North Dakota Teachers' Fund for Retirement

Plan Management Policy Score Update

Based on the July 1, 2021 Actuarial Valuation

April 21, 2022 / Matt Strom / Brad Ramirez

Segal

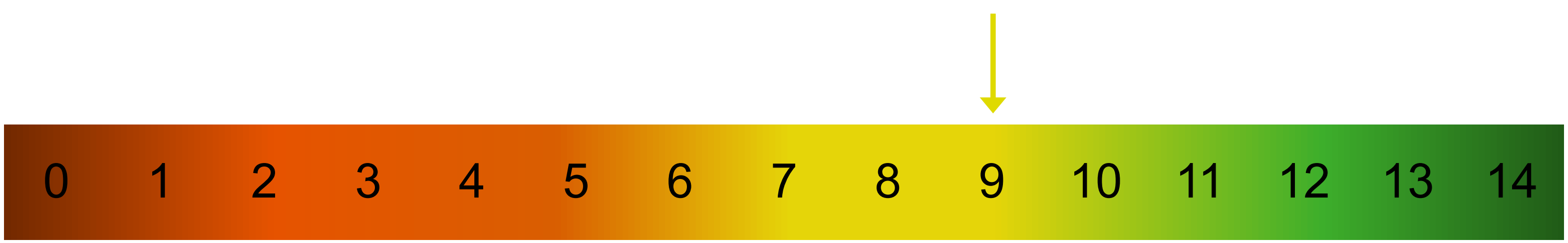
Summary Score based on July 1, 2021 Actuarial Valuation

- Composite summary score equal to 9

<u>Assessment:</u>

Summary score of 11 to 14:	**Objectives being met or likely to be met**
Summary score of 7 or 10:	**Objectives may be met over longer period**
Summary score of 4 to 6:	**Continue to monitor**
Summary score of 0 to 3:	**Changes should be considered**

Based on a summary score of 9: Yellow



The summary score has increased from a prior score of 6 based on last year's valuation results.

Plan Funding Policy vs. Plan Management Policy

The funding policy sets actuarially sound contribution rates

- TFFR's funding policy serves as a benchmark, which compares the actuarially determined contribution rate to the fixed employer contribution rate
- Actuarially determined contribution is equal to Normal Cost plus 22-year amortization of Unfunded Accrued Liability (as of 7/1/2021)
  - Amortization targets 100% funding in 22 years
    - Based on the 30-year closed period that began on July 1, 2013.

The plan management policy monitors the ongoing plan health

- Objective criteria have been established to evaluate health of TFFR
- Market volatility and contribution inadequacy risks are illustrated through stochastic modeling
- Board is able to evaluate the probabilities of future funded ratios
- Serves as advance warning tool

The TFFR plan management policy is a more robust way to evaluate the ongoing health and sustainability of TFFR.

Using the Plan Management Policy

- The Policy Score is updated subsequent to each valuation and experience study
- The Policy Score provides context for likelihood of future positive or negative events
  - For example, if funded ratio is projected to be at an unacceptable level with a high likelihood, the Board can explore ways to address this
- The Policy Score will be part of the actuarial analysis of proposed legislation
  - Will proposed legislation improve, retain, or worsen the Policy Score?

The July 1, 2021 Policy Score is determined on the basis of:

- **The July 1, 2021 actuarial valuation**
- **The Horizon Actuarial Services, LLC *Survey of Capital Market Assumptions (2021 Edition)***

Stochastic Modeling of Investment Return

- Modeling of future simulated return trials is based on:
  - The Horizon Survey of Capital Market Assumptions (2021 Edition)
    - This survey compiles and averages the capital market assumptions of 39* investment consultants
  - TFFR's current target asset allocation mapped to asset classes from the survey:

	Asset Class	Target Allocation
Fixed/Alternative	US Core	18.0%
	Real Estate	9.0%
	High Yield	8.0%
	Commodities/Timber	1.6%
	Infrastructure	7.4%
	Cash	1.0%
Equity	US Large Cap	21.6%
	US Small Cap	5.4%
	International Developed	13.5%
	Emerging Markets	4.5%
	Private Equity	10.0%

* Our analysis is based upon the 18 respondents that provided “long-term” (20+ years) assumptions

