



# Cavanaugh Macdonald

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January 31, 2012

Ms. Laurie Hacking  
Executive Director  
Teacher Retirement Association of Minnesota  
60 Empire Drive, Suite 400  
St. Paul, MN 55103

## **Re: Projection of Future Actuarial Results**

Dear Laurie:

Attached are both graphs and tables showing projections of the funded status, required vs. statutory contribution rates, contributions and benefit payments, and the unfunded actuarial accrued liability (UAAL) for the Teachers Retirement Association of Minnesota. These projections are for a thirty year period beginning with the July 1, 2012 actuarial valuation. As required by the Legislative Commission on Pensions and Retirement (LCPR) Standards for Actuarial Work, projections of key valuation results are shown assuming investment returns of 7.0%, 8.5%, and 10.0% for the next thirty years. While the investment returns were assumed to change, the discount rate assumption of 8.5% used for valuation purposes was not changed, as specified by the LCPR standards.

The projections are developed by first creating a demographic profile of recent new entrants. Next, the membership population from the July 1, 2011 valuation is projected forward one year assuming all demographic assumptions are met. Members who left active employment are replaced with an equal number of new members from the demographic profile mentioned earlier. Then, a valuation as of July 1, 2012 is run to determine the various liability and cost measurements. The last two steps are repeated year after year until projections have been performed through the July 1, 2041 valuation. To model the possibility of the cost of living adjustment (COLA) returning to 2.5% at some future date, projections were also performed using a 2.5% COLA assumption for future years.

We have reflected the current benefits and contributions provided by law. In particular, we have reflected the scheduled contribution rate increases of 1% (shared between employees and employers) effective July 1 of 2012, 2013, and 2014. The results presented in this letter are shown under two contribution scenarios. The first is a fixed contribution scenario, assuming that the Board does not utilize the stabilizer mechanism to adjust future contribution rates. The second scenario assumes that the stabilizer is used in all years in which it is applicable after July 1, 2014. Our understanding is that the stabilizer may be used at the Board's discretion, so these two scenarios reflect a sample of possible outcomes.

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In keeping with current law, we have also reflected the granting of a 2% COLA until the funding of TRA improves. Once the market value of assets exceeds 90% of the actuarial accrued liability – measured with a 2.5% future COLA assumption – then the 2.5% COLA is assumed to be granted. We are aware that the exact methodology for determining when the 2.5% COLA can be granted has not yet been determined by the LCPR, so we have used this approach as a reasonable interpretation of the intent of the guiding legislation.

Because the projected results for TRA are expected to be compared with the projections for the two other large Minnesota retirement systems, it is important to note that somewhat different methodology has been employed for the treatment of the increased COLA. We have discussed the methodology in detail with the actuarial firm retained by the other systems to understand the approach utilized for their projections. Our model is dynamic and interactive allowing the actual asset return in future years to be input by the user. Based on the asset returns that are input as well as how the parameters controlling application of the stabilizer on contributions are set, the increase in COLA from 2.0% to 2.5% varies since it is granted the first year in which the requirements are met. The approach used by the other systems is to determine in advance when the requirements are expected to be met for each specific scenario to be modeled. Then the liabilities, starting from the July 1, 2011 initial valuation date are valued with an assumption that liabilities will change on this expected date. This methodology, however, is incompatible with the way our model has been developed. Further, we believe the methodology we have used better reflects what would actually be experienced over time as valuations are performed. Finally, we note that the other systems have differences in funded status and contribution sufficiency that make the time frame for the 2.5% COLA shorter than what is expected for TRA. Consequently, they may find the alternative method more appropriate.

The calculation of the actuarial contribution rate for TRA uses a closed amortization period of 26 years for the July 1, 2011 valuation. Because the amortization period is closed, it eventually reaches one year for the July 1, 2036 valuation and remains at one year for all subsequent years if the actuarial accrued liability is greater than the actuarial value of assets. If the actuarial value of assets is greater than the actuarial accrued liability, the amortization period is reset to an open thirty (30) year period. Under several of the scenarios, the short amortization period leads to actuarial contribution rates that are very large or volatile in the last few years of the projection period. If those scenarios occur, there would likely be changes made to prevent this contribution pattern before the amortization period reached one year, but the requirements of the Standards for Actuarial Work preclude us from reflecting any change in the amortization period in our projections. This fact should be considered when viewing the later years of the projections.

In preparing these exhibits, we have followed the Standards for Actuarial Work, with the following exceptions which are allowed by the Standards. Because of the expected changes in active membership demographics over time as the pre-July 1, 1989 tier leaves covered employment and current Baby Boomers are replaced by new employees, we have modeled future populations and valued them directly. We believe that this provides a better reflection of future results than would be produced by assuming a constant normal cost rate and fixed growth in covered payroll.

Projections of future events rely on a number of assumptions. Significant items are noted below:

- All demographic assumptions regarding mortality, disability, retirement, salary increases, and termination of employment are assumed to be met exactly in each year in the future. Please note that the actuarial assumption already assumes that mortality will improve in the future (i.e. people will live longer).



- Changes in other programs may have an effect on future retirement patterns. For example, if changes in Social Security and/or Medicare are implemented to reduce benefits or delay eligibility for those programs, retirements from TRA are likely to also be delayed, thereby lowering the cost of the plan. Because such changes cannot be reasonably anticipated, however, they are not reflected in this analysis.
- The number of active members covered by TRA in the future is assumed to remain level (neither growth nor decline in the active membership count). As active members leave employment, they are assumed to be replaced by new employees who have a similar demographic profile as recent new hires. With the gradual departure of current active members who were hired before July 1, 1989, and have the retirement eligibility in effect at that time, the demographic composition of the membership may gradually change.
- Plan provisions and scheduled contribution rate increases are assumed to remain unchanged from current law. As noted earlier, the stabilizer could be used to adjust the contribution rate, but because it is discretionary, we have not reflected its usage.
- The funding methods including the entry age normal cost method, the asset smoothing method, and the amortization method and period remain unchanged. Once the amortization period reaches one year, it is assumed to remain at one year.
- The current supplementary contributions made by the state will continue at approximately the same dollar amount as they are now.
- The actuaries relied upon the membership data provided by TRA for the actuarial valuation. The numerical results depend on the integrity of this information. If there are material inaccuracies in this data, the results presented herein may be different and the projections may need to be revised.

Models are designed to identify anticipated trends and to compare various scenarios rather than predicting some future state of events. These projections are based on TRA's estimated financial status on July 1, 2011, and project future events using one set of assumptions out of a range of many possibilities. The projections do not predict the Fund's financial condition or its ability to pay benefits in the future and do not provide any guarantee of future financial soundness of the Fund. Over time, a defined benefit plan's total cost will depend on a number of factors, including the amount of benefits paid, the number of people paid benefits, the duration of the benefit payments, plan expenses, and the amount of earnings on assets invested to pay benefits. These amounts and other variables are uncertain and unknowable at the time the projections were made. Because not all of the assumptions will unfold exactly as expected, actual results will differ from the projections. To the extent that actual experience deviates significantly from the assumptions, results could be significantly better or significantly worse than indicated in this report.

We, Patrice A. Beckham and Brent A. Banister, are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. We also meet the requirements of "approved actuary" under Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (c).

Sincerely,

A handwritten signature in black ink that reads "Patrice Beckham".

