North Dakota Teachers' Fund for Retirement Actuarial Audit of the July 1, 2021 Actuarial Valuation

Dana Woolfrey, FSA, FCA, EA, MAAA
Paul Wood, ASA, FCA, MAAA
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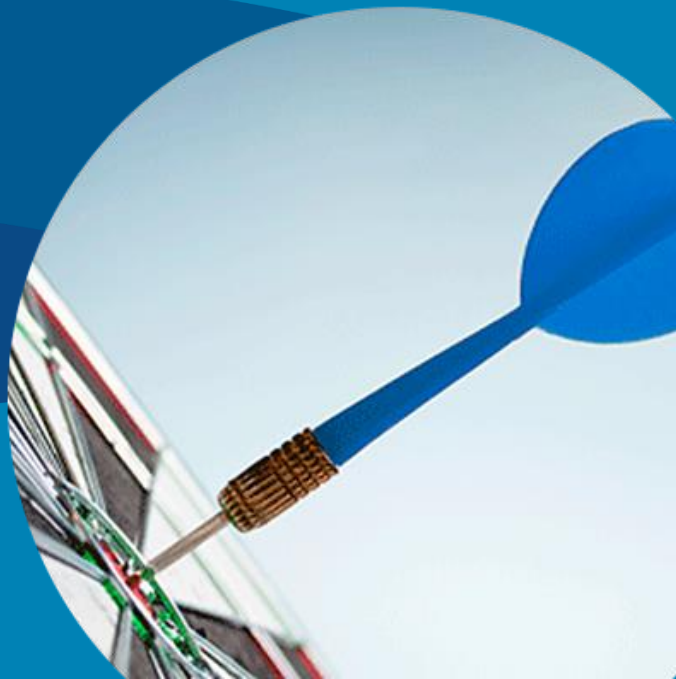


Purpose of an Actuarial Audit

- Are the funding results, in particular the assessment of the contribution requirements, reasonable?
- Does there appear to be any bias in the current actuarial model?
- Do the reports meet actuarial standards of practice?
- Are there potential, or even predictable, risks on the horizon that need to be discussed and perhaps addressed?

Review Checklist

- Census Data
- Assumptions
- Actuarial Model
- Report and Deliverables

Primary Conclusion

- "Based on our review of the census data, experience study documents, liability replications, and actuarial valuation report, we believe the 2021 actuarial valuation is reasonable for the purpose of determining the sufficiency of the current contribution rates, based on reasonable assumptions and methods, and the report generally complies with the Actuarial Standards of Practice."

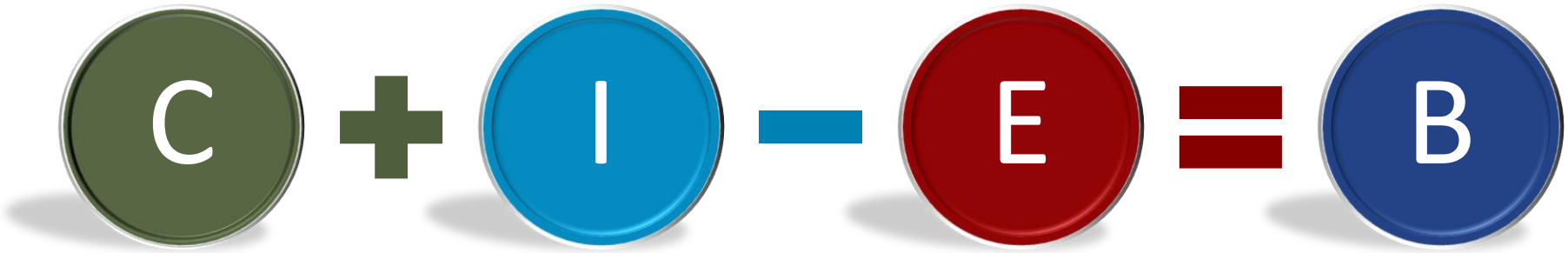
CENSUS DATA REVIEW

Census Data Review

- Checked data against raw and reconciliation of data from year to year
  - Checked that no records “falling off” during processing
    - Most common issue we see
    - Especially on teacher plans with summer valuation date
    - NDTFFR looks good ✓
- **No concerns**

ASSUMPTION REVIEW

Actuarial Funding
Basic Retirement Funding Equation



Contributions	Investment Income	Expenses	Benefits
• Funding Policy	• Investment Strategy	• Administrative Policy	• Plan Design

"Money In = Money Out"