Capital Market Assumptions

	Asset Class	Expected Return*	Standard Deviation	Target Allocation	Weighted Return
Fixed/Alternative	US Core	3.4%	5.5%	18.0%	0.61%
	Real Estate	7.7%	17.6%	9.0%	0.69%
	High Yield	5.5%	9.9%	8.0%	0.44%
	Commodities/Timber	5.5%	17.3%	1.6%	0.09%
	Infrastructure	8.1%	17.0%	7.4%	0.60%
	Cash	1.9%	1.3%	1.0%	0.02%
Equity	US Large Cap	8.0%	16.4%	21.6%	1.72%
	US Small Cap	9.0%	20.2%	5.4%	0.49%
	International Developed	8.8%	18.3%	13.5%	1.19%
	Emerging Markets	10.8%	24.3%	4.5%	0.49%
	Private Equity	12.3%	22.3%	10.0%	1.23%
	Total			**100.0%**	**7.57%**
	Adjustment to Geometric				(0.80%)
	Total Long-term Return				**6.77%**

* Based on 20-year arithmetic assumptions and reflects long-term inflation of 2.24%

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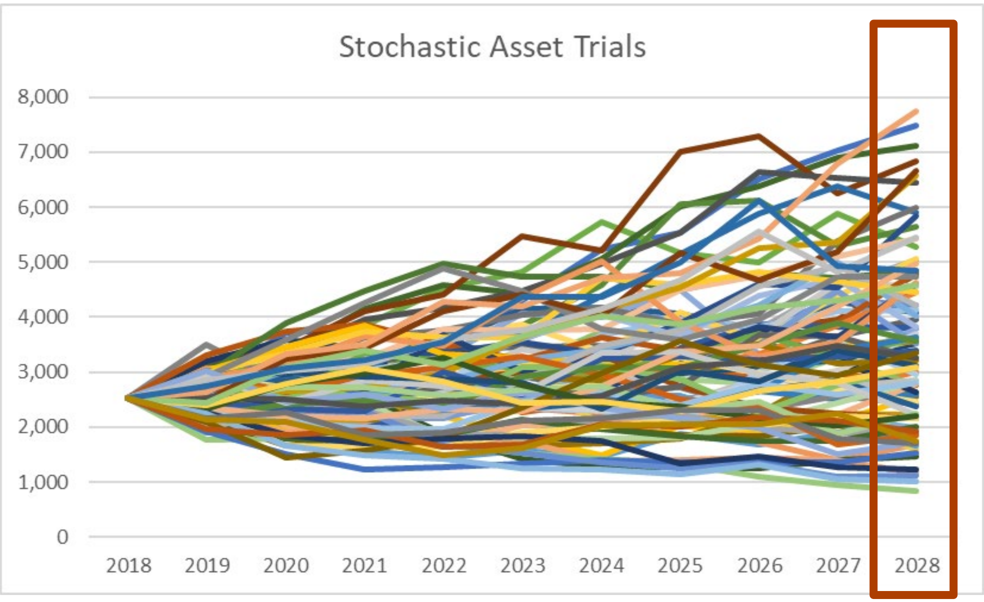
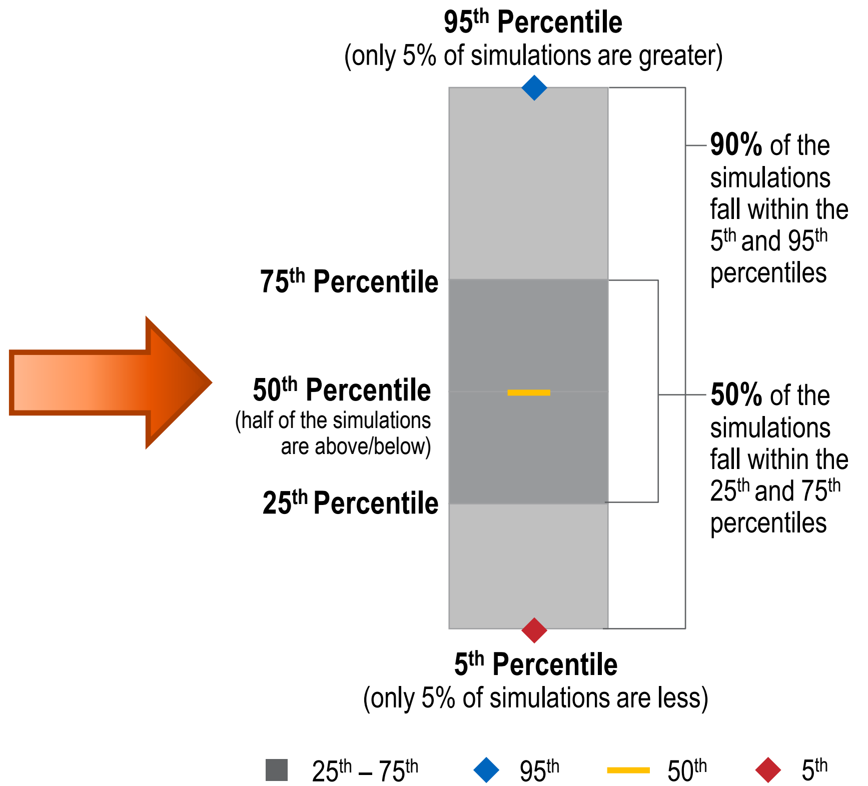
Summarizing Stochastic Results

