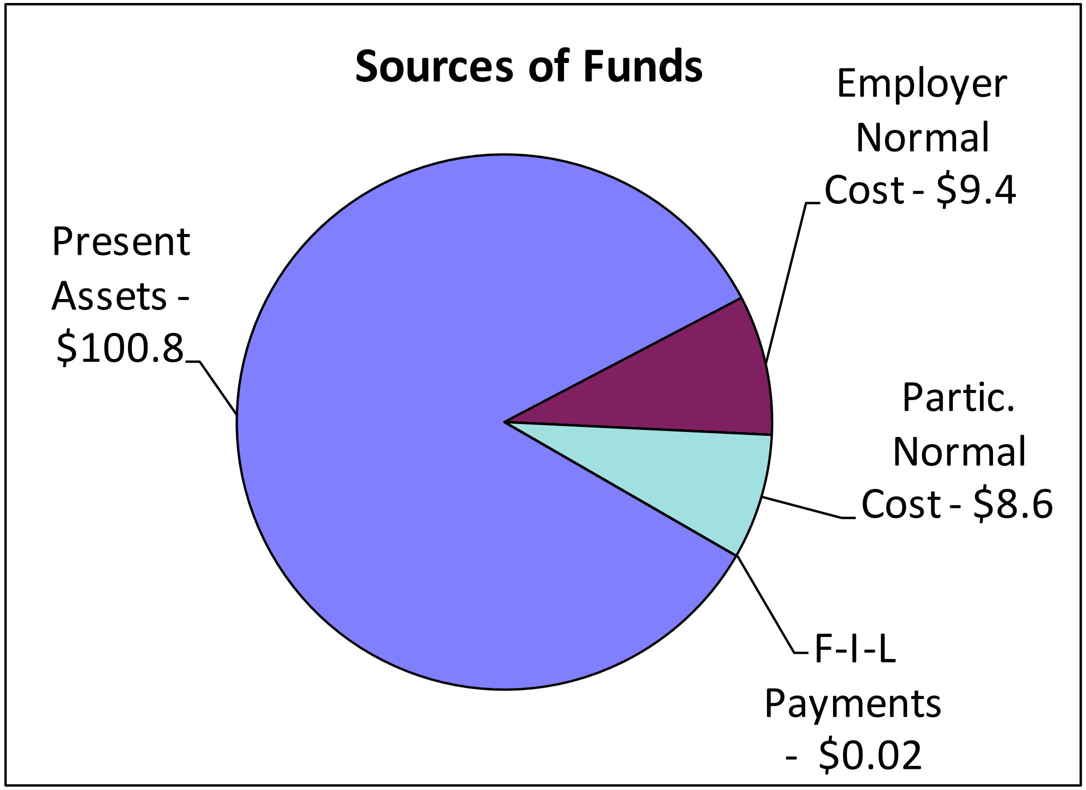
** For inactives, average money purchase balance.*

