

**SPECIAL MEETING OF THE
MONTANA BOARD OF INVESTMENTS
DEPARTMENT OF COMMERCE**

**December 20, 2010
1:30 p.m.**

This meeting will be conducted by teleconference. The public is welcome to attend at the Board of Investments Office, 2401 Colonial Drive, 3rd Floor, Helena, Montana.

AGENDA

- I. CALL TO ORDER**
Roll Call

- II. TEACHERS' RETIREMENT SYSTEM ASSET LIABILITY STUDY**
Prepared and Presented by R.V. Kuhns & Associates, Inc.

The Board of Investments makes reasonable accommodations for any known disability that may interfere with a person's ability to participate in public meetings. Persons needing an accommodation must notify the Board (call 444-0001) or write to (P.O. Box 200126, Helena, Montana 59620) no later than three days prior to the meeting to allow adequate time to make needed arrangements. Actual times may vary from those in the agenda.

MEMORANDUM

To: The Montana Board of Investments
Carroll South – Executive Director
Cliff Sheets – Chief Investment Officer

From: Jim Voytko – Sr. Consultant (RVK)
Becky Gratsinger – Sr. Consultant (RVK)
The RVK A/L Study and MTBOI Consulting Teams

Subject: Discussion Points Regarding the State of Montana TRS Asset Liability Study

Date: December 14, 2010

Purpose: The purpose of this memorandum is to summarize the key inferences we draw from the asset liability study of the State of Montana Teachers’ Retirement System Pension Plan (“TRS Plan”). The final draft study—awaiting only the completion of the executive summary—is attached. We expect formal submission of the study to the Board within the next ten days. RVK is also sending the study to TRS’ actuary—Cavanaugh MacDonald—for comment or insights they wish to offer. Their assistance in the provision of key underlying data for the study has been a critical element in its execution.

In the interest of time and at the Board’s direction, a conference call has been scheduled for December 20th to allow the Board to receive an overview of the study, to discuss its keys points and to question the RVK team regarding its execution and conclusions. This memorandum is intended to aid in that discussion. However, while this memorandum refers directly to points raised within the study, a full understanding of the asset liability analysis and its implications requires a close review of entire study.

Discussion Point #1: The current contribution policy in place does not appear to be compatible with a goal of ensuring the financial health of the TRS Plan.

Discussion Point #2: If, as is current policy, contributions stay fixed at approximately 17% of salary AND the TRS Plan’s assets return a constant 7.75% each and every year without fail:

- (1) The TRS unfunded actuarial liability (UAL) would grow steadily to approximately \$4 billion in about 13 years and reach approximately \$6 billion by 2030. (pp. 16 and 17)
- (2) The TRS actuarial funding ratio would steadily decline from its current 66% to less than 50% in about seven years and decline further to just above 20% in 2030. (p. 18)
- (3) The contributions to the TRS Plan are currently about 18% below actuarial requirements and would fall steadily to just 65% of the actuarially required contribution rate (ARC) in

less than 10 years and below 60% of the annual required level by 2030. *Each year* that contributions fall short of the ARC by amounts of this magnitude, unless investment returns are well in excess of 7.75%, the TRS UAL will grow larger. (p. 14)

- (4) Payout ratios (the percentage of the Fund's assets that must be paid each year to fund benefits), now around 11%, would rise steadily and nearly triple to 31% in 2030. (p. 10)

Discussion Point #3: If, as is current policy, contributions stay fixed at approximately 17% of salary, it is extremely unlikely investment returns can compensate for contributions below the actuarially required level.

- (1) Investment returns would have to be 15.4% per year with no variance (i.e., no years below this level) for the next 10 consecutive years for the TRS Plan to reach full funding. (p. 19)
- (2) Investment returns would have to be 11.6% per year with no variance (i.e., no years below this level) for the next 20 consecutive years for the TRS Plan to reach full funding. (p. 19)

Discussion Point #4: If, as is current policy, contributions stay fixed at approximately 17% of salary BUT investment returns remain constant for the next 30 years at 7.25%, just 50 bps (1/2 percent) below the assumed rate of return of 7.75%, the TRS Plan's financial health would deteriorate faster and to a greater extent over the next 30 years.