- The individual trials are grouped into percentiles and summarized as a range





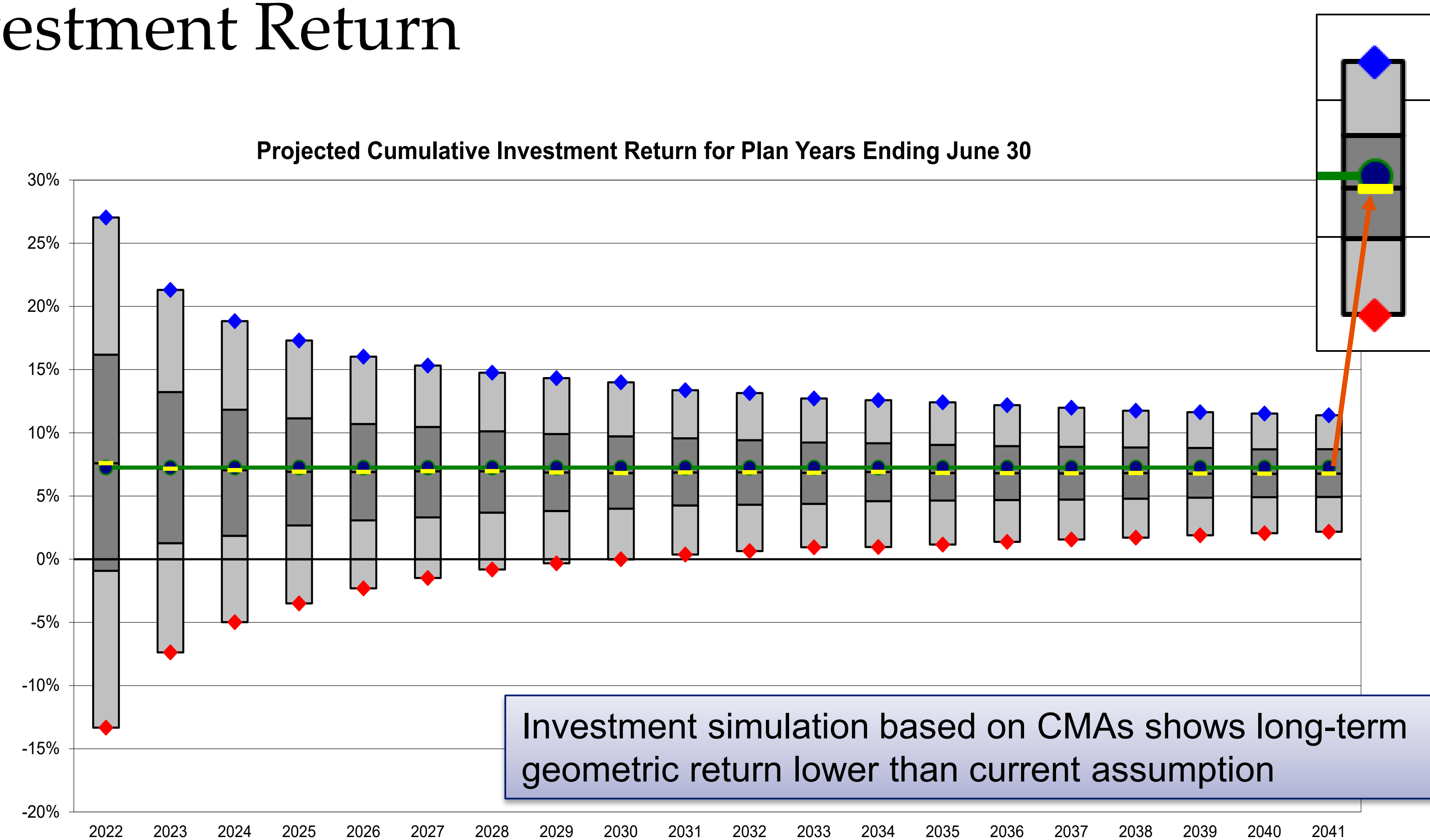
➢ The median is represented by the yellow line at the center of the distribution