NDTFFR Assumption Context

- Fixed rate plan
- Assumptions used to test contribution sufficiency of statutory contribution rates
  1. Assumptions turn out spot on
     - Plan funding evolves as expected
  2. Assumptions turn out conservative (plan costs less then thought)
     - Plan funding improves more quickly than expected
  3. Assumptions turn out aggressive (plan costs more than thought)
     - Plan could prove unsustainable at statutory rates
     - Have to make up for lost time on needed contributions

The Assumption Set

- The main assumptions used in most actuarial models, include but are not limited to:

Economic	Demographic
Inflation	Retirement Rates
Investment Return/Discount Rate	Disability Rates
Total Payroll Growth	Turnover Rates
Administrative Expenses	Mortality Rates
	Individual Salary Increases

Demographic Assumptions

- Reasonable ✓
  - Mortality using standard current tables
  - Modest adjustments last experience study looked reasonable and appropriate
  - No major demographic gains or losses since study
  - Gains and losses offsetting
    - No concerning bias
- One concern identified in looking at test life detail when setting up valuation replication
  - Early retirement application in cases of extreme benefit reduction

Early Retirement Example

- Eligibility at age 55 and 3/5 years of service
- Tier 1 grandfathered
  - 6% early retirement reduction from Rule of 85 or 65
- Tier 1 non-grandfathered and Tier 2
  - 8% early retirement reduction from Rule of 90 (min age 60) or 65
- Same retirement rates for both groups

Early Retirement Example

- Example specifically chosen to highlight the issue

Age	Years of Service	Tier 1 GF		Tier 1 NGF and Tier 2	
		Early Retirement Factor	Probability of Retirement	Early Retirement Factor	Probability of Retirement
55	26	76%	2.0%	28%	2.0%
56	27	88%	2.0%	44%	2.0%
57	28	100%	27.5%	60%	3.0%
58	29	100%	15.0%	76%	3.5%
59	30	100%	15.0%	92%	4.0%
60	31	100%	15.0%	100%	17.5%

- Assuming long service member will take a benefit with large reduction rather than simply waiting a few years underestimates costs
- Recommend setting retirement probabilities in red (anything less than 60% for ERF) to 0%
  - Increases our Actuarially Determined Contribution 0.22%

Economic Assumptions

- Economic assumptions reasonable ✓
- Inflation
  - Appropriate when set, still appropriate now
  - Long term assumption
  - Not feeling the urge to change our own inflation assumptions
  - No COLA in NDTFFR (where we tend to see inflation experience matter more)
    - Although pressure for ad hoc may exist
  - Inflation driven salary experience often doesn't significantly change funding trajectory on fixed rate plans
    - Near term results change, but
    - Contributory pay increasing often offsets initial liability increases over long term

Economic Assumptions

- Investment return = most pivotal assumption
- Current assumption reasonable based on
  - Timing of experience study
  - Plan history
- But likely downward pressure at next experience study
  - Used short-term expectations for prior justification
  - Capital market expectations down since 2019
  - Peer risk
  - Asymmetrical outcomes – consider conservatism

ACTUARIAL MODEL

Actuarial Model

- Were able to closely replicate Segal's results using stated assumptions
- Recommend alternate approach in calculating normal cost rate
  - Current method over-relies on new hire contributions in sufficiency comparison

Replication Results

- Total Present Value of Future Benefits within 0.2%!

Development of Current Plan Obligations

	Segal	GRS	Difference
1. Present Value of Future Benefits			
Active members			
Retirement	$2,506	$2,497	-0.4%
Withdrawal	184	189	2.9%
Death	35	35	2.6%
Disability	39	45	15.3%
Total	2,764	2,767	0.1%
Total Active	2,764	2,767	0.1%
Retirees and Beneficiaries	2,515	2,524.31	0.4%
Inactive vested members	118	118	0.2%
Inactive non-vested members	14	14	0.0%
Total	$5,411	$5,423	**0.2%**
2. Present Value of Future Normal Costs	$1,075	$1,108	3.1%
3. Actuarial Accrued Liability [1. - 2.]	$4,336	$4,314	-0.5%

Replication Results

Development of the Actuarially Determined Employer Contribution - Replicate

	Segal	GRS	Difference
Actuarial Accrued Liability	$4,336	$4,314	-0.5%
Actuarial Value of Assets	$2,974	$2,974	
Unfunded Actuarial Accrued Liability	$1,362	$1,341	-1.6%
Normal Cost	$95.6	$94.5	-1.1%
Administrative Expenses	$2.7	$2.7	0.0%
Amortization of Unfunded Liability	$92.8	$91.4	-1.6%
Total Contribution Requirement	**$191.2**	$188.6	-1.3%
Payroll for Upcoming Year	$793	$793	0.0%
Amounts as a % of Pay:			
Normal Cost*	12.06%	11.92%	
Administrative Expenses	0.35%	0.35%	
Amortization of Unfunded Liability	11.71%	11.52%	
Total Actuarially Determined Contribution	**24.12%**	23.79%	
Employee Contribution Rate	11.75%	11.75%	
Net Employer Actuarially Determined Contribution**	12.37%	12.04%	