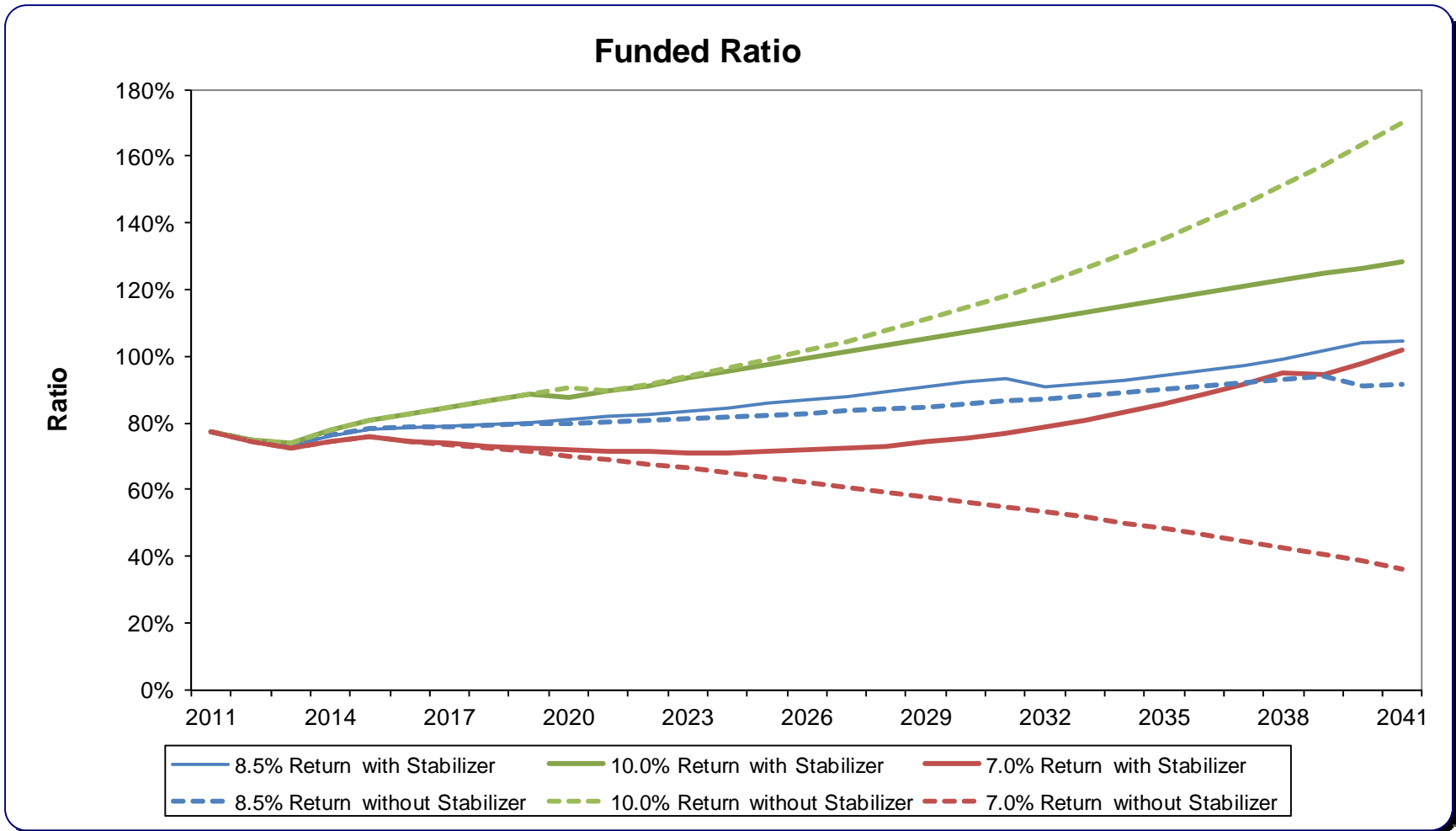
Patrice A. Beckham, FSA, EA, FCA, MAAA  
Principal and Consulting Actuary

A handwritten signature in black ink that reads "Brent A. Banister".

Brent A. Banister, PhD, FSA, EA, FCA, MAAA  
Chief Pension Actuary



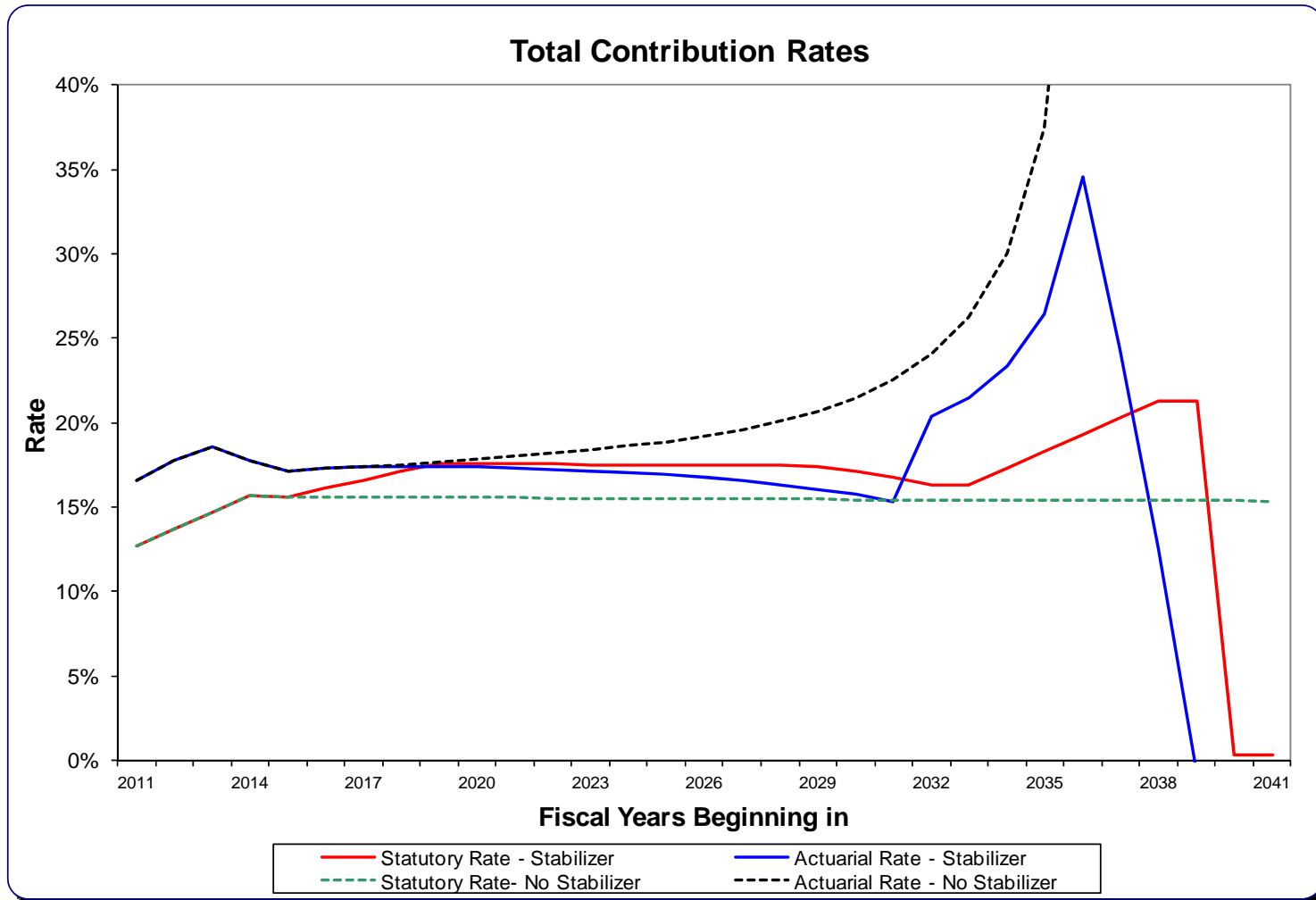
**All Investment Return Scenarios**



Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



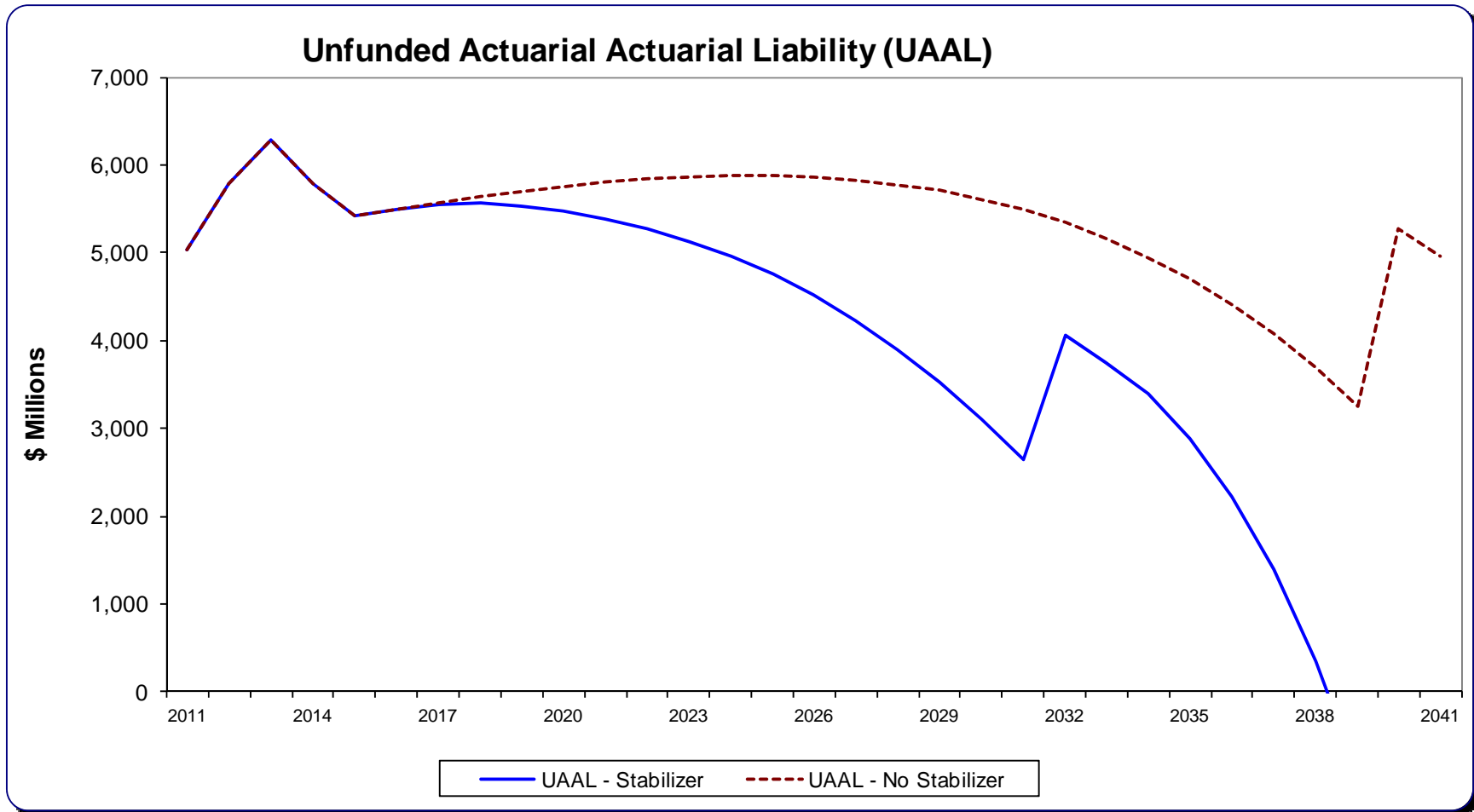
**8.5% Actual Investment Return in Future Years**



Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



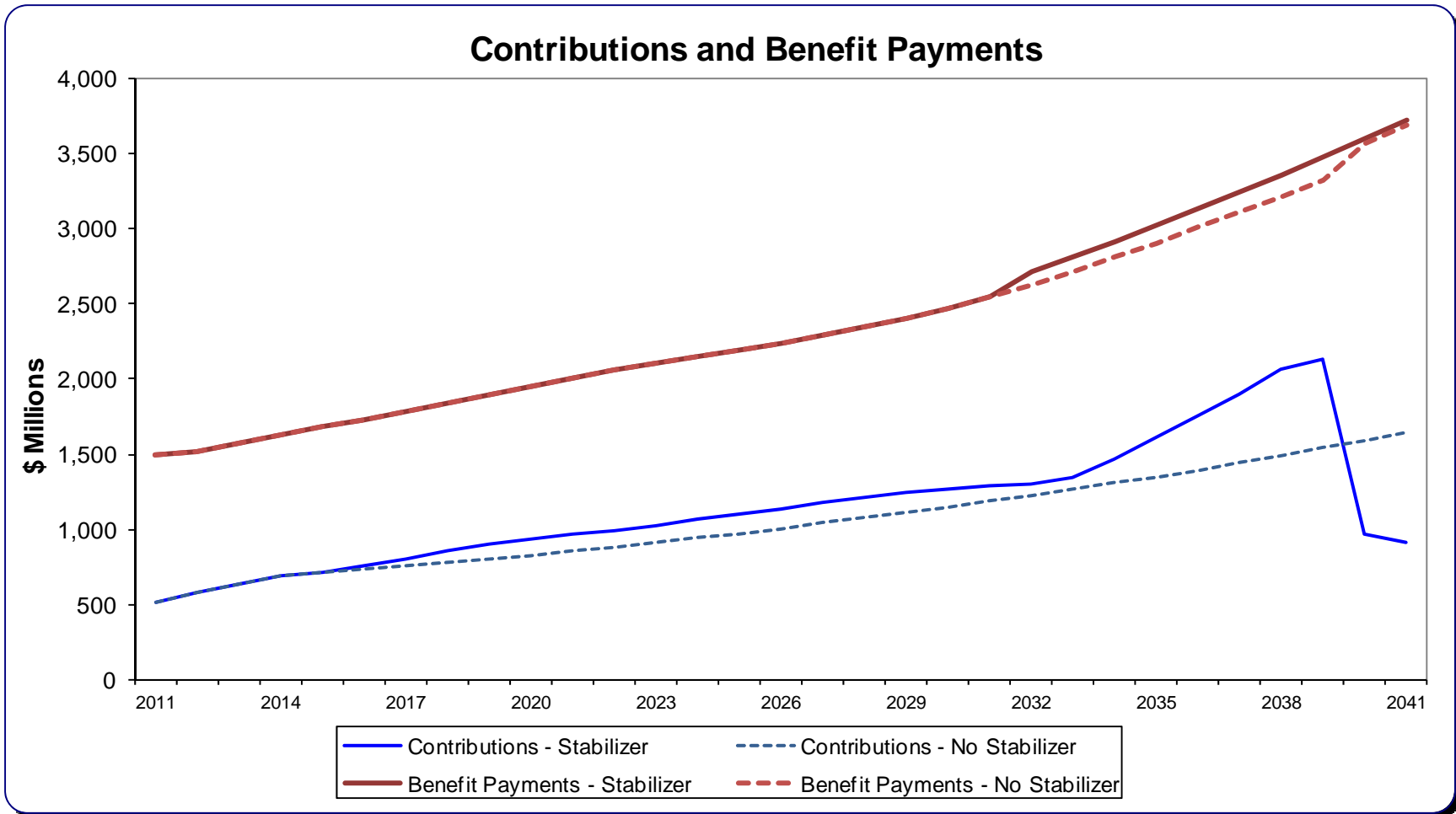
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# Teachers Retirement Association of Minnesota



## 8.5% Actual Investment Return in Future Years With Stabilizer

July 1	Asset Values		Actuarial	Unfunded	Funded	Contribution Rates			Benefit
	Actuarial	Market	Accrued Liability	Actuarial Accrued Liability		Statutory	Required	Sufficiency/ (Deficiency)	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	17,035.9	17,753.2	22,815.7	5,779.8	75%	13.67%	17.73%	-4.05%	1,519.0
2013	17,226.2	18,282.5	23,506.0	6,279.8	73%	14.66%	18.53%	-3.87%	1,572.0
2014	18,428.6	18,861.4	24,208.2	5,779.6	76%	15.65%	17.73%	-2.08%	1,624.0
2015	19,498.9	19,498.9	24,924.9	5,426.0	78%	15.64%	17.15%	-1.52%	1,678.3
2016	20,153.9	20,153.9	25,655.9	5,502.0	79%	16.12%	17.27%	-1.15%	1,732.3
2017	20,854.1	20,854.1	26,403.5	5,549.4	79%	16.61%	17.36%	-0.75%	1,786.9
2018	21,605.6	21,605.6	27,169.2	5,563.6	80%	17.09%	17.40%	-0.30%	1,842.4
2019	22,414.4	22,414.4	27,954.4	5,540.0	80%	17.58%	17.41%	0.17%	1,898.3
2020	23,287.6	23,287.6	28,760.6	5,472.9	81%	17.57%	17.38%	0.19%	1,953.7
2021	24,206.4	24,206.4	29,590.7	5,384.3	82%	17.56%	17.32%	0.24%	2,006.0
2022	25,179.5	25,179.5	30,450.8	5,271.3	83%	17.54%	17.25%	0.29%	2,055.5
2023	26,216.1	26,216.1	31,347.1	5,131.0	84%	17.53%	17.16%	0.37%	2,100.9
2024	27,328.0	27,328.0	32,288.1	4,960.2	85%	17.52%	17.05%	0.47%	2,144.2
2025	28,525.9	28,525.9	33,281.2	4,755.3	86%	17.51%	16.91%	0.60%	2,188.2
2026	29,817.8	29,817.8	34,330.8	4,513.0	87%	17.49%	16.76%	0.73%	2,235.8
2027	31,209.0	31,209.0	35,438.6	4,229.5	88%	17.48%	16.58%	0.90%	2,287.9
2028	32,704.4	32,704.4	36,605.5	3,901.1	89%	17.47%	16.36%	1.12%	2,344.6
2029	34,309.0	34,309.0	37,832.6	3,523.5	91%	17.36%	16.08%	1.28%	2,406.2
2030	36,020.6	36,020.6	39,120.3	3,099.7	92%	17.09%	15.74%	1.35%	2,473.9
2031	37,830.1	37,830.1	40,468.4	2,638.3	93%	16.74%	15.34%	1.40%	2,548.2
2032	39,732.4	39,732.4	43,797.5	4,065.0	91%	16.35%	20.38%	-4.02%	2,715.3
2033	41,634.8	41,634.8	45,389.0	3,754.2	92%	16.35%	21.49%	-5.14%	2,810.3
2034	43,644.1	43,644.1	47,038.6	3,394.6	93%	17.34%	23.32%	-5.99%	2,911.1
2035	45,853.5	45,853.5	48,746.6	2,893.1	94%	18.33%	26.41%	-8.08%	3,018.0
2036	48,281.4	48,281.4	50,512.7	2,231.3	96%	19.32%	34.53%	-15.21%	3,128.4
2037	50,950.6	50,950.6	52,339.4	1,388.8	97%	20.31%	24.31%	-4.00%	3,239.4
2038	53,889.7	53,889.7	54,233.0	343.2	99%	21.30%	12.55%	8.76%	3,352.8
2039	57,128.7	57,128.7	56,198.1	(930.6)	102%	21.30%	8.30%	13.00%	3,471.3
2040	60,593.3	60,593.3	58,237.0	(2,356.3)	104%	9.31%	7.48%	1.83%	3,595.8
2041	63,004.7	63,004.7	60,351.0	(2,653.7)	104%	8.48%	7.38%	1.10%	3,725.4