$118.8 Billion* of Benefit Promises to Present Active and Retired Members



* *Present value of future benefits; all divisions combined.*

Sources of Funds for Financing $118.8 Billion of Benefit Promises



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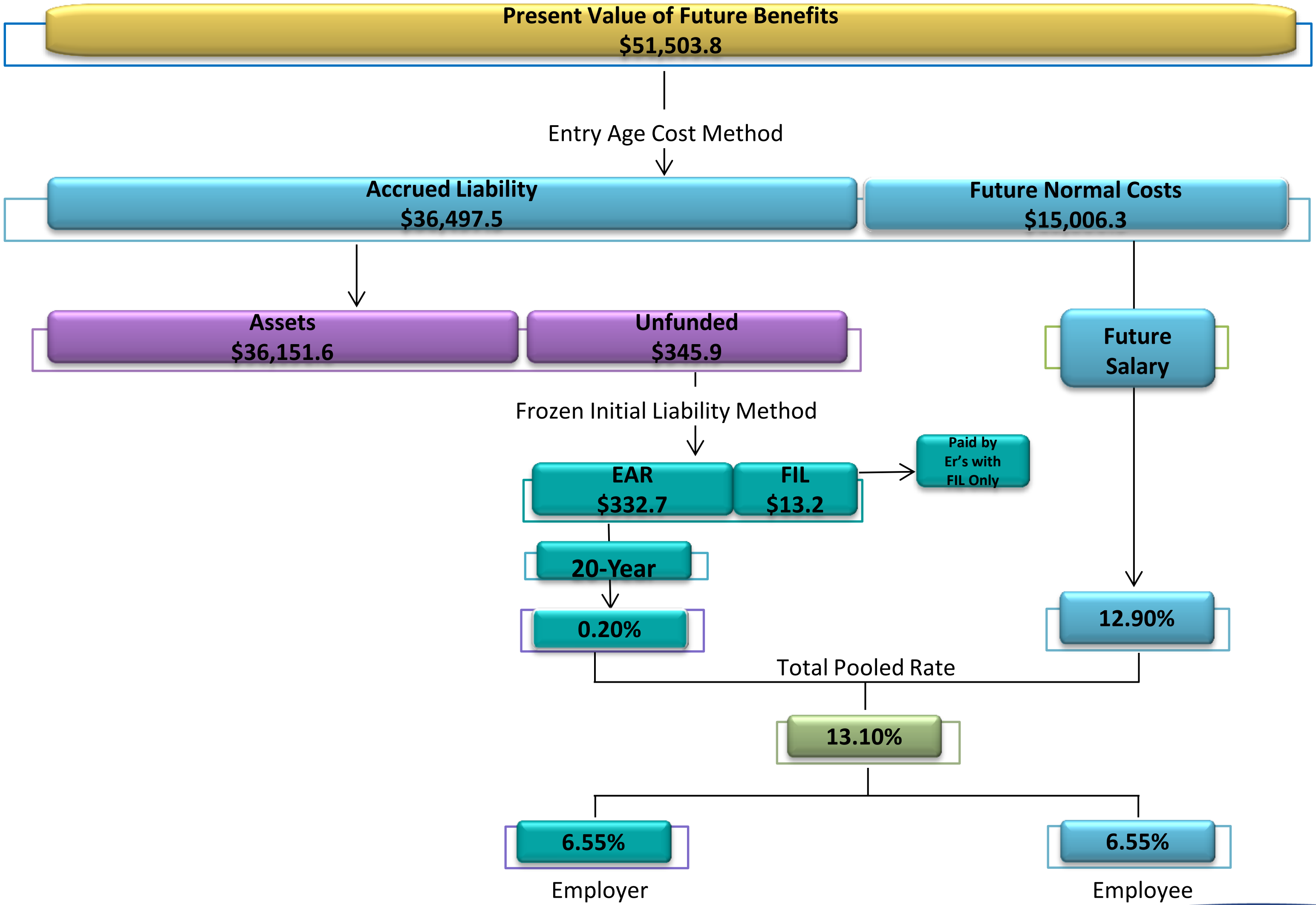
Actuarial Valuation Process
Illustration for General/Elected Group ($ Millions)



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Summary of December 31, 2017 Valuation Results

	General, Executive & Elected		Protective Occupation				Average
			With Soc. Sec.		Without Soc. Sec.		
	2019	2018	2019	2018	2019	2018	2019
Employer Normal Cost	6.55%	6.70%	10.55%	10.70%	14.95%	14.90%	7.10%
Participant Normal Cost	6.55%	6.70%	6.55%	6.70%	6.55%	6.70%	6.55%
Total Normal Cost	**13.1%**	**13.4%**	**17.1%**	**17.4%**	**21.5%**	**21.6%**	**13.7%**

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Comparative Statement of Total Average Contribution Rates

Valuation 12/31	General	Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
1997	11.60%	15.10%	13.80%	19.70%
2002	10.82%	11.51%	12.52%	15.01%
2007	10.58%	11.55%	13.15%	14.09%
2012	14.00%	15.50%	17.10%	21.00%
2013	13.60%	15.40%	16.30%	20.20%
2014	13.20%	15.60%	16.00%	20.00%
2015	13.67%	13.67%	17.50%	21.80%
2016	13.43%	13.43%	17.43%	21.65%
2017	13.12%	13.12%	17.10%	21.59%

Executive and Elected employee and employer rates for CY 2016 and beyond are made in accordance with the combined General/Exec & Elected results.