**GRS recommendation regarding normal cost would increase rate by 0.5%*

***GRS recommendation incorporating above and early retirement recommendation increases ADC 0.76% and increases time to full funding by about 2 years*

Normal Cost Rate Determination - Current Approach

Numbers based on July 1, 2021 Segal Valuation (isolating normal cost issue, $ in millions)

	FY 2022 Pay		FY 2022 Contribs
Total	$793	x 24.5% =	$194.2
Closed Group	$761	x 24.5% =	$186.4
New Hires	$32	x 24.5% =	$7.8

	Contribution Needs FY 2022		Contributions Payable FY 2022
Closed Group Normal Cost + Admin as of July 1, 2021	$ 98.3		$ 94.4
Newly Hired Normal Cost During FY 2022	$ -		$ 3.9
Amortization Payment on Closed Group Payroll	$ 89.1		$ 92.0
Amortization Payment on New Hire Payroll	$ 3.7		$ 3.9
Total Dollar Amount	$ 191.2	≤	$ 194.2
As % of Total Pay	24.12%		24.50%

Sufficient✓

- Spreads $98.3 million normal cost associated with closed group over both closed group and new hire payroll
- But new hires have their own normal cost
  - Have consistently been showing up with $6 or $7 million liability at first valuation

Normal Cost Rate Determination - Recommended Approach

Numbers based on July 1, 2021 Segal Valuation (isolating normal cost issue, $ in millions)

	FY 2022 Pay		FY 2022 Contribs
Total	$793	x 24.5% =	$194.2
Closed Group	$761	x 24.5% =	$186.4
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	Contribution Needs FY 2022		Contributions Payable FY 2022
Closed Group Normal Cost + Admin as of July 1, 2021	$ 98.3		$ 98.3
Newly Hired Normal Cost During FY 2022	$ 4.1		$ 4.1
Amortization Payment on Closed Group Payroll	$ 89.1		$ 88.1
Amortization Payment on New Hire Payroll	$ 3.7		$ 3.7
Total Dollar Amount	$ 195.2	≥	$ 194.2
As % of Total Pay	24.63%		24.50%

Not Sufficient x

- $4.1 million based on GRS typical approach, but could include $6 or $7 million based on recent experience…Should not be $0

REPORT AND PRESENTATION

Valuation Report

- Contains required disclosures
- One minor assumption missing from assumption section
  - Incorporate in 2023

Projections and Associated Communications

- Both MVA Basis and AVA Basis Projections assume market value earns 7.25%
  - Creates volatility in funding period
  - Disconnect with contribution sufficiency result
- If time to full funding is key metric for decision making, then communication should also use smoothed assets
- Okay to use market for stochastic and for short term sensitivity analysis

Funding Period Volatility

- Basing funding period off Market Value (MVA) results in volatile results
- May result in an inconsistent message

	Time to Full Funding	
Valuation Year	Market Value of Assets	Smoothed Value of Assets
2021	2037	~2042
2022	2044	~2042

Funding Period Volatility - Disconnect

- Answer to question, “Is contribution sufficient to achieve full funding by 2043?”, should be the same based on Actuarially Determined Contribution and Projections

	Information from ADC		Information from Projections	
Valuation Year	**Employer ADC**	**12.75% Contribution Sufficient to Fund by 2043?**	**Full Funding Year**	**12.75% Contribution Sufficient to Fund by 2043?**
2021	12.37%	Yes	2037	Yes
2022	12.12%	Yes	2044	No

CONCLUSIONS

Primary Conclusion

- "Based on our review of the census data, experience study documents, liability replications, and actuarial valuation report, we believe the 2021 actuarial valuation is reasonable for the purpose of determining the sufficiency of the current contribution rates, based on reasonable assumptions and methods, and the report generally complies with the Actuarial Standards of Practice."

Review Checklist

- Data ✓
- Assumptions ✓
  - Pay close attention to retirement experience at eligibilities with severe early retirement reductions
    - Potentially set rates to 0%
  - Likely downward pressure on investment return at upcoming experience study
    - Recommend adopting best estimate or conservative assumption
- Actuarial Model ✓
  - Update normal cost rate calculation to avoid overreliance on new hire payroll
- Report and Deliverables ✓
  - Incorporate minor missing assumption in 2023

Thank You!

- It was a privilege and a pleasure