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



# Teachers Retirement Association of Minnesota



## 8.5% Actual Investment Return in Future Years

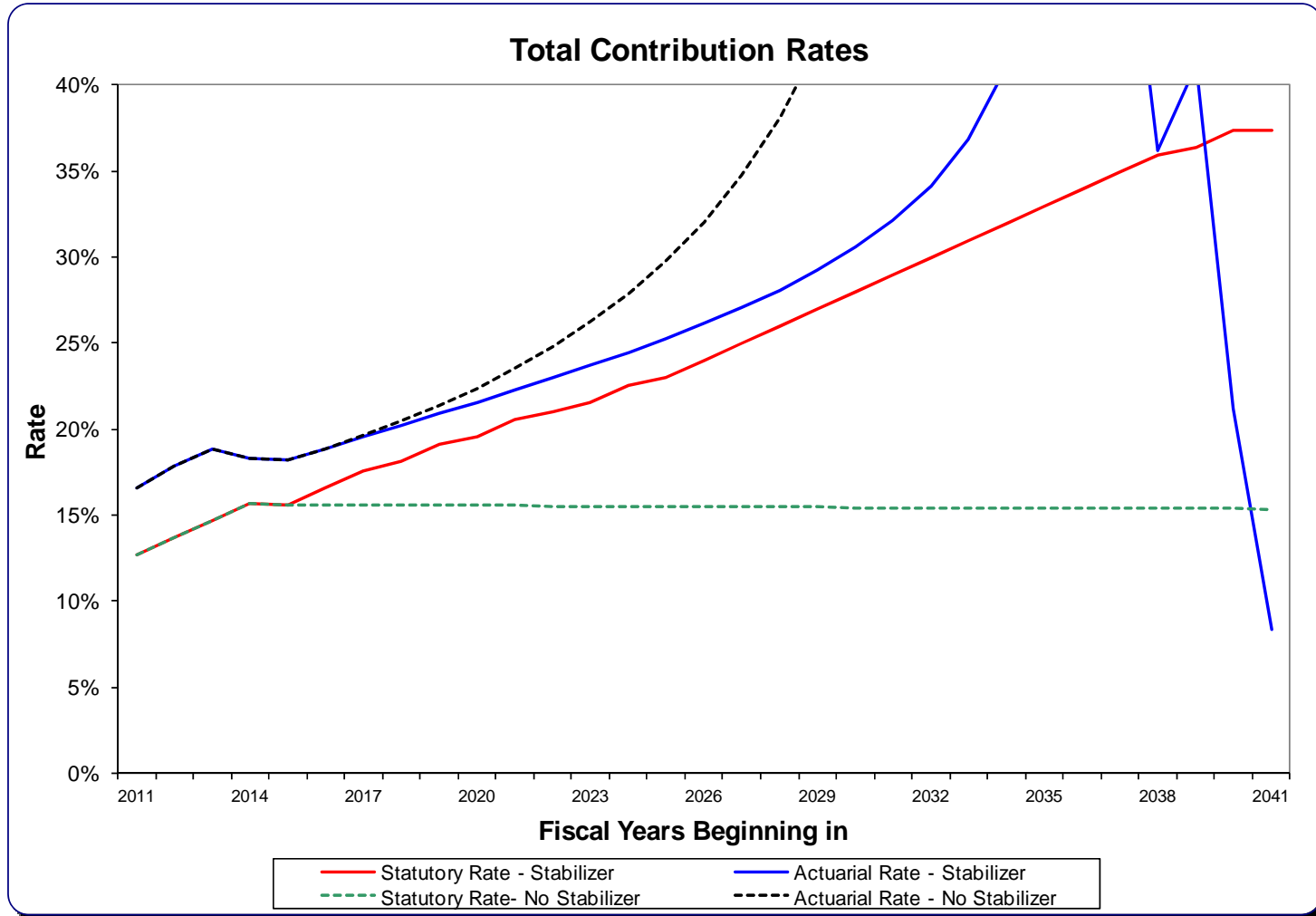
### Without Stabilizer

July 1	Asset Values		Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Funded Ratio	Contribution Rates			Benefit Payments
	Actuarial	Market				Statutory	Required	Sufficiency/ (Deficiency)	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	17,035.9	17,753.2	22,815.7	5,779.8	75%	13.67%	17.73%	-4.05%	1,519.0
2013	17,226.2	18,282.5	23,506.0	6,279.8	73%	14.66%	18.53%	-3.87%	1,572.0
2014	18,428.6	18,861.4	24,208.2	5,779.6	76%	15.65%	17.73%	-2.08%	1,624.0
2015	19,498.9	19,498.9	24,924.9	5,426.0	78%	15.64%	17.15%	-1.52%	1,678.3
2016	20,153.9	20,153.9	25,655.9	5,502.0	79%	15.62%	17.27%	-1.65%	1,732.3
2017	20,829.6	20,829.6	26,403.5	5,573.9	79%	15.61%	17.40%	-1.79%	1,786.9
2018	21,528.3	21,528.3	27,169.2	5,640.9	79%	15.59%	17.53%	-1.93%	1,842.4
2019	22,252.4	22,252.4	27,954.4	5,702.0	80%	15.58%	17.67%	-2.09%	1,898.3
2020	23,004.3	23,004.3	28,760.6	5,756.2	80%	15.57%	17.83%	-2.26%	1,953.7
2021	23,788.1	23,788.1	29,590.7	5,802.6	80%	15.56%	18.00%	-2.44%	2,006.0
2022	24,611.1	24,611.1	30,450.8	5,839.6	81%	15.54%	18.18%	-2.64%	2,055.5
2023	25,481.1	25,481.1	31,347.1	5,866.0	81%	15.53%	18.39%	-2.86%	2,100.9
2024	26,408.3	26,408.3	32,288.1	5,879.9	82%	15.52%	18.62%	-3.10%	2,144.2
2025	27,401.4	27,401.4	33,281.2	5,879.7	82%	15.51%	18.88%	-3.37%	2,188.2
2026	28,466.8	28,466.8	34,330.8	5,864.0	83%	15.49%	19.20%	-3.71%	2,235.8
2027	29,607.7	29,607.7	35,438.6	5,830.9	84%	15.48%	19.59%	-4.11%	2,287.9
2028	30,826.7	30,826.7	36,605.5	5,778.8	84%	15.47%	20.08%	-4.60%	2,344.6
2029	32,126.7	32,126.7	37,832.6	5,705.8	85%	15.46%	20.69%	-5.23%	2,406.2
2030	33,510.3	33,510.3	39,120.3	5,610.0	86%	15.45%	21.48%	-6.03%	2,473.9
2031	34,979.4	34,979.4	40,468.4	5,489.0	86%	15.44%	22.54%	-7.10%	2,548.2
2032	36,535.2	36,535.2	41,875.6	5,340.3	87%	15.43%	24.04%	-8.60%	2,628.7
2033	38,179.8	38,179.8	43,341.1	5,161.3	88%	15.43%	26.27%	-10.84%	2,715.2
2034	39,915.9	39,915.9	44,864.6	4,948.7	89%	15.42%	29.99%	-14.58%	2,807.4
2035	41,746.6	41,746.6	46,445.8	4,699.1	90%	15.41%	37.41%	-22.00%	2,905.9
2036	43,675.5	43,675.5	48,084.2	4,408.7	91%	15.40%	59.63%	-44.23%	3,007.8
2037	45,708.7	45,708.7	49,781.8	4,073.1	92%	15.39%	54.24%	-38.85%	3,110.5
2038	47,856.4	47,856.4	51,544.1	3,687.7	93%	15.38%	48.61%	-33.22%	3,215.6
2039	50,127.9	50,127.9	53,375.3	3,247.4	94%	15.38%	42.71%	-27.33%	3,325.8
2040	52,530.6	52,530.6	57,796.7	5,266.1	91%	15.37%	61.91%	-46.54%	3,562.5
2041	54,946.4	54,946.4	59,910.1	4,963.7	92%	15.36%	57.19%	-41.83%	3,692.2