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Reasons for Contribution Changes

	General, Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
2018 Normal Cost Rate	13.40%	17.40%	21.60%
Effect of Benefit Change	0.00%	0.00%	0.00%
Effect of Assumption Change	0.00%	0.00%	0.00%
Effect of Asset Performance	(0.16)%	(0.27)%	(0.29)%
Effect of Salary Experience	(0.08)%	(0.02)%	0.07%
Effect of Money Purchase Benefit	(0.06)%	(0.03)%	(0.01)%
Demographic and Other Experience	0.00%	0.02%	0.13%
2019 Normal Cost Rate	13.10%	17.10%	21.50%

The effect of Asset Performance is different for each group because the ratio of assets to payroll is different for each group.

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Impact of Asset Gains/Losses

- Asset gains and losses above or below the assumed rate of return are smoothed in over the current year and four future years
- Four years after a valuation date, all asset gains or losses known at valuation date are fully recognized
- Statutory smoothing method in WRS is referred to as the Market Recognition Account (MRA)

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Operation of Market Recognition Account (MRA) - $ Millions

	2017	2018	2019	2020	2021
Actual Investment Return	$ 13,842				
Assumed Investment Return	6,533				
Gain/(Loss) to be phased-in	7,309				
Phased-in recognition					
• Current year	$ 1,462	?	?	?	?
• First prior year	120	$ 1,462	?	?	?
• Second prior year	(1,344)	120	$ 1,462	?	?
• Third prior year	(243)	(1,344)	120	$ 1,462	?
• Fourth prior year	953	(243)	(1,344)	120	$ 1,462
Total recognized gain (loss)	$ 948	$ (5)	$ 238	$ 1,582	$ 1,462