- (1) The TRS actuarial funded ratio and market value of assets would both decline to a greater extent and the Fund's liquidity would worsen as the payout ratio would rise. (p. 20)
- (2) Conversely, an increase in contribution rates of 2% of salary, initiated immediately and maintained over the course of the study period (to 2030) would have a positive effect on the TRS Plan's financial health—though an increase of this amount would still fall below the ARC and thus would not reverse the general negative trend in key plan financial metrics over this period. (p. 21)

Discussion Point #5: If, as is current policy, contributions stay fixed at approximately 17% of salary and the Board adopts an investment strategy from those listed in Table I and shown in Figure I (pp. 27 and 26, respectively) AND future returns are uncertain and vary above and below the assumed rate of 7.75% for the next ten years:

- (1) There is little chance that the TRS Plan would reach full funding. (p. 31)
- (2) Most likely (median) market value funded ratios for the TRS Plan would range from approximately 29% to 51% versus the current 56%. (pp. 31 and 6, respectively)

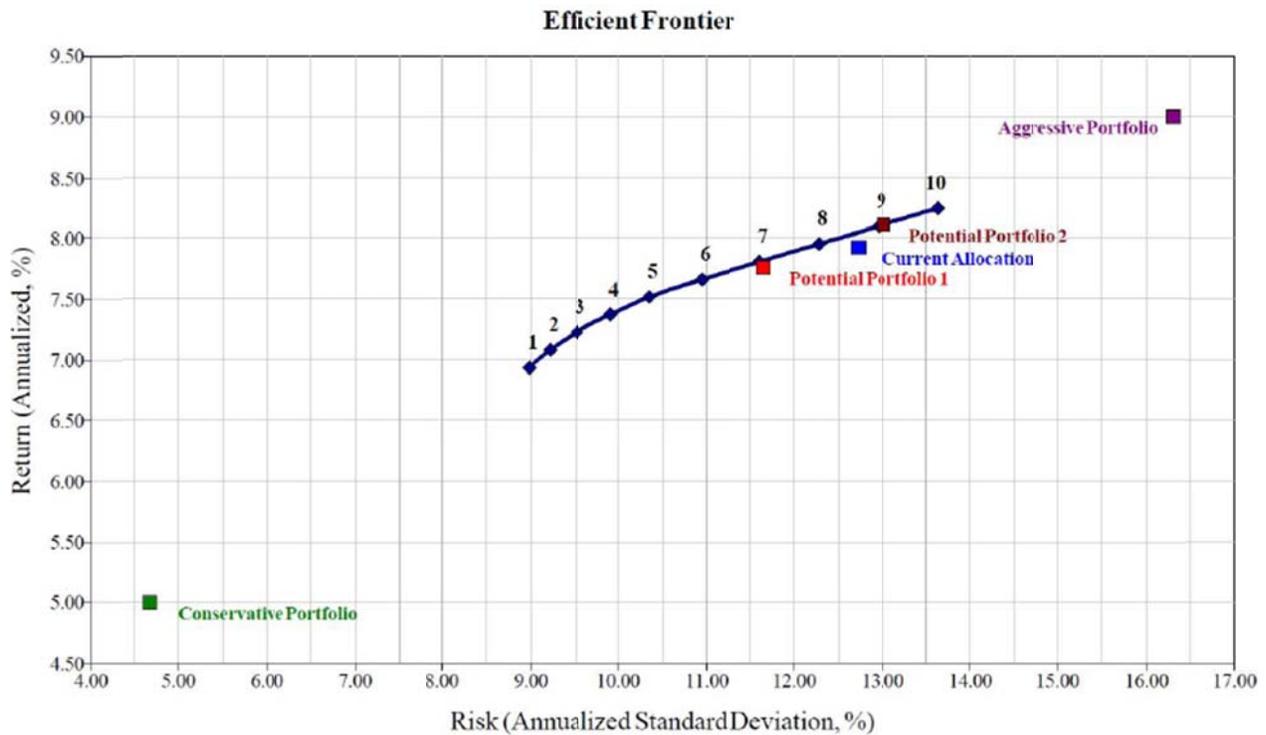
(3) Worst case market funding ratios would likely range from 10% to 16%. (p. 31)

(4) The most aggressive (higher risk/higher expected return) strategy has a small, but measurable, chance of producing a fully funded plan, but it also has the probability of producing the lowest (worst) outcome – a funding ratio of about 10%. (p. 31)

TABLE I

Asset Class	Current Allocation	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Aggressive Portfolio
Broad US Equity	35.5%	0.0%	28.0%	30.0%	30.0%
Broad International Equity	18.6%	0.0%	18.0%	22.0%	30.0%
Core Fixed Income	24.9%	80.0%	30.0%	20.0%	0.0%
High Yield Fixed Income	2.4%	10.0%	2.0%	4.0%	10.0%
Blended Real Estate	5.8%	0.0%	8.0%	9.0%	10.0%
Private Equity	12.4%	0.0%	13.0%	14.0%	20.0%
Cash Equivalents	0.3%	10.0%	1.0%	1.0%	0.0%
Expected Return	7.93%	5.00%	7.76%	8.11%	9.01%
Expected Risk	12.72%	4.68%	11.66%	13.01%	16.30%