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



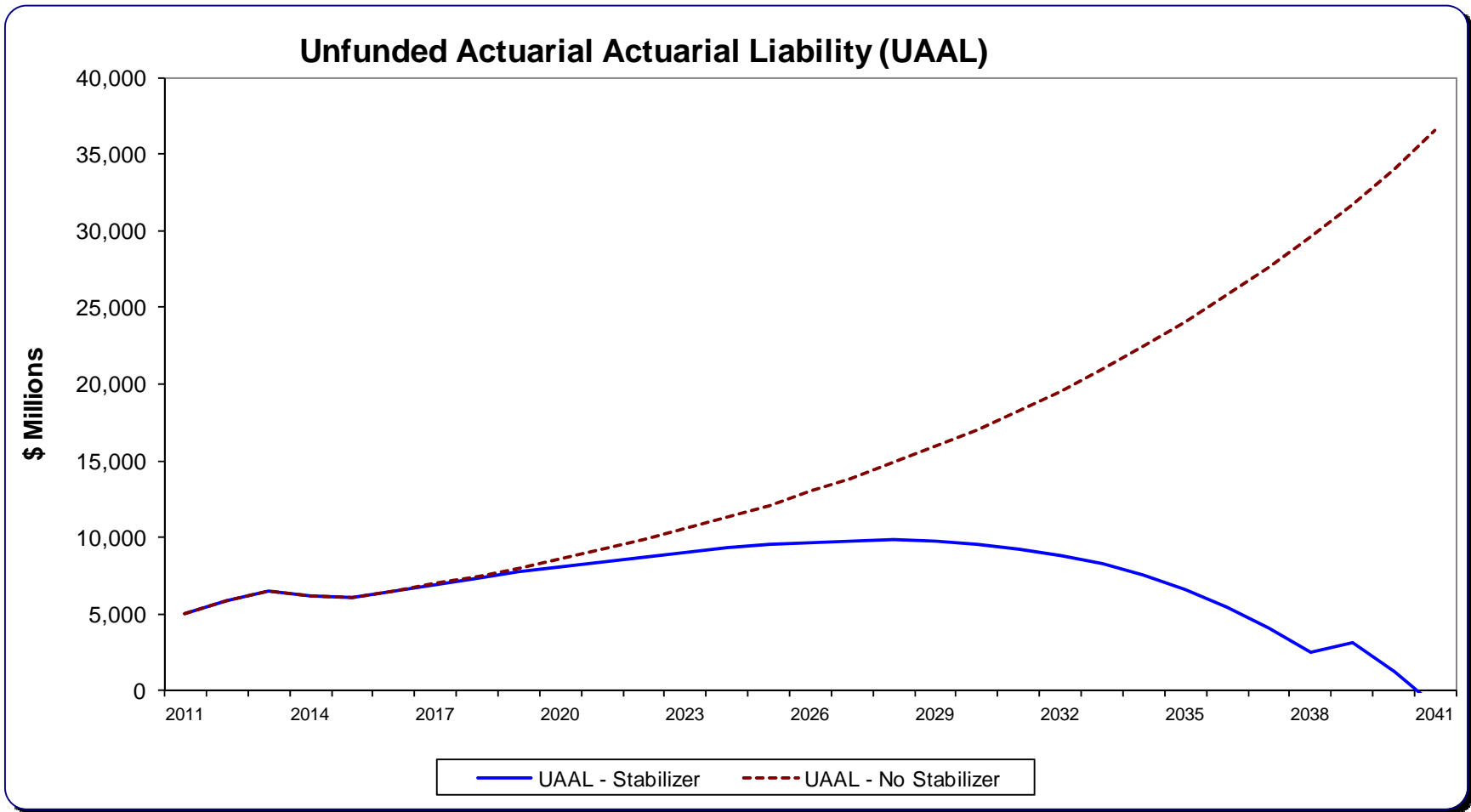
**7.0% Actual Investment Return in Future Years**



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### 7.0% Actual Investment Return in Future Years

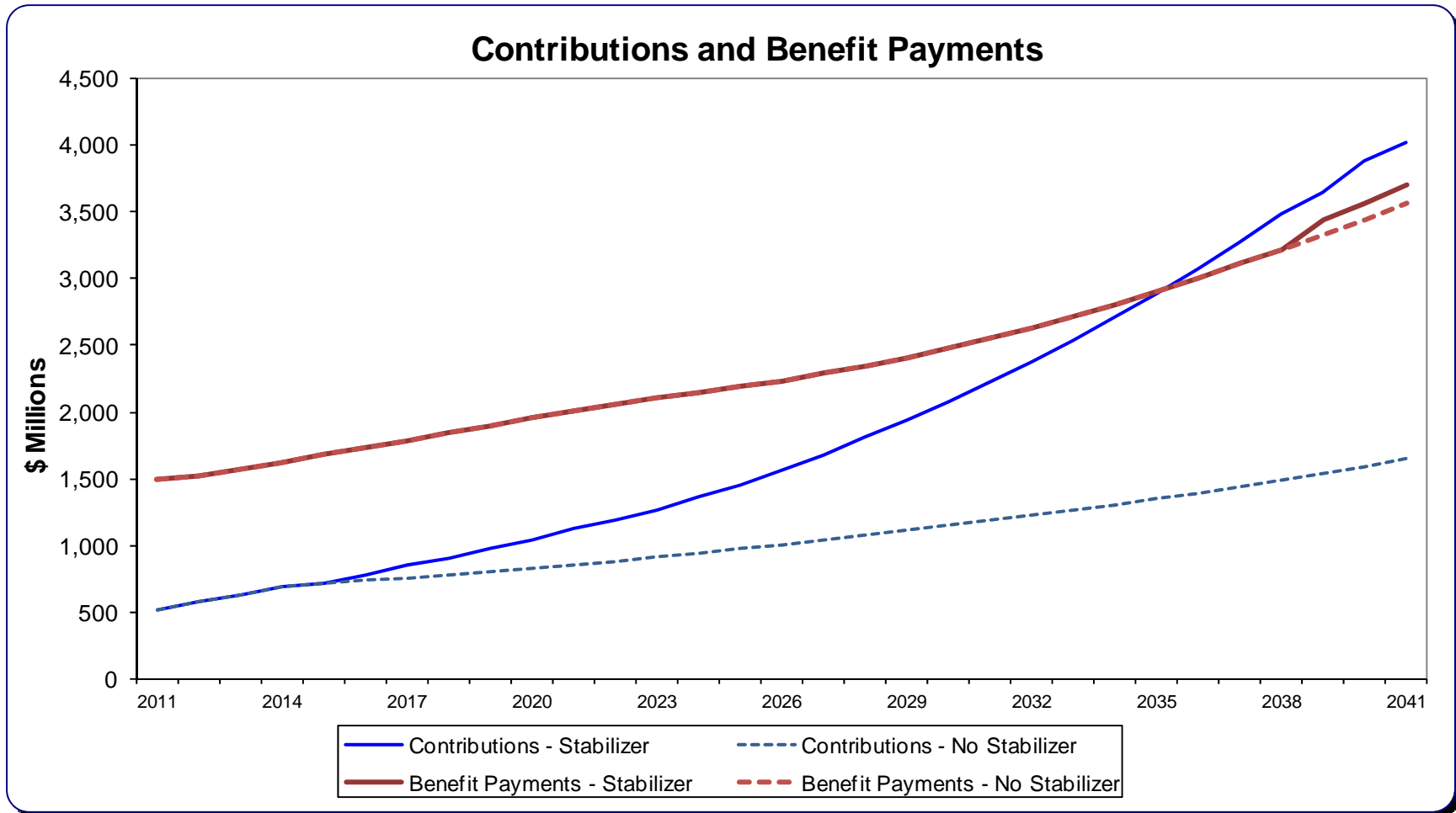


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# Teachers Retirement Association of Minnesota



## 7.0% Actual Investment Return in Future Years



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# Teachers Retirement Association of Minnesota