➢ The dark gray shaded rectangle represents 50% of all outcomes around the median

➢ The large, light gray rectangle (inclusive of the dark gray area) represents 90% of all outcomes around the median

➢ Other percentile results/probabilities are calculated from the underlying data

Investment Return



	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
95th	27.0%	21.3%	18.8%	17.3%	16.0%	15.3%	14.8%	14.3%	14.0%	13.4%	13.1%	12.7%	12.6%	12.4%	12.2%	12.0%	11.8%	11.6%	11.5%	11.4%
75th	16.2%	13.2%	11.8%	11.1%	10.7%	10.5%	10.1%	9.9%	9.7%	9.6%	9.4%	9.2%	9.2%	9.0%	8.9%	8.9%	8.8%	8.8%	8.7%	8.7%
50th	7.6%	7.2%	7.0%	6.9%	6.9%	7.0%	7.0%	6.9%	6.8%	6.9%	6.9%	6.8%	6.9%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
25th	-0.9%	1.3%	1.9%	2.7%	3.1%	3.3%	3.7%	3.8%	4.0%	4.3%	4.3%	4.4%	4.6%	4.6%	4.7%	4.7%	4.8%	4.9%	4.9%	4.9%
5th	-13.3%	-7.4%	-5.0%	-3.5%	-2.3%	-1.5%	-0.8%	-0.3%	0.0%	0.4%	0.6%	0.9%	1.0%	1.2%	1.4%	1.6%	1.7%	1.9%	2.1%	2.2%
●	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%

● Current investment return assumption

Metrics for Plan Management Policy Scoring System

- **Current funded ratio**
  - The Fund's current funded ratio is one of the most visible metrics
  - A high current funded ratio should be recognized in the scoring
- **Downside funded ratio in 2030**
  - In the short-term, the Fund should avoid an "undesirable" funded ratio with relatively high probability
- **Target funded ratio in 2040**
  - Over a longer term, the Fund should be on the path to achieving its goals with reasonable probability
- **Improvement in funded ratio over a 10-year period**
  - Regardless of where the Fund sits today, it should seek an increasing funded ratio over time
- **Ability to recover from/withstand a market downturn**
  - In situations where the financial markets experience a downturn, the scoring should recognize when the funded ratio improves relative to the impact after the downturn

For purposes of the Policy scoring, the market value of assets is used when determining the funded ratio.

Policy Scoring System

Criteria 1

Based on current year funded ratio
- If current ratio is 90% or higher: **+3**
- If current ratio is between 80% to 90%: **+2**
- If current ratio is between 70% to 80%: **+1**
- If current ratio is less than 70%: **+0**

Criteria 2

Downside funded ratio in 2030
- Under 65% funded ratio with less than 20% probability: **+3**
- Under 65% funded ratio with less than 30% probability: **+2**
- Under 65% funded ratio with less than 40% probability: **+1**
- Under 65% funded ratio with more than 40% probability: **+0**

Criteria 3

Target funded ratio in 2040
- 85% or higher with more than 50% probability: **+4**
- 80% or higher with more than 50% probability: **+3**
- 75% or higher with more than 50% probability: **+2**
- 70% or higher with more than 50% probability: **+1**
- Not more than 70% with more than 50% probability: **+0**

Criteria 4

Improvement over 10 years
- Funded ratio improves by +5% over 10 years with 66% probability: **+2**
- Funded ratio improves by +5% over 10 years with 50% probability: **+1**
- Ratio does not improve by +5% over 10 years with 50% probability: **+0**

Criteria 5

Ability to recover from market downturn*
- Funded ratio after downturn improves by +5% over 10 years with 50% probability: **+2**
- Funded ratio after downturn improves by +5% over 10 years with 33% probability: **+1**
- Ratio after downturn does not improve by +5% over 10 years with 33% probability: **+0**

* “Market downturn” defined as a two-year compound average return of -10% or worse