FIGURE I



Discussion Point #6: If, as is current policy, contributions stay fixed at approximately 17% of salary and the Board adopts an investment strategy from those listed in the table above AND future returns are uncertain and vary above and below the assumed rate of 7.75% for the next twenty years:

- (1) There is only a small chance that the TRS Plan would reach full funding. (p. 33)
- (2) There is an appreciable chance that the TRS Plan market funding ratio would fall to zero—in other words, all Fund assets would be depleted leaving only incoming annual contributions to pay benefits. (p. 33)
- (3) The most likely (median) market value funded ratios for the TRS Plan would range between zero and 36%. (p. 33)
- (4) The most conservative approach has virtually no chance of producing a market funding ratio higher than 35% and little chance of producing a funding ratio higher than 20%. (p. 33)
- (5) The median payout ratio (the percentage of the TRS Plan’s assets needed to pay benefits in a specific year) would range from 14% to as high as 100%. (pp. 35 to 39)

TABLE II

	Probability of Full Funding in 2030	Probability of Market Value = \$0 in 2030
Current Allocation	13%	29%
Conservative Portfolio	0%	69%
Potential Portfolio 1	10%	30%
Potential Portfolio 2	15%	28%
Aggressive Portfolio	26%	25%

TABLE III

	Actuarial Funded Ratio in 2030			Market Funded Ratio in 2030			Payout Ratios
	50th	5th	95th	50th	5th	95th	2030 Median
Current Allocation	20.6%	0.0%	152.1%	20.3%	0.0%	154.9%	22.7%
Conservative Portfolio	0.0%	0.0%	20.9%	0.0%	0.0%	19.6%	100.0%
Potential Portfolio 1	18.6%	0.0%	132.3%	18.1%	0.0%	134.9%	25.7%
Potential Portfolio 2	23.0%	0.0%	166.2%	22.6%	0.0%	171.2%	21.0%
Aggressive Portfolio	35.4%	0.0%	274.6%	36.1%	0.0%	287.1%	14.3%

Discussion Point #7: The projections referenced here assume that the illiquid investments required to execute all investment strategies analyzed in this study, with the sole exception of the “Conservative Portfolio” (see Table I), remain viable even in the event that the TRS Plan assets fall to levels requiring high annual payout ratios (e.g., above 25% to 30%). This is an unrealistic assumption. Thus, should plan assets decline to these levels, it is almost certain that (1) substantially more liquid asset allocations will be required to pay

benefits, (2) those asset allocations will produce lower returns than assumed in the analysis and (3) the projected TRS Plan funding levels will decline, from that point forward, at a much faster pace and to a lower level than is forecast in this study.

RVKuhns

▶▶▶ & ASSOCIATES, INC.