## 7.0% Actual Investment Return in Future Years With Stabilizer

July 1	Asset Values		Actuarial	Unfunded	Funded	Contribution Rates			Benefit
	Actuarial	Market	Accrued Liability	Actuarial Accrued Liability		Statutory	Required	Sufficiency/ (Deficiency)	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	16,985.4	17,500.7	22,815.7	5,830.2	74%	13.67%	17.81%	-4.13%	1,519.0
2013	17,052.7	17,752.9	23,506.0	6,453.3	73%	14.66%	18.81%	-4.15%	1,572.0
2014	18,056.5	18,027.3	24,208.2	6,151.7	75%	15.65%	18.32%	-2.67%	1,624.0
2015	18,849.6	18,330.1	24,924.9	6,075.3	76%	15.64%	18.19%	-2.56%	1,678.3
2016	19,145.4	18,617.8	25,655.9	6,510.5	75%	16.62%	18.88%	-2.26%	1,732.3
2017	19,475.7	18,939.6	26,403.5	6,927.8	74%	17.61%	19.55%	-1.94%	1,786.9
2018	19,846.8	19,301.5	27,169.2	7,322.4	73%	18.09%	20.21%	-2.11%	1,842.4
2019	20,239.1	19,683.9	27,954.4	7,715.3	72%	19.08%	20.90%	-1.82%	1,898.3
2020	20,683.1	20,117.0	28,760.6	8,077.5	72%	19.57%	21.58%	-2.01%	1,953.7
2021	21,160.0	20,582.1	29,590.7	8,430.7	72%	20.56%	22.28%	-1.72%	2,006.0
2022	21,707.5	21,116.5	30,450.8	8,743.3	71%	21.04%	22.97%	-1.93%	2,055.5
2023	22,309.8	21,704.1	31,347.1	9,037.3	71%	21.53%	23.70%	-2.17%	2,100.9
2024	22,979.5	22,357.5	32,288.1	9,308.7	71%	22.52%	24.47%	-1.95%	2,144.2
2025	23,759.7	23,119.5	33,281.2	9,521.4	71%	23.01%	25.26%	-2.25%	2,188.2
2026	24,631.6	23,970.7	34,330.8	9,699.1	72%	23.99%	26.14%	-2.15%	2,235.8
2027	25,635.2	24,950.8	35,438.6	9,803.3	72%	24.98%	27.07%	-2.09%	2,287.9
2028	26,781.4	26,070.2	36,605.5	9,824.1	73%	25.97%	28.10%	-2.12%	2,344.6
2029	28,081.8	27,340.0	37,832.6	9,750.7	74%	26.96%	29.23%	-2.27%	2,406.2
2030	29,548.8	28,772.2	39,120.3	9,571.5	76%	27.95%	30.54%	-2.59%	2,473.9
2031	31,194.4	30,378.6	40,468.4	9,273.9	77%	28.94%	32.10%	-3.16%	2,548.2
2032	33,031.3	32,171.3	41,875.6	8,844.2	79%	29.93%	34.10%	-4.16%	2,628.7
2033	35,073.6	34,164.2	43,341.1	8,267.5	81%	30.93%	36.83%	-5.90%	2,715.2
2034	37,337.5	36,373.0	44,864.6	7,527.0	83%	31.92%	41.05%	-9.14%	2,807.4
2035	39,841.3	38,815.8	46,445.8	6,604.4	86%	32.91%	49.01%	-16.10%	2,905.9
2036	42,605.0	41,511.7	48,084.2	5,479.3	89%	33.90%	71.97%	-38.07%	3,007.8
2037	45,652.4	44,484.4	49,781.8	4,129.4	92%	34.89%	54.87%	-19.98%	3,110.5
2038	49,013.4	47,762.9	51,544.1	2,530.7	95%	35.88%	36.14%	-0.25%	3,215.6
2039	52,719.0	51,377.6	55,812.8	3,093.8	94%	36.38%	41.11%	-4.73%	3,442.2
2040	56,627.4	55,186.6	57,851.7	1,224.4	98%	37.37%	21.22%	16.15%	3,566.7
2041	60,920.5	59,372.1	59,965.2	(955.3)	102%	37.36%	8.36%	29.00%	3,696.4

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.

# Teachers Retirement Association of Minnesota



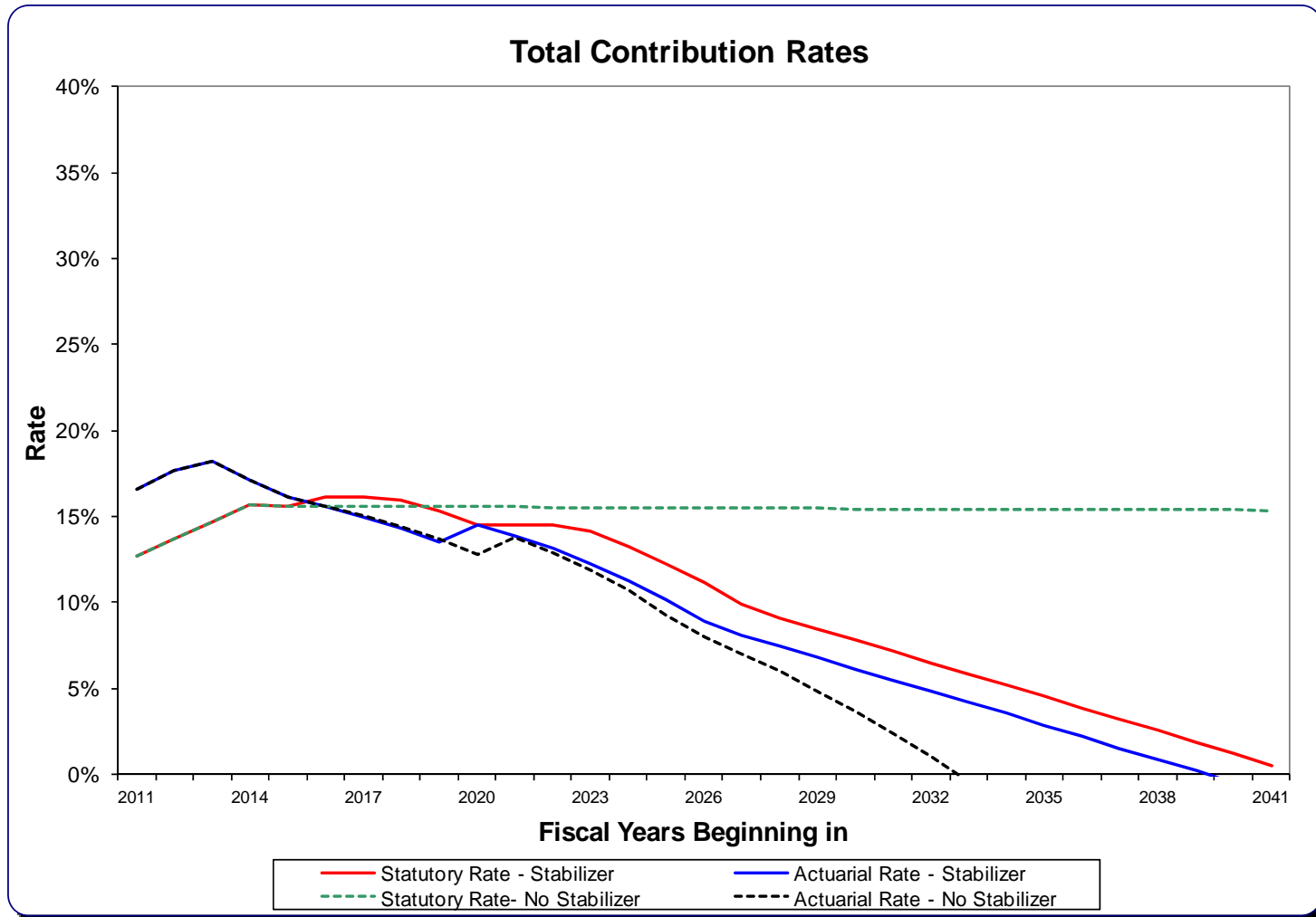
## 7.0% Actual Investment Return in Future Years Without Stabilizer

July 1	Asset Values		Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Funded Ratio	Contribution Rates			Benefit Payments
	Actuarial	Market				Statutory	Required	Sufficiency/ (Deficiency)	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	16,985.4	17,500.7	22,815.7	5,830.2	74%	13.67%	17.81%	-4.13%	1,519.0
2013	17,052.7	17,752.9	23,506.0	6,453.3	73%	14.66%	18.81%	-4.15%	1,572.0
2014	18,056.5	18,027.3	24,208.2	6,151.7	75%	15.65%	18.32%	-2.67%	1,624.0
2015	18,849.6	18,330.1	24,924.9	6,075.3	76%	15.64%	18.19%	-2.56%	1,678.3
2016	19,145.4	18,617.8	25,655.9	6,510.5	75%	15.62%	18.88%	-3.26%	1,732.3
2017	19,426.7	18,890.8	26,403.5	6,976.8	74%	15.61%	19.63%	-4.02%	1,786.9
2018	19,692.8	19,148.9	27,169.2	7,476.4	72%	15.59%	20.46%	-4.86%	1,842.4
2019	19,942.8	19,391.1	27,954.4	8,011.6	71%	15.58%	21.37%	-5.79%	1,898.3
2020	20,175.8	19,616.9	28,760.6	8,584.8	70%	15.57%	22.39%	-6.82%	1,953.7
2021	20,392.3	19,826.6	29,590.7	9,198.4	69%	15.56%	23.53%	-7.97%	2,006.0
2022	20,595.9	20,023.8	30,450.8	9,854.9	68%	15.54%	24.80%	-9.26%	2,055.5
2023	20,790.0	20,212.0	31,347.1	10,557.1	66%	15.53%	26.24%	-10.71%	2,100.9
2024	20,980.4	20,396.7	32,288.1	11,307.8	65%	15.52%	27.88%	-12.36%	2,144.2
2025	21,170.7	20,581.6	33,281.2	12,110.4	64%	15.51%	29.79%	-14.28%	2,188.2
2026	21,361.9	20,767.3	34,330.8	12,968.9	62%	15.49%	32.05%	-16.56%	2,235.8
2027	21,551.0	20,951.1	35,438.6	13,887.5	61%	15.48%	34.77%	-19.29%	2,287.9
2028	21,734.3	21,129.1	36,605.5	14,871.2	59%	15.47%	38.10%	-22.62%	2,344.6
2029	21,907.4	21,297.0	37,832.6	15,925.1	58%	15.46%	42.26%	-26.80%	2,406.2
2030	22,065.3	21,449.9	39,120.3	17,055.0	56%	15.45%	47.64%	-32.19%	2,473.9
2031	22,201.7	21,581.7	40,468.4	18,266.7	55%	15.44%	54.82%	-39.38%	2,548.2
2032	22,308.9	21,684.9	41,875.6	19,566.7	53%	15.43%	64.89%	-49.45%	2,628.7
2033	22,379.4	21,752.0	43,341.1	20,961.7	52%	15.43%	79.98%	-64.55%	2,715.2
2034	22,405.6	21,775.9	44,864.6	22,458.9	50%	15.42%	105.12%	-89.71%	2,807.4
2035	22,379.9	21,749.0	46,445.8	24,065.8	48%	15.41%	155.39%	-139.98%	2,905.9
2036	22,293.9	21,663.0	48,084.2	25,790.3	46%	15.40%	306.14%	-290.74%	3,007.8
2037	22,141.0	21,511.9	49,781.8	27,640.8	44%	15.39%	317.05%	-301.66%	3,110.5
2038	21,917.9	21,292.2	51,544.1	29,626.2	43%	15.38%	328.27%	-312.88%	3,215.6
2039	21,619.0	20,998.8	53,375.3	31,756.2	41%	15.38%	339.79%	-324.41%	3,325.8
2040	21,236.2	20,623.5	55,277.3	34,041.0	38%	15.37%	351.63%	-336.26%	3,442.1
2041	20,759.6	20,156.7	57,251.1	36,491.5	36%	15.36%	363.83%	-348.47%	3,563.6