Policy Scoring System *(continued)*

- Total summary score ranged from 0 to 14
  - –Metrics focus on funded ratio measures
- Summary "health" is summed up as follows:
  - –**Green** (score of 11 to 14) indicates *"objectives being met or likely to be met"*
  - –**Yellow** (score of 7 to 10) indicates *"objectives may be met over longer period"*
  - –**Orange** (score of 4 to 6) indicates *"continue to monitor"*
  - –**Red** (score of 0 to 3) indicates *"changes should be considered"*

Policy Scoring System *(continued)*

Criteria 1

Current year funded ratio is 76%

- If current ratio is 90% or higher: **+3**
- If current ratio is between 80% to 90%: **+2**
- If current ratio is between 70% to 80%: **+1**
- If current ratio is less than 70%: **+0**

*Prior year: **+0** based on funded ratio of 63%*

+1

Criteria 2

24% probability of funded ratio <65% in 2030

- Under 65% funded ratio with less than 20% probability: **+3**
- Under 65% funded ratio with less than 30% probability: **+2**
- Under 65% funded ratio with less than 40% probability: **+1**
- Under 65% funded ratio with more than 40% probability: **+0**

*Prior year: **+1** based on 38% probability of funded ratio <65% in 2030*

+2

Criteria 3

56% probability of funded ratio >85% in 2040

- 85% or higher with more than 50% probability: **+4** (56% probability)
- 80% or higher with more than 50% probability: **+3** (60% probability)
- 75% or higher with more than 50% probability: **+2** (64% probability)
- 70% or higher with more than 50% probability: **+1** (69% probability)
- Not more than 70% with more than 50% probability: **+0**

*Prior year: **+3** based on 53% probability of funded ratio >80% in 2040*

+4

Criteria 4

57% probability of improvement over 10 years

- Funded ratio improves by +5% over 10 years with 66% probability: **+2**
- Funded ratio improves by +5% over 10 years with 50% probability: **+1**
- Ratio does not improve by +5% over 10 years with 50% probability: **+0**

+1

Criteria 5

42% probability of recovering from market downturn*

- Funded ratio after downturn improves by +5% over 10 years with 50% probability: **+2**
- Funded ratio after downturn improves by +5% over 10 years with 33% probability: **+1**
- Ratio after downturn does not improve by +5% over 10 years with 33% probability: **+0**

+1

+9

* 1,288 scenarios contain -10% average or worse over 2 years (in the first 10 years), 543 of which “recover”

Notable Differences from Prior Analysis

- The 2021 Horizon Survey CMAs result in a lower 50th percentile long-term geometric return compared to the 2020 study
  - 6.77% in 2021 versus 7.25% in the 2020 study
  - If the policy scoring were based on the 2020 CMA and asset allocation (shown in the appendix), the probability of a funded ratio less than 65% in 2030 would be 19% instead of 24%, which would result in a +3 instead of +2 for the Criteria 2 score. The other Criteria scores would remain unchanged based on the 2020 CMA and asset allocation.
- The market value return for the plan year ended June 30, 2021 was 26.1% compared to the assumed rate of 7.25%. This resulted in a significantly higher July 1, 2021, funded ratio than projected in the prior year
  - 75.7% actual funded ratio compared to a 64.1% projected funded ratio
- More scenarios hit 100% funding and trigged the sunset of contribution rates back to 7.75%, resulting in relatively less projected contributions.
- The net result is that the probabilities on which the scoring is based improved for Criteria 2 and 3 compared to the prior analysis.

Other External Factors

- Other factors outside of TFFR could have an effect on the directional trend of future Policy Scores, such as projected economic conditions, typical market cycles, and the North Dakota economy.
- The stochastic projections on which most of the scoring elements are based rely on composite capital market expectations of several investment consulting firms, generally from Q1 2021.
- Based on Segal Marco Advisor's Q1 2022 investment outlook, over the next 12 to 18 months, Segal Marco Advisors expects*:
  - U.S. large caps to lag long-term assumptions.
  - U.S. small caps and developed market stocks to be challenged.
  - Returns for U.S. core fixed income that are below long-term assumptions.
  - Private equity and real estate will perform in line with long-term expectations, while infrastructure and farmland have an above-normal return outlook.

* The views represented for each of the asset classes are relative to SMA 10-year capital market assumptions.