Teachers' Retirement System State of Montana Asset Liability Study

December 2010

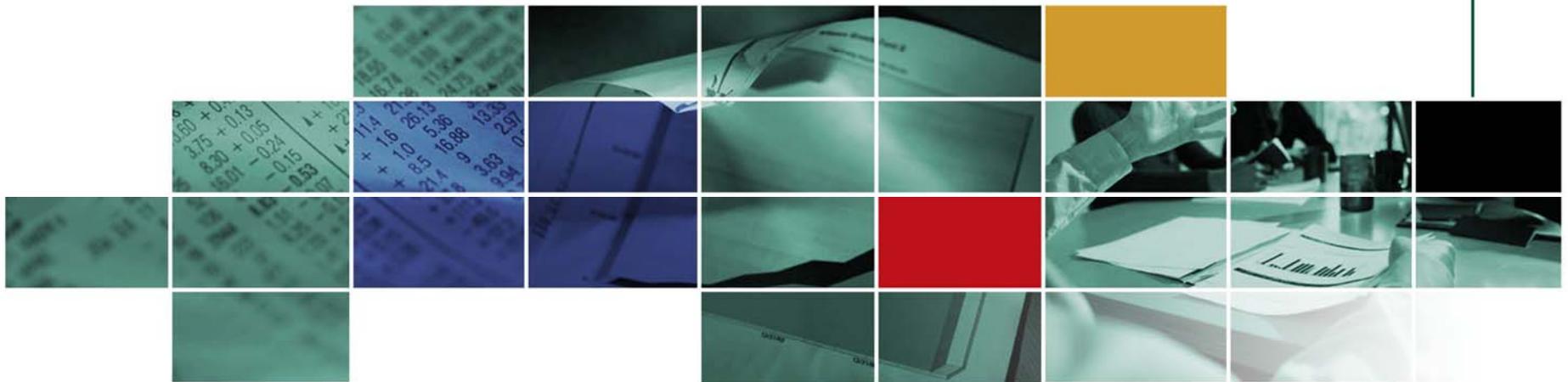


Table of Contents

ACKNOWLEDGEMENTS PAGE 2

INTRODUCTION PAGE 3

CURRENT STATUS PAGE 6

DETERMINISTIC ANALYSIS..... PAGE 7

DETERMINISTIC SCENARIO ANALYSIS..... PAGE 19

STOCHASTIC ANALYSIS PAGE 22

APPENDIX 1: SENSITIVITY ANALYSIS: VOLATILITY PAGE 42

APPENDIX 2: SENSITIVITY ANALYSIS: CORRELATIONS..... PAGE 57

APPENDIX 3: ASSUMPTIONS AND METHODS..... PAGE 72

Acknowledgements

PREPARED BY:

JAMES VOYTKO, SENIOR CONSULTANT, R.V. KUHNS & ASSOCIATES, INC.

BECKY GRATSINGER, SENIOR CONSULTANT, R.V. KUHNS & ASSOCIATES, INC.

ASHLEE MOEHRING, CONSULTANT, R.V. KUHNS & ASSOCIATES, INC.

MARK HIGGINS, ASSOCIATE CONSULTANT, R.V. KUHNS & ASSOCIATES, INC.

RYAN SULLIVAN, INVESTMENT ASSOCIATE, R.V. KUHNS & ASSOCIATES, INC.

MATTHIAS BAUER, INVESTMENT ASSOCIATE, R.V. KUHNS & ASSOCIATES, INC.

WITH THE COOPERATION OF:

DAVID DOUGHERTY, LLC. (CONSULTING ACTUARY)

CAVANAUGH MACDONALD CONSULTING (PLAN ACTUARIES)

Introduction

R.V. Kuhns & Associates, Inc. has prepared this report for the State of Montana Teachers' Retirement System (TRS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

Introduction (continued)

What is an Asset/Liability Study?

- Investment programs do not exist in a vacuum. They seek to satisfy one or more investment objectives.
- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan – the Plan “liabilities”.
- In doing so, it creates an important “guidepost” for the actual asset allocation for the Plan; the asset allocation chosen by the Plan’s fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.
- For the TRS Asset/Liability Study, we assume the objectives are:
 - Fund all participants’ benefits over time.
 - Assure sufficient liquidity to pay benefits at all times.
 - Foster a stable contribution stream consistent with objectives 1 and 2.
 - Achieve adequate returns without accepting unnecessary or imprudent levels of risk.

An Asset/Liability Study is NOT . . .

- An actuarial study of the TRS liabilities—that is the purview of the Plan’s actuary.
- A prescription for plan benefits—that is the purview of the legislature.
- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.
- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.

Introduction (continued)

Asset/Liability Study in Practice . . .

- Begin with a forecast of the financial liabilities (i.e., benefit obligations).
- Include a baseline estimation of the financial contributions to the Plan over time.
- Compare alternative investment strategies (i.e., total fund asset allocations to the Plan's financial needs).
- Draw conclusions regarding how well various investment strategies satisfy the Plan's financial needs.