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



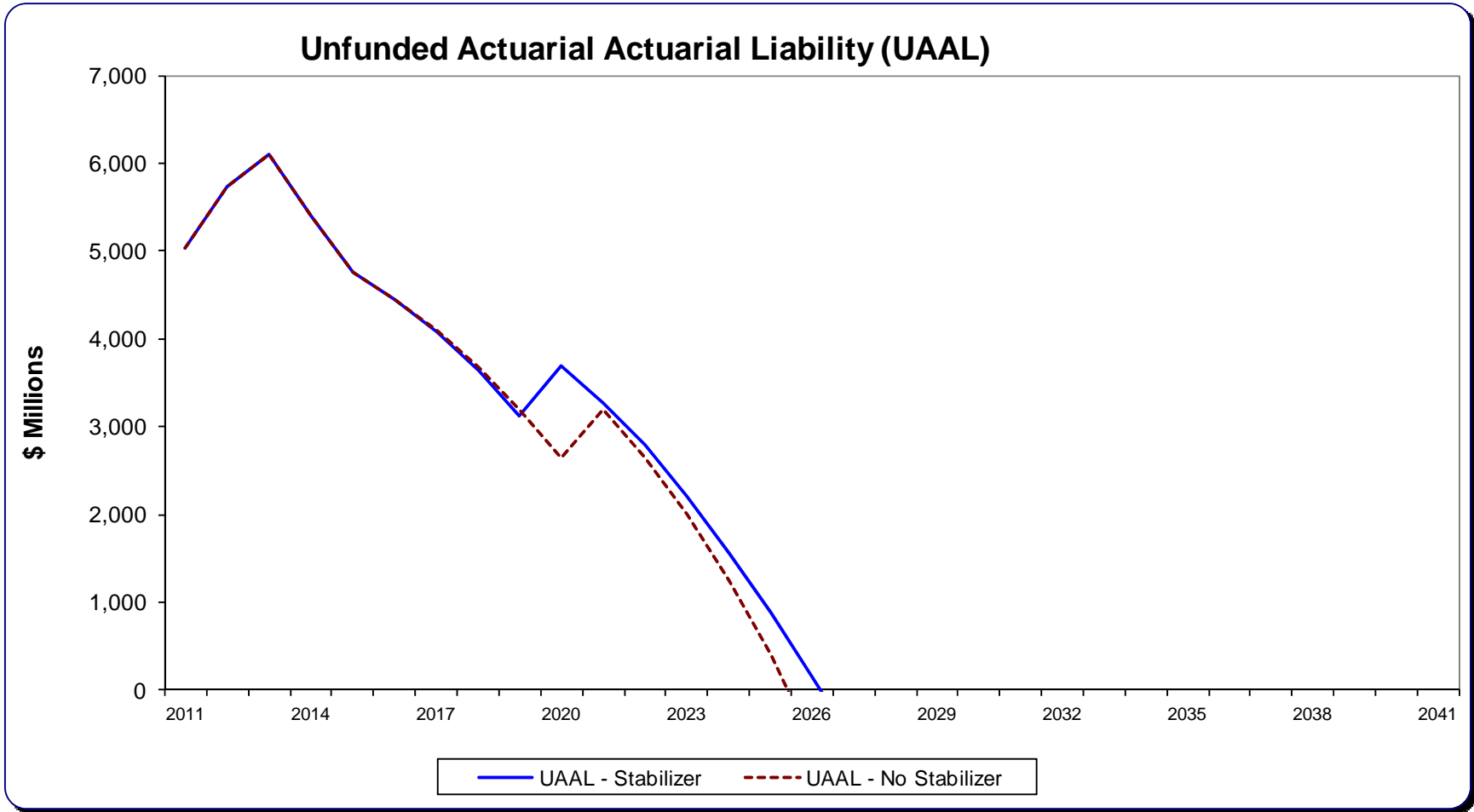
**10.0% Actual Investment Return in Future Years**



Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.



**10.0% Actual Investment Return in Future Years**

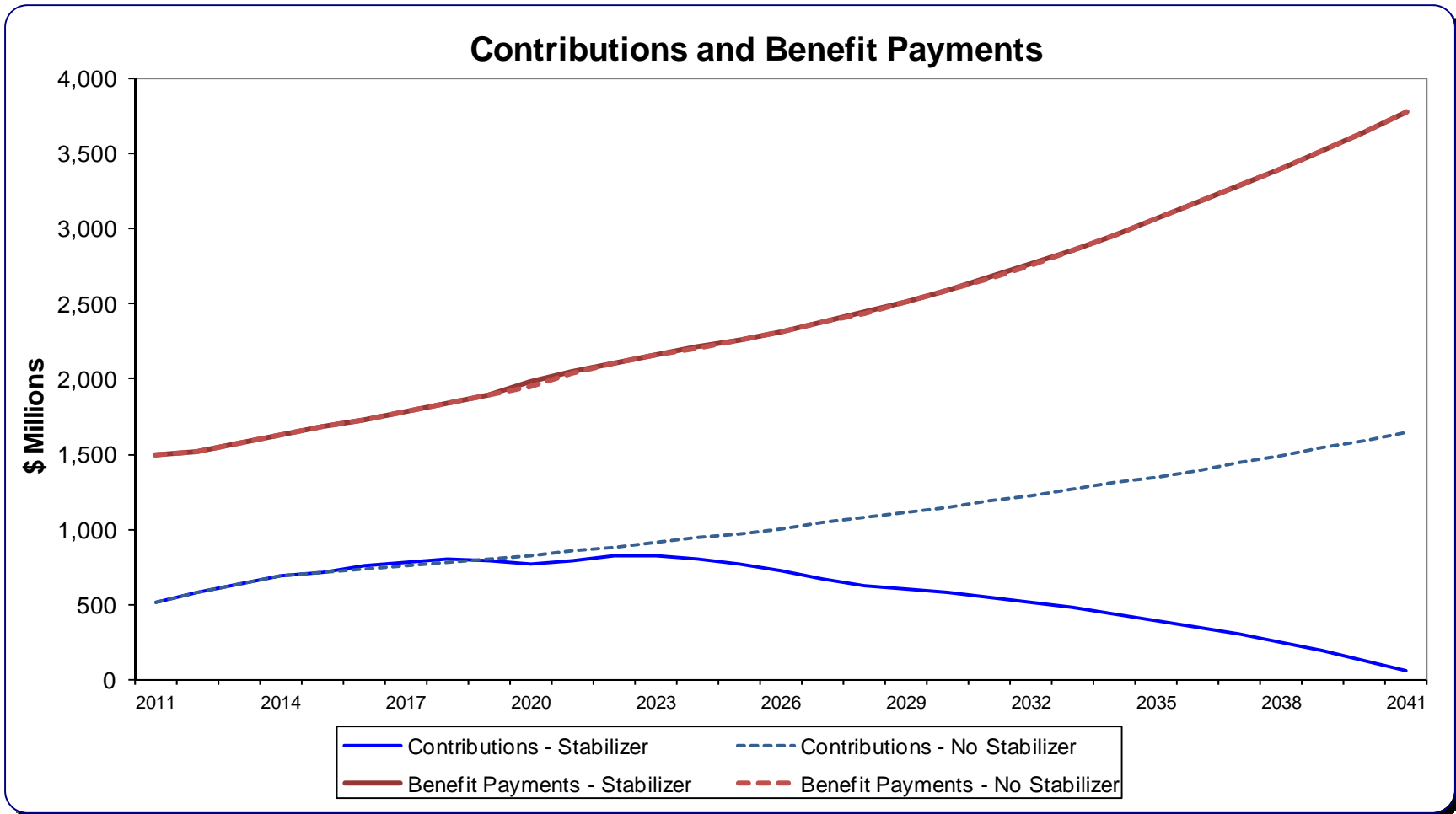


Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.