Other External Factors *(continued)*

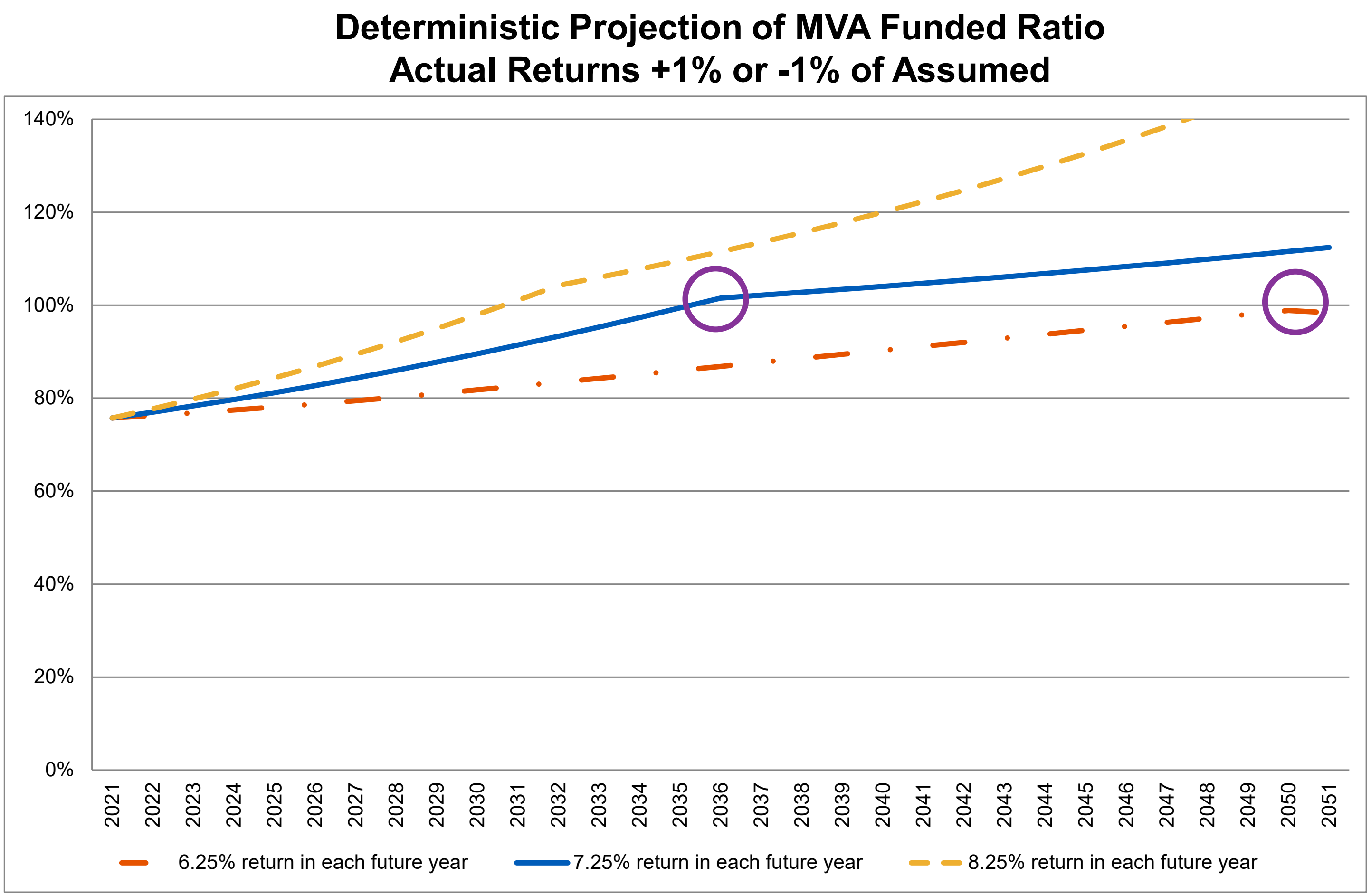
- There are other external forces not explicitly factored into the capital market assumptions, which may have a short-term impact on the Policy score:
  - The plan's funded status does not reflect short-term market fluctuations, as it is based on the market values on the last day of the plan year.
  - The projections on which this analysis was based do not include any possible short-term or long-term impacts on mortality of the covered population that may emerge after July 1, 2021.
  - If inflation continues to increases in the short-term, the impact on the US equity market is likely to be a mixed bag, but history shows a correlation to high inflation and lower returns for the overall market in most periods, with increases in volatility.