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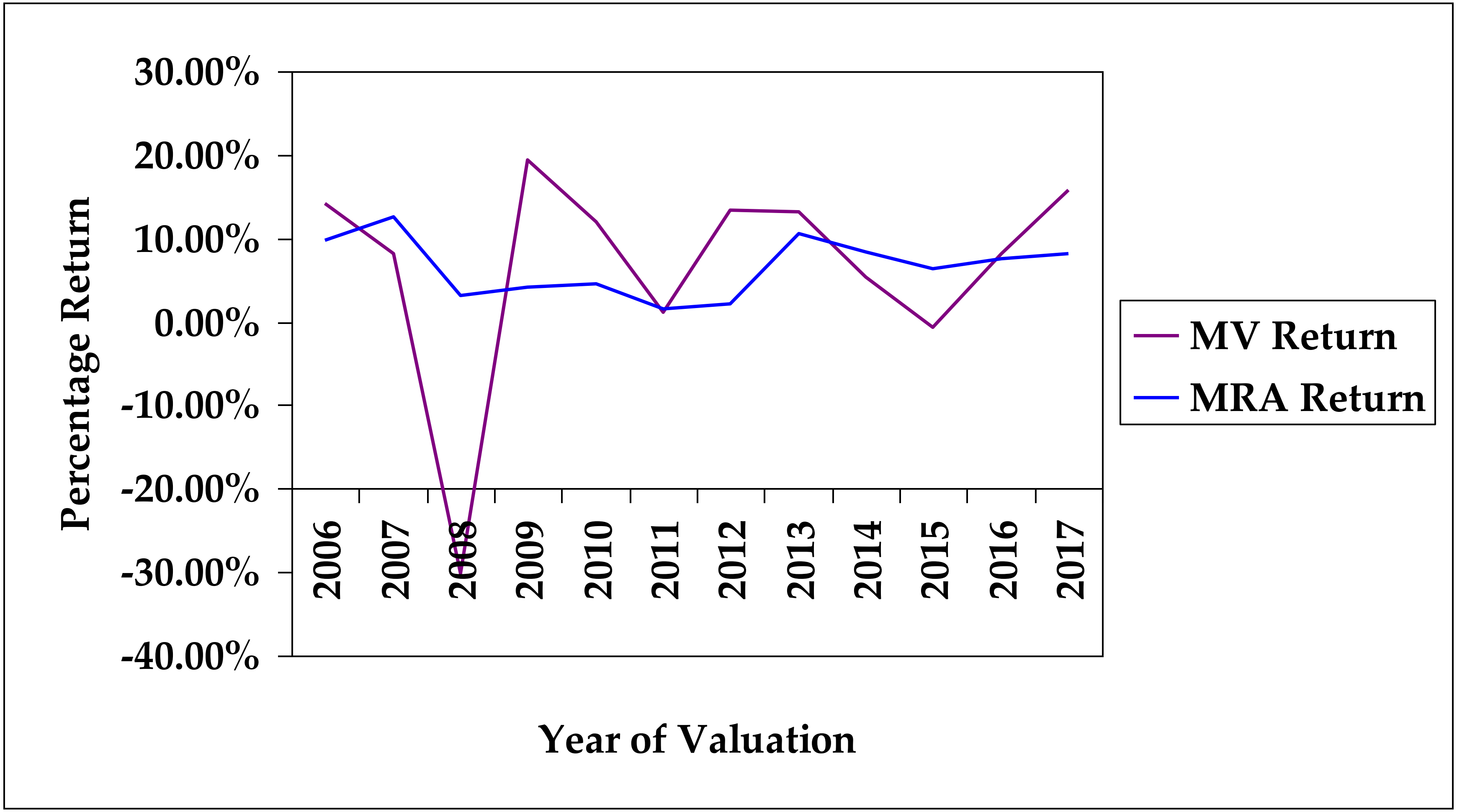
Reconciliation of Market Recognition Account (MRA)

	$ Millions
MRA at Beginning of Year	$92,268.1
Non-Investment Cash Flow	(3,055.1)
Assumed Return (at 7.2%)	6,533.3
Phase-in of Gains/(losses)	948.0
MRA at End of Year	$96,694.3

Assets in MRA include non WRS programs such as Sick Leave, LTDI, Duty Disability, etc.

Market Value Return vs. Market Recognition (Actuarial) Return



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WRS Funded Status

	Frozen Initial	Entry Age
2015	100.0%	98.7%
2016	100.0%	99.0%
2017	100.0%	99.5%

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Concluding Remarks

- There are $3.3 billion of unrecognized gains in the MRA
- Due to the cost sharing nature of WRS, asset losses have been traditionally shared by:
  - Employees (through reduced money purchase benefits)
  - Employers (through increases in contributions)
  - Retirees (through reduced dividends)