**10.0% Actual Investment Return in Future Years**



Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.

# Teachers Retirement Association of Minnesota



## 10.0% Actual Investment Return in Future Years

### With Stabilizer

July 1	Asset Values		Actuarial	Unfunded	Funded	Contribution Rates			Benefit
	Actuarial	Market	Accrued Liability	Actuarial Accrued Liability		Ratio	Statutory	Required	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	17,086.4	18,005.6	22,815.7	5,729.3	75%	13.67%	17.65%	-3.97%	1,519.0
2013	17,401.4	18,819.8	23,506.0	6,104.6	74%	14.66%	18.25%	-3.59%	1,572.0
2014	18,807.7	19,719.9	24,208.2	5,400.5	78%	15.65%	17.12%	-1.47%	1,624.0
2015	20,167.0	20,719.5	24,924.9	4,757.9	81%	15.64%	16.09%	-0.46%	1,678.3
2016	21,202.7	21,782.2	25,655.9	4,453.2	83%	16.12%	15.60%	0.52%	1,732.3
2017	22,331.6	22,940.5	26,403.5	4,071.9	85%	16.11%	15.00%	1.11%	1,786.9
2018	23,540.2	24,180.9	27,169.2	3,629.0	87%	15.99%	14.32%	1.68%	1,842.4
2019	24,831.6	25,506.6	27,954.4	3,122.8	89%	15.32%	13.54%	1.78%	1,898.3
2020	26,184.2	26,895.8	29,877.5	3,693.3	88%	14.53%	14.51%	0.02%	1,985.8
2021	27,563.9	28,314.0	30,840.9	3,277.0	89%	14.52%	13.89%	0.63%	2,046.2
2022	29,045.7	29,836.0	31,830.9	2,785.2	91%	14.50%	13.15%	1.35%	2,104.1
2023	30,643.4	31,476.4	32,854.9	2,211.5	93%	14.15%	12.27%	1.88%	2,158.0
2024	32,353.5	33,231.9	33,922.2	1,568.7	95%	13.28%	11.26%	2.02%	2,210.0
2025	34,156.4	35,083.2	35,039.8	883.4	97%	12.27%	10.14%	2.13%	2,262.7
2026	36,049.1	37,027.3	36,212.3	163.2	100%	11.13%	8.90%	2.23%	2,319.0
2027	38,025.3	39,057.7	37,441.7	(583.5)	102%	9.90%	8.07%	1.83%	2,379.9
2028	40,077.3	41,166.5	38,729.3	(1,348.0)	103%	9.07%	7.43%	1.65%	2,445.4
2029	42,232.3	43,380.8	40,076.3	(2,156.0)	105%	8.42%	6.79%	1.63%	2,515.9
2030	44,505.4	45,715.9	41,483.7	(3,021.7)	107%	7.79%	6.15%	1.64%	2,592.4
2031	46,901.0	48,176.7	42,951.3	(3,949.6)	109%	7.16%	5.50%	1.66%	2,675.4
2032	49,421.7	50,766.1	44,478.4	(4,943.3)	111%	6.51%	4.86%	1.66%	2,764.7
2033	52,069.2	53,485.8	46,064.5	(6,004.7)	113%	5.87%	4.20%	1.67%	2,859.9
2034	54,847.3	56,339.9	47,709.6	(7,137.7)	115%	5.20%	3.54%	1.65%	2,960.8
2035	57,758.6	59,330.9	49,413.9	(8,344.6)	117%	4.55%	2.89%	1.66%	3,067.8
2036	60,808.8	62,464.8	51,177.3	(9,631.4)	119%	3.88%	2.22%	1.66%	3,178.3
2037	64,003.0	65,746.7	53,002.1	(11,000.9)	121%	3.23%	1.55%	1.68%	3,289.3
2038	67,353.6	69,189.2	54,894.3	(12,459.3)	123%	2.56%	0.89%	1.68%	3,402.7
2039	70,868.1	72,799.9	56,858.7	(14,009.4)	125%	1.90%	0.22%	1.68%	3,521.2
2040	74,553.6	76,586.4	58,897.5	(15,656.1)	127%	1.23%	-0.45%	1.68%	3,645.6
2041	78,416.6	80,555.4	61,012.2	(17,404.4)	129%	0.56%	-1.12%	1.68%	3,775.2

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.

# Teachers Retirement Association of Minnesota



## 10.0% Actual Investment Return in Future Years

### Without Stabilizer

July 1	Asset Values		Actuarial	Unfunded	Funded	Contribution Rates			Benefit
	Actuarial	Market	Accrued Liability	Actuarial Accrued Liability		Ratio	Statutory	Required	
2011	\$17,132.4	\$17,297.4	\$22,171.5	\$5,039.1	77%	12.69%	16.57%	-3.88%	\$1,495.1
2012	17,086.4	18,005.6	22,815.7	5,729.3	75%	13.67%	17.65%	-3.97%	1,519.0
2013	17,401.4	18,819.8	23,506.0	6,104.6	74%	14.66%	18.25%	-3.59%	1,572.0
2014	18,807.7	19,719.9	24,208.2	5,400.5	78%	15.65%	17.12%	-1.47%	1,624.0
2015	20,167.0	20,719.5	24,924.9	4,757.9	81%	15.64%	16.09%	-0.46%	1,678.3
2016	21,202.7	21,782.2	25,655.9	4,453.2	83%	15.62%	15.60%	0.02%	1,732.3
2017	22,307.1	22,915.8	26,403.5	4,096.5	84%	15.61%	15.04%	0.57%	1,786.9
2018	23,488.1	24,128.3	27,169.2	3,681.1	86%	15.59%	14.40%	1.20%	1,842.4
2019	24,753.8	25,427.7	27,954.4	3,200.6	89%	15.58%	13.67%	1.91%	1,898.3
2020	26,113.1	26,823.0	28,760.6	2,647.4	91%	15.57%	12.82%	2.75%	1,953.7
2021	27,577.1	28,325.7	30,768.4	3,191.3	90%	15.56%	13.75%	1.81%	2,042.5
2022	29,122.8	29,912.7	31,760.8	2,638.1	92%	15.54%	12.91%	2.63%	2,100.3
2023	30,792.4	31,626.6	32,787.1	1,994.7	94%	15.53%	11.91%	3.62%	2,154.2
2024	32,604.3	33,486.0	33,856.5	1,252.2	96%	15.52%	10.72%	4.80%	2,206.1
2025	34,576.4	35,509.5	34,975.8	399.4	99%	15.51%	9.29%	6.22%	2,258.7
2026	36,725.2	37,714.1	36,150.0	(575.2)	102%	15.49%	8.05%	7.44%	2,315.1
2027	39,065.2	40,114.8	37,380.7	(1,684.5)	105%	15.48%	7.06%	8.42%	2,375.9
2028	41,611.8	42,727.4	38,669.5	(2,942.3)	108%	15.47%	6.01%	9.47%	2,441.4
2029	44,381.8	45,569.2	40,017.5	(4,364.3)	111%	15.46%	4.89%	10.57%	2,511.8
2030	47,393.3	48,658.9	41,425.7	(5,967.6)	114%	15.45%	3.69%	11.76%	2,588.3
2031	50,665.4	52,016.1	42,894.0	(7,771.4)	118%	15.44%	2.42%	13.02%	2,671.3
2032	54,218.4	55,661.4	44,421.7	(9,796.7)	122%	15.43%	1.08%	14.36%	2,760.6
2033	58,074.9	59,618.3	46,008.2	(12,066.7)	126%	15.43%	-0.37%	15.80%	2,855.7
2034	62,260.6	63,913.0	47,653.7	(14,607.0)	131%	15.42%	-1.91%	17.32%	2,956.6
2035	66,804.3	68,575.0	49,358.3	(17,446.0)	135%	15.41%	-3.54%	18.95%	3,063.6
2036	71,737.2	73,636.3	51,121.9	(20,615.3)	140%	15.40%	-5.28%	20.68%	3,174.1
2037	77,096.3	79,134.8	52,946.9	(24,149.4)	146%	15.39%	-7.13%	22.52%	3,285.2
2038	82,925.5	85,115.5	54,839.2	(28,086.3)	151%	15.38%	-9.09%	24.48%	3,398.6
2039	89,271.7	91,626.4	56,803.6	(32,468.1)	157%	15.38%	-11.18%	26.56%	3,517.0
2040	96,183.7	98,717.6	58,842.5	(37,341.2)	163%	15.37%	-13.38%	28.75%	3,641.4
2041	103,714.1	106,443.1	60,957.1	(42,757.0)	170%	15.36%	-15.73%	31.09%	3,771.1

Results are based on specified investment return and all other assumptions being met each year in the future. Please refer to the accompanying letter from Cavanaugh Macdonald dated January 31, 2012 for important details regarding assumptions and methodology.