Other External Factors *(continued)*

- NDSU released an economic outlook report in December 2021 with predictions for the 2022 calendar year.
  - Total wages and salaries have shown a rebound since last year's decline, and are expected to pick up pace in Q3 2022
  - Labor force has declined slightly over this past year, but this trend is expected to reverse in 2022.
  - However, Gross State Product is expected to decline during the first half of 2022, with later growth in the second half of 2022.
- Russia's recent invasion of Ukraine and the inevitable fallout from that situation has the potential to create "uncertainty" in the market, at best.
  - Governor Burgum has released a tally of state investments with ties to Russia, and the State Investment Board will be holding a special meeting to discuss the matter, OFAC sanctions, and "the evolving situation."
    - There will be a push for public pension systems to divest all Russian financial interests with Russian or Russia-affiliated entities.

Additional Thoughts

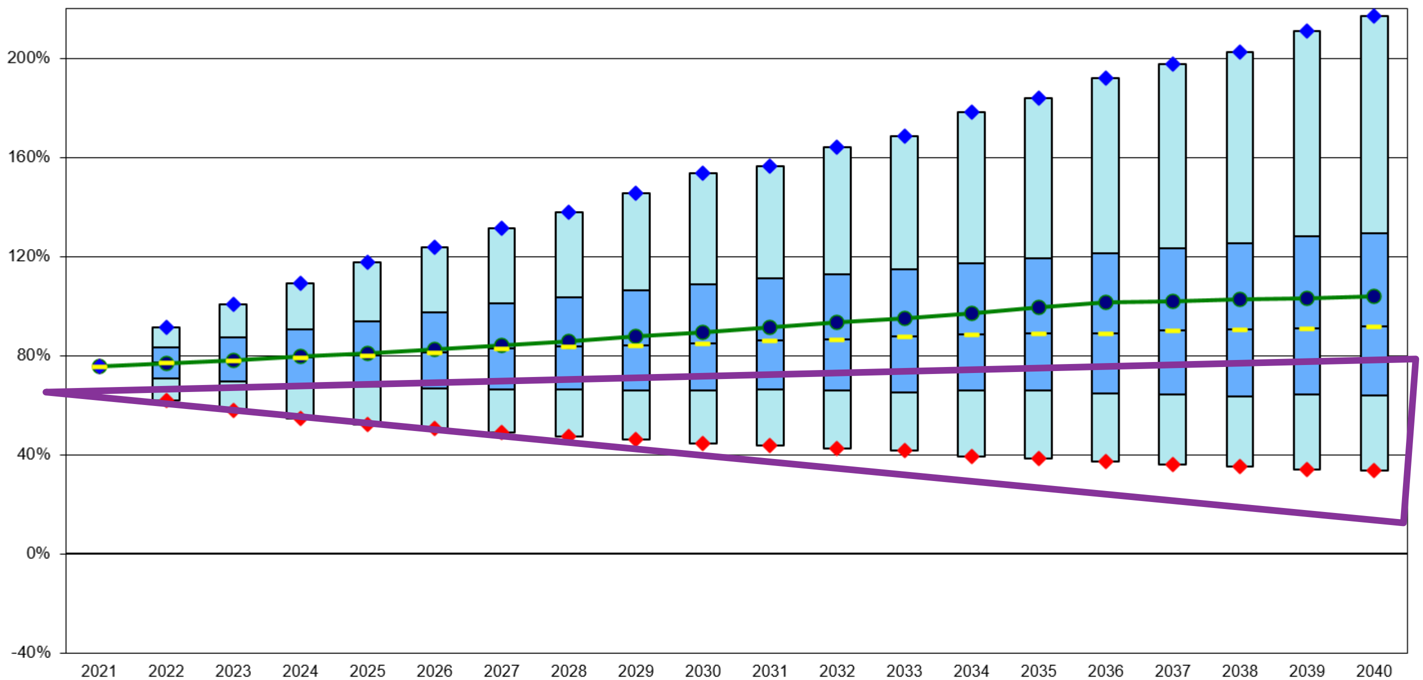
- In the spirit of "market uncertainty," as presented in the July 1, 2021, actuarial valuation, sustained average returns of 1% below the 7.25% assumption would delay full funding by 14 years



Additional Thoughts *(continued)*

- The bottom quartile stochastic results show a best-case of a mild decline in the funded percentage over the next 20 years, with a worst-case of steady decline.