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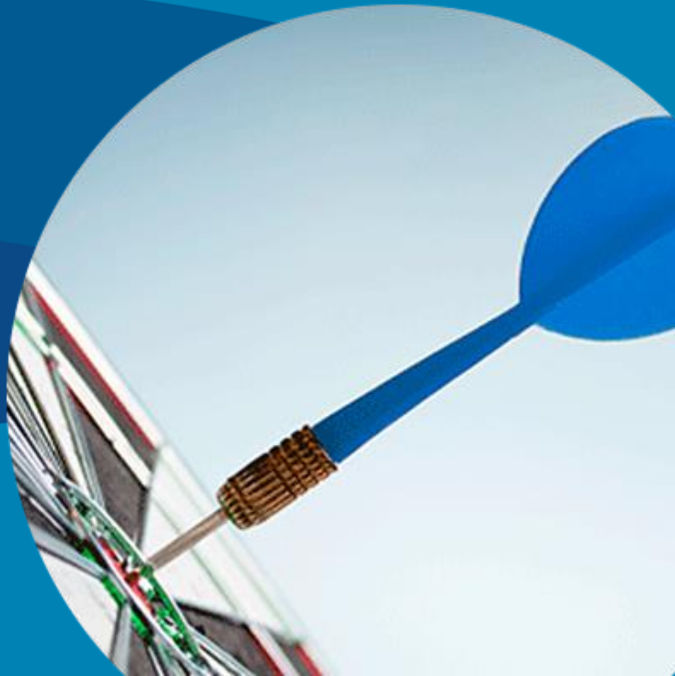
Gain/Loss Analysis



2017 Gain/Loss Analysis

A Gain/Loss Analysis measures differences between actual and assumed experience in each Risk Area.

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WRS Assumption Risk Areas

Primary Risks

Demographic	**Economic**
Normal retirement	Salary increases
Early retirement	Investment return
Death-in-service	
Disability	
Other separations	

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Why Have a Gain/Loss Analysis?

- To gain an understanding of reasons for contribution rate changes
- It is a year-by-year measure of the operation of assumptions
- To determine when assumption changes are needed
- To understand the nature of risk

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Population Development During 2017

		Actual	Expected
Beginning Census		256,208	
(-)	Normal Retirement	4,084	4,141
(-)	Early Retirement	3,440	4,138
(-)	Death	107	251
(-)	Disability Retirement		
	- Total Approved	104	192
	- Less Pending	28	
	- Net New	76	
(-)	Other Separations	15,527	12,384
(-)	Transfers Out	1,943	
(+)	Transfers In	1,943	
(+)	New Entrants	23,409	
Ending Census		256,383	

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Population Development During 2017

Normal Retirements: Varied by group and gender. Overall, slightly lower than expected, but net result on liabilities is a small loss.

Early Retirements: Lower than expected, overall producing a small loss.

Deaths: Among active participants were lower than expected. The net result for the past year was a small loss.

Disabilities: Lower than expected, producing a gain.

Other Separations: Varied by group, gender and service. The net result was a small gain.

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Components of Total Gain/(Loss)

	Gain/(Loss) in Millions	
	2016	2017
Economic Risk Areas	$ 436	$450
Decrement Risk Areas	(15)	10
Other Activity	(19)	(122)
Total Gain/(Loss)	$ 402	$338

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Investment Earnings in 2017 (Active Participants)

	$ Millions
A. Average balance on Participant and Employer Accumulation Reserves	$38,605
B. Expected earnings: 7.2%	2,780
C. Earnings credited to Participant and Employer Accumulation Reserves	3,642
D. Gain (loss) from earnings: C - B	$ 862

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Investment Earnings in 2017 (Active Participants)

- $862 million is the total recognized asset gain for the year for active participants
- However, part of the total gain/loss is allocated to Variable Excess accounts
- Some of the loss flows through to members via the operation of Money Purchase minimum benefits
- Must net these out to determine remaining core fund gain or loss
- Remaining portion affects contribution rates

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Investment Earnings in 2017 (Active Participants)

	$ Millions
Gross Gain/(Loss) for the Year (for Actives)	$862
Less Estimated Gain/(Loss) due to Money Purchase	71
Less Estimated Gain/(Loss) due to Variable Excess	442
Net Core Fund Asset Gain/(Loss)	$349

Comparative Schedule of Experience Gains/Losses by Decrement

Divisions Combined (Millions)

	2016	2017
Normal Retirement	$ (33.1)	$ (27.0)
Early Retirement	(18.5)	(13.4)
Disability Retirement	17.2	15.9
Death with Benefit	(0.2)	(2.4)
Other Separations	20.0	37.4
Total	$ (14.6)	$ 10.5
As % of Liabilities	<0.05%	<0.05%