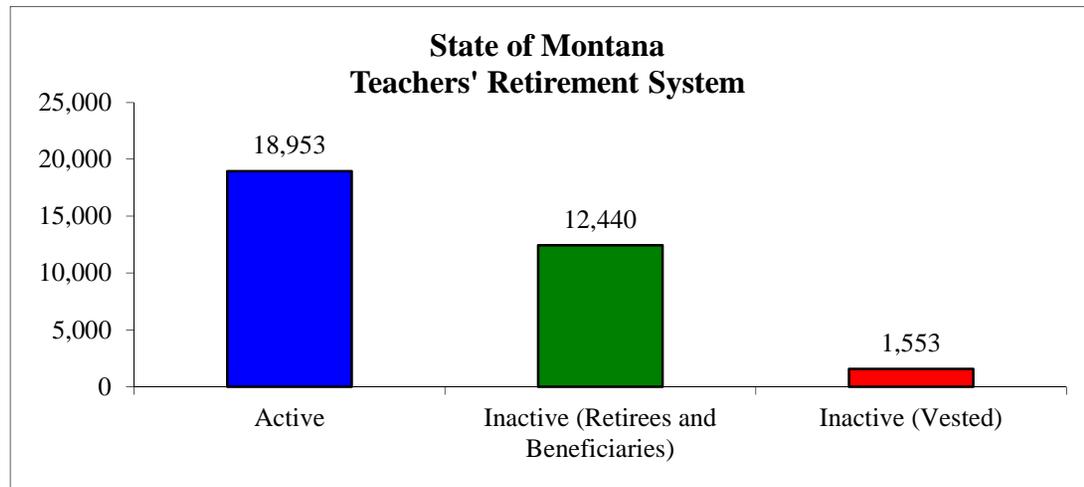
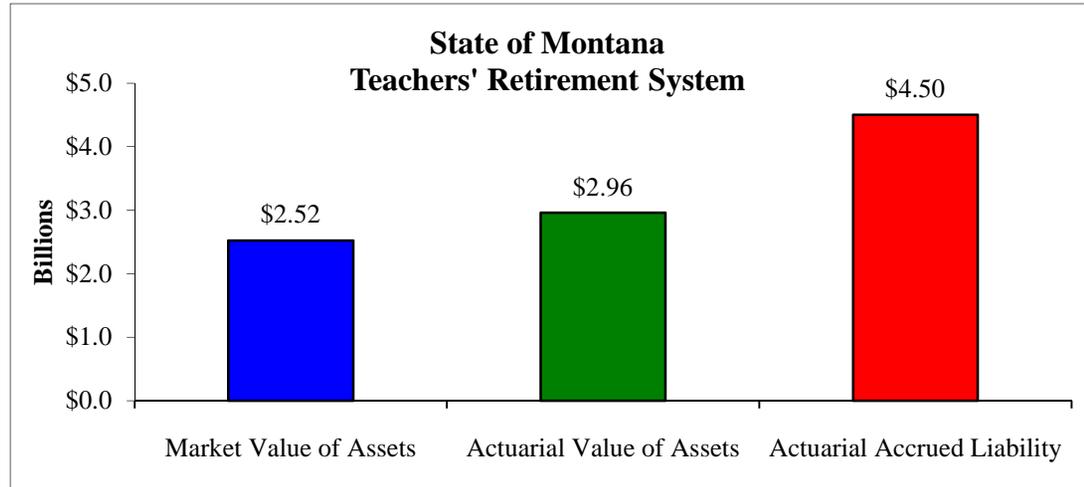
This Asset/Liability Study . . .

- Uses data from the most recent (July 1, 2010) TRS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method and other assumptions described in the July 1, 2010 Actuarial Valuation.
- Compares these specific investment strategies—(A) Current Allocation, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) diversified lower risk (Potential Portfolio 1), (D) diversified higher risk (Potential Portfolio 2), and (E) an aggressive illustrative portfolio (Aggressive Portfolio)—expressed as total fund asset allocations to the projection of Plan liabilities.
- Note: Does not assume any actuarial adjustments that may take place in future years.

Current Status

A summary of the Plan follows:

Valuation Date	July 1, 2010
Market Value of Assets (MVA)	\$2.52 billion
Actuarial Value of Assets (AVA)	\$2.96 billion
Actuarial Accrued Liability (AAL)	\$4.50 billion
Actuarial Funded Ratio (AVA/AAL)	66%
Market Value Funded Ratio (MVA/AAL)	56%
Active Participants	18,953
Inactive Participants	
Retirees and Beneficiaries	12,440
Vested	1,553



Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #3, #4 and #5.