Projected MVA Funded Percentage as of July 1



◆ 95th	76%	91%	101%	109%	118%	124%	131%	138%	146%	153%	157%	164%	169%	178%	184%	192%	198%	203%	211%	217%
▬ 75th	76%	83%	87%	91%	94%	97%	101%	103%	106%	109%	111%	113%	115%	117%	119%	121%	123%	126%	128%	129%
50th	76%	77%	78%	79%	80%	81%	83%	84%	84%	85%	86%	87%	88%	89%	89%	89%	90%	91%	91%	92%
▬ 25th	76%	71%	70%	68%	68%	67%	66%	66%	66%	66%	66%	66%	65%	66%	66%	65%	64%	64%	64%	64%
◆ 5th	76%	62%	58%	55%	52%	51%	49%	48%	46%	45%	44%	42%	42%	39%	38%	37%	36%	35%	34%	34%
●	76%	77%	78%	80%	81%	83%	84%	86%	88%	90%	91%	93%	95%	97%	99%	102%	102%	103%	103%	104%

● Baseline deterministic projection using current 7.25% investment return assumption

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Caveats

- *The projections are based on the results of the July 1, 2021, actuarial valuation performed for the Board of Trustees of the North Dakota Teachers' Fund for Retirement. The actuarial valuation report has information on the plan provisions, data, methods and assumptions used in the valuation.*
- *Projections, by their nature, are not a guarantee of future results. The projections modeled are intended to serve as estimates of future financial outcomes that are based on the information available to us at the time the modeling is undertaken and completed, and the agreed-upon assumptions and methodologies described herein. Emerging results may differ significantly if the actual experience proves to be different from these assumptions or if alternate methodologies are used.*

Appendix – Prior Policy Scoring as of June 30, 2020

Criteria 1

Current year funded ratio is 63%
- If current ratio is 90% or higher: **+3**
- If current ratio is between 80% to 90%: **+2**
- If current ratio is between 70% to 80%: **+1**
- If current ratio is less than 70%: **+0**

+0

Criteria 2

38% probability of funded ratio <65% in 2030
- Under 65% funded ratio with less than 20% probability: **+3**
- Under 65% funded ratio with less than 30% probability: **+2**
- Under 65% funded ratio with less than 40% probability: **+1**
- Under 65% funded ratio with more than 40% probability: **+0**

+1

Criteria 3

53% probability of funded ratio >80% in 2040
- 85% or higher with more than 50% probability: **+4** (48% probability)
- 80% or higher with more than 50% probability: **+3** (53% probability)
- 75% or higher with more than 50% probability: **+2** (58% probability)
- 70% or higher with more than 50% probability: **+1** (63% probability)
- Not more than 70% with more than 50% probability: **+0**

+3

Criteria 4

57% probability of improvement over 10 years
- Funded ratio improves by +5% over 10 years with 66% probability: **+2**
- Funded ratio improves by +5% over 10 years with 50% probability: **+1**
- Ratio does not improve by +5% over 10 years with 50% probability: **+0**

+1

Criteria 5

42% probability of recovering from market downturn*
- Funded ratio after downturn improves by +5% over 10 years with 50% probability: **+2**
- Funded ratio after downturn improves by +5% over 10 years with 33% probability: **+1**
- Ratio after downturn does not improve by +5% over 10 years with 33% probability: **+0**

+1

From the Plan Management Policy Score Update Presentation Dated March 3, 2021

+6

* 921 scenarios contain -10% average or worse over 2 years (in the first 10 years), 384 of which “recover”

Appendix – 2020 Capital Market Assumptions & Target Allocation

	Asset Class	Expected Return*/ Standard Deviation		Target Allocation	Weighted Return
Fixed/Alternative	US Core	3.7%	5.5%	18.0%	0.67%
	Real Estate	7.9%	16.8%	9.0%	0.71%
	High Yield	6.1%	9.8%	8.0%	0.49%
	Commodities/Timber	5.6%	17.6%	1.9%	0.11%
	Infrastructure	8.5%	14.6%	7.1%	0.60%
	Cash	2.3%	1.8%	1.0%	0.02%
Equity	US Large Cap	8.4%	16.2%	20.5%	1.71%
	US Small Cap	9.5%	20.2%	5.5%	0.52%
	International Developed	9.1%	18.1%	13.6%	1.24%
	Emerging Markets	11.3%	24.2%	4.1%	0.46%
	Private Equity	12.5%	22.0%	11.3%	1.41%
	Total			**100.0%**	**7.96%**
	Adjustment to Geometric				(0.71%)
	Total Long-term Return				**7.25%**

* Based on 20-year arithmetic assumptions and reflects long-term inflation of 2.16%

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