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Salary Related Gain/Loss

- Pay increases were overall less than expected, resulting in a gain

	Gain/Loss $ Millions	% of Group Liabilities
General, Executive & Elected	$99.3	0.3 %
Protective w/Soc. Sec.	3.9	0.1 %
Protective w/o Soc. Sec.	(2.2)	(0.2)%
	$101.0	0.2 %

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Concluding Remarks

- Recognition of remaining prior asset gains and losses are expected over the next few years
- This Gain/Loss Analysis is the third in a regular 3-year experience cycle
- This study, together with the 2015 and 2016 results, will form the basis for the next experience study – to be performed later this year

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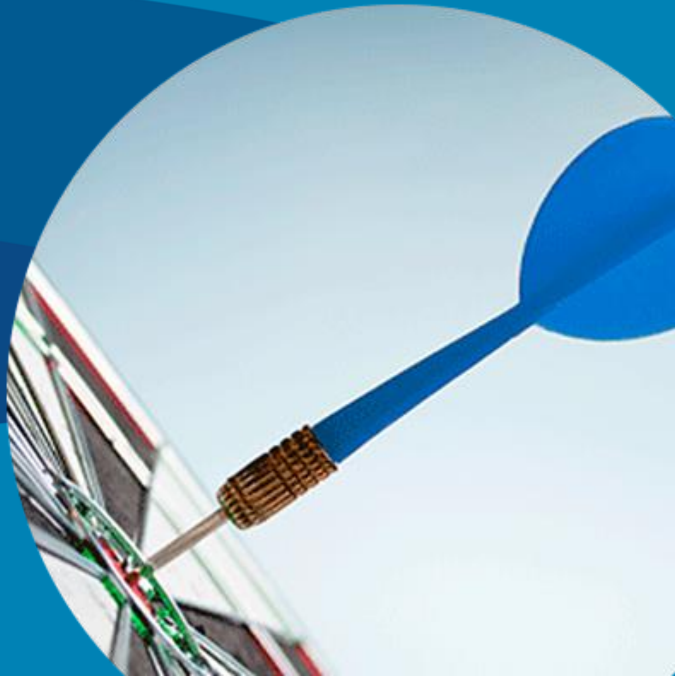
Current Events



CHANGING ACTUARIAL STANDARDS "ASOPS"

Actuarial Standards Generally

- Actuarial Standards Board (ASB) develops standards for work in various actuarial practice areas (Life, Health, Pension, etc.)
- Our work for the Wisconsin Retirement System (WRS) must follow actuarial standards

Pension Actuarial Standards

- ASOP 4: Measuring Pension Obligations
- ASOP 27: Selecting Economic Assumptions
- ASOP 35: Selecting Demographic Assumptions
- ASOP 41: Actuarial Communications
- ASOP 44: Asset Valuation Methods
- ASOP 51: Risk Disclosures (New)

Changes

- ASOPs 4, 27, 35 are being changed
  - Still in “Exposure Draft Form”
  - Might affect WRS 2019 valuation
- ASOP 51 is new and will affect WRS’ December 31, 2018 valuation

ASOP 4 Exposure Draft

- New requirement for an Investment Risk Defeasement Measure or "IRDM" whenever a funding valuation is performed
- Used to be called a "Solvency Measure"
- Seems to be almost the same thing

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IRDM – What is it?

- “Market Based Alternative Liability measurement”
- Calculate Present Value of Accrued benefits
  - “Unit Credit” cost method
  - Based on either US Treasury Yields
  - Or “settlement rates” (e.g. highly rated fixed income debt securities)
  - And other assumptions either from the funding valuation or market data

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Controversy

- Public Sector Groups have opposed this calculation for years and probably will continue to do so.
  - Will be a big number that will make even well funded plans like WRS appear to be severely underfunded.
  - Subject to use/misuse by opponents of Defined Benefit plans.
  - Pension Liabilities cannot legally be “defeased” in most jurisdictions so why calculate a defeasement value?
  - Does not relate to funding.
  - Imposing costs onto the public sector.