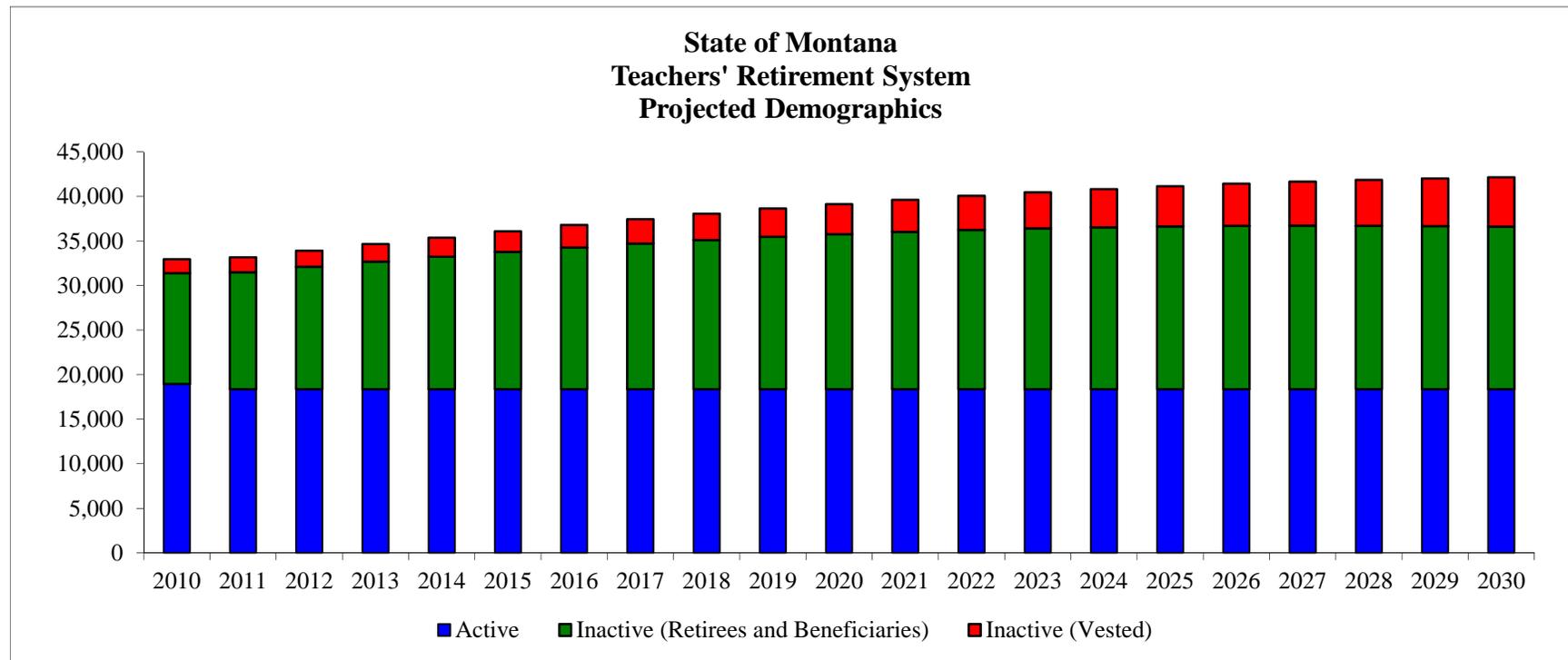
The deterministic assumptions are as follows:

1. Current Plan provisions (see summary of Benefit Provisions in the Assumptions and Methods section of this report)
2. The actuarial data used by Cavanaugh Macdonald Consulting (see summary in the Assumptions and Methods section of this report)
3. Assumed rate of return on Plan assets for all projection years: 7.75%
4. Assumes a constant employer contribution rate of 9.96% of pay (unless stated otherwise)
5. Assumes a constant employee contribution rate of 7.15% of pay
6. Open group analysis: New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.
7. Assumes a level active population in the future

Deterministic Analysis (continued)

Demographics

Following are the projected number of active and inactive participants at the beginning of each plan year from 2010 through 2030 (2010 is actual). These projections are based on an open group analysis. Using the actuary’s assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The open group analysis replaces these participants with new ones having similar characteristics as the current active employee group. The number of inactive participants increases by more than 70% during the 20-year projection period shown.



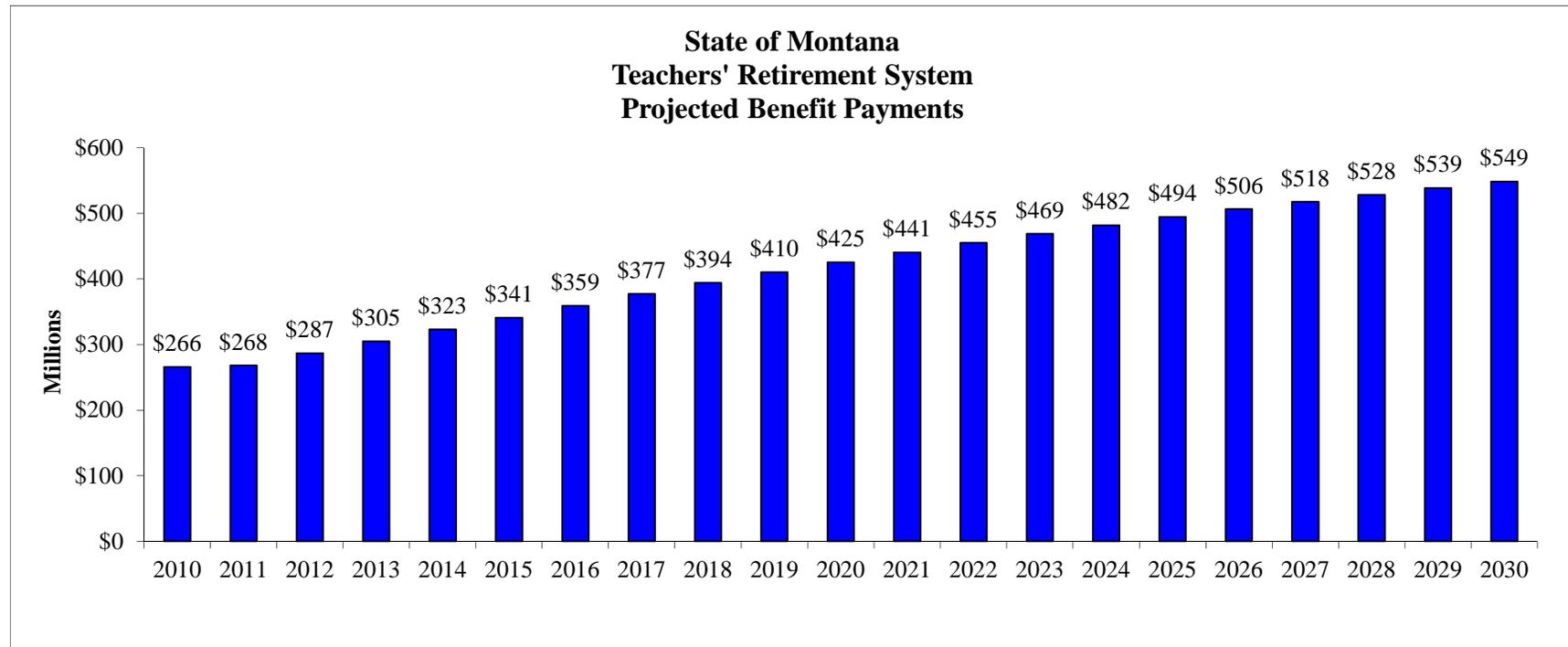
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual Percent Change	N/A	0.7%	2.2%	2.2%	2.0%	2.1%	1.9%	1.8%	1.6%	1.5%	1.3%	1.2%	1.1%	1.0%	0.9%	0.8%	0.7%	0.6%	0.5%	0.4%	0.3%

Note: Annual change for 2011 assumes all existing non-vested terminated employees exit the Plan.

Deterministic Analysis (continued)

Benefit Payments

The Plan’s projected benefit payments for plan years 2010 through 2030 are shown below. The expected benefit payments are expected to increase by more than 200% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to increase to more than 31% by the end of the projection period (see next page).



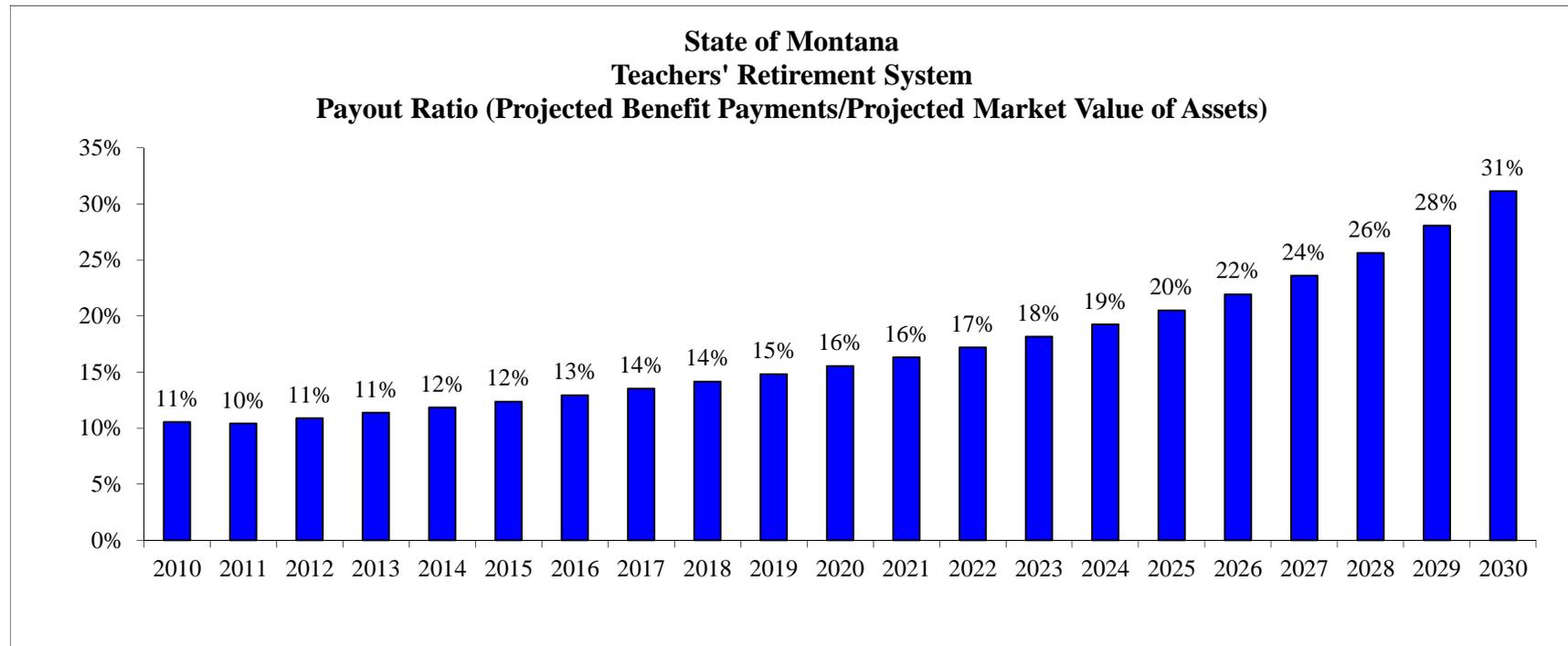
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual Percent Change	N/A	0.7%	6.9%	6.5%	5.8%	5.6%	5.4%	5.0%	4.5%	4.1%	3.7%	3.6%	3.3%	3.0%	2.8%	2.6%	2.4%	2.2%	2.0%	1.9%	1.9%