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Discussion

- Bond rating agencies are using approximations to calculate a version of the IRDM anyway.
  - Might be better to have accurate numbers and have a say in the message.
- The IRDM aids in understanding the extent to which plans depend on risk premium to fund promised benefits.
- The IRDM can assist plans in avoiding unintended risk transfers when employers withdraw, service is purchased, or separate accounts are annuitized.

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Other ASOP 4 changes

- Permits level % of pay amortization but encourages payments at least equal to interest on UAL
  - WRS UAL payments are minimal
- Requires calculation of a reasonable "Actuarially Determined Contribution" or ADC
  - WRS' ADC is already reasonable
  - This may affect plans with various statutory calculations or assumptions

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Other ASOP 4 changes

- Requires a Gain and Loss analysis when a funding valuation is performed
  - Permits a “simplified” Gain and Loss Analysis
  - WRS work already exceeds this standard
- Requires an affirmative statement that the assumptions are reasonable
  - Not an issue unless they aren’t

ASOP 27 Exposure Draft

- If economic assumption changes are phased in, each step must be reasonable.
  - Not an issue for WRS.
- Actuary should determine reasonability of economic assumptions at each valuation date.
  - Can’t just “set ‘em & forget ‘em” every three years.
  - Could affect WRS if return expectations fall materially from present levels.

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ASOP 35 Exposure Draft

- If demographic assumption changes are phased in, each step must be reasonable.
  - Not an issue for WRS.
- Actuary should determine reasonability of demographic assumptions at each valuation date.
  - Can’t just “set ‘em & forget ‘em” every three years.
  - Not likely to affect WRS.

ASOP 35 Exposure Draft

- Regarding mortality Actuary should consider
  - Recently published tables
  - Different assumptions before and after retirement
  - Different assumptions for disabled lives
  - Different assumptions for participant subgroups and beneficiaries
- First three are already in place for WRS
- We currently use a single mortality table for all participant subgroups and beneficiaries
  - Unlikely that we would apply different mortality to different subgroups because of effect on optional benefits
  - May use a $ weighted analysis in the next experience study

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ASOP 51

- Actuary should identify risks that may affect the plan's future financial condition. For example:
  - Investment risk
  - Asset/liability mismatch risk
  - Interest rate risk
  - Longevity risk
  - Contribution risk
  - Other…

ASOP 51

- Actuary should assess the identified risks
  - Effect on future financial condition
  - Take into account plan specifics
  - Can be qualitative or quantitative

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ASOP 51

- Examples of quantitative assessments
  - Scenario tests
  - Sensitivity tests
  - Stochastic modelling
  - Stress tests
  - Comparison of an actuarial liability from the funding valuation with one calculated using minimal risk investments (IRDM?)

ASOP 51 – Qualitative or Quantitative?

- Small plans may mostly have qualitative assessments to minimize cost
- Larger plans such as WRS may lean toward periodic quantitative assessments
  - Possible Separate "Risk Report"
  - Could be annual or less frequent with qualitative in between
  - Practice has not yet emerged

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ASOP 51

- Disclose various plan maturity ratios
  - Market Value of assets to payroll
  - Retiree liability to total
  - Net cash flow to assets
  - Etc.
- WRS December 31, 2017 report includes extensive maturity measures

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- QUESTIONS?

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Disclaimers

- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- Brian Murphy, Mark Buis and James Anderson 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.
- This is one of multiple documents comprising the actuarial report. Additional information regarding actuarial assumptions and methods, and important additional disclosures are provided in the full report entitled "Thirty-Seventh Annual Actuarial Valuation and Gain Loss Analysis."
- If you need additional information to make an informed decision about the contents of this presentation or the contents of the full report, or if anything appears to be missing or incomplete, please contact us before making use of the information.

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