Note: Annual change for 2011 assumes all existing non-vested terminated employees exit the Plan.

Deterministic Analysis (continued)

Payout Ratio (benefit payments/market value of assets)

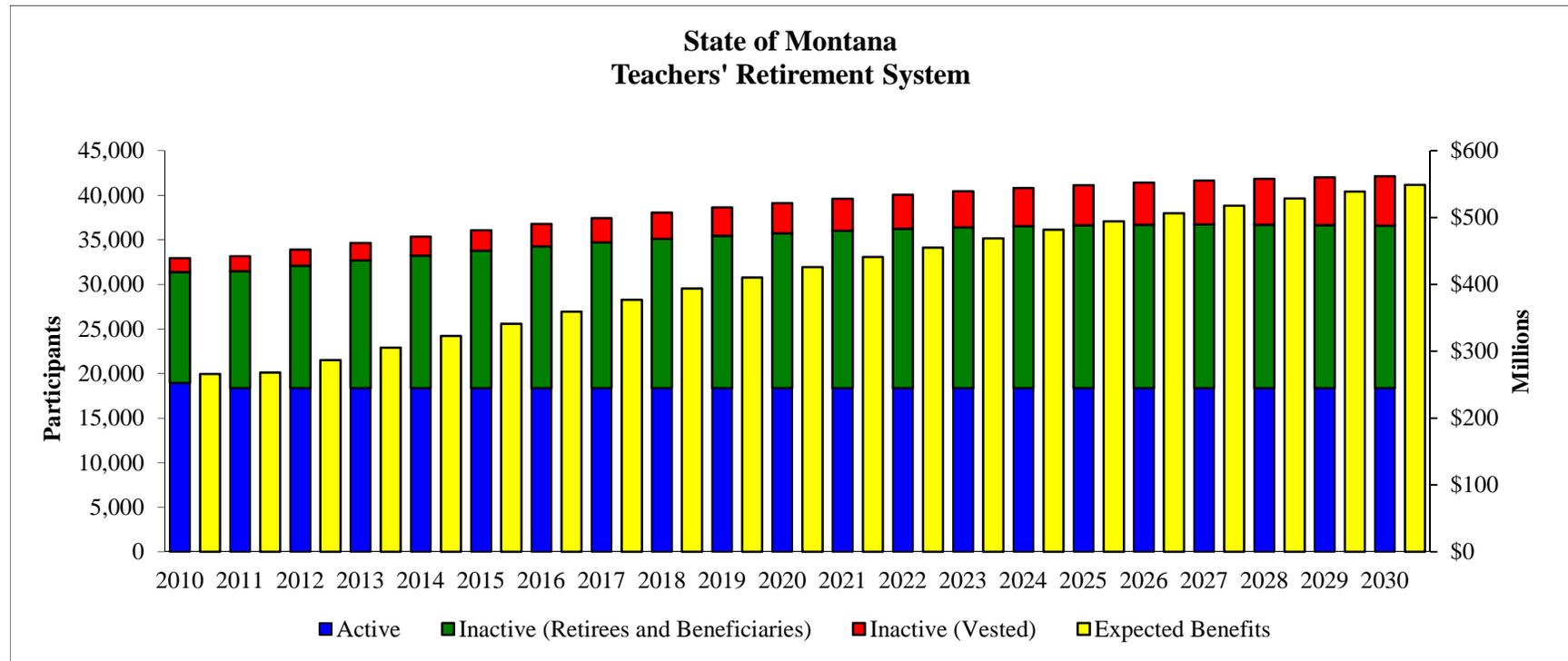
The Plan's projected payout ratio for plan years 2010 through 2030 are shown below. The expected payout ratios are expected to increase to more than 31% through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 7.75% each year without exception for all projection years.



Deterministic Analysis (continued)

Demographics and Benefit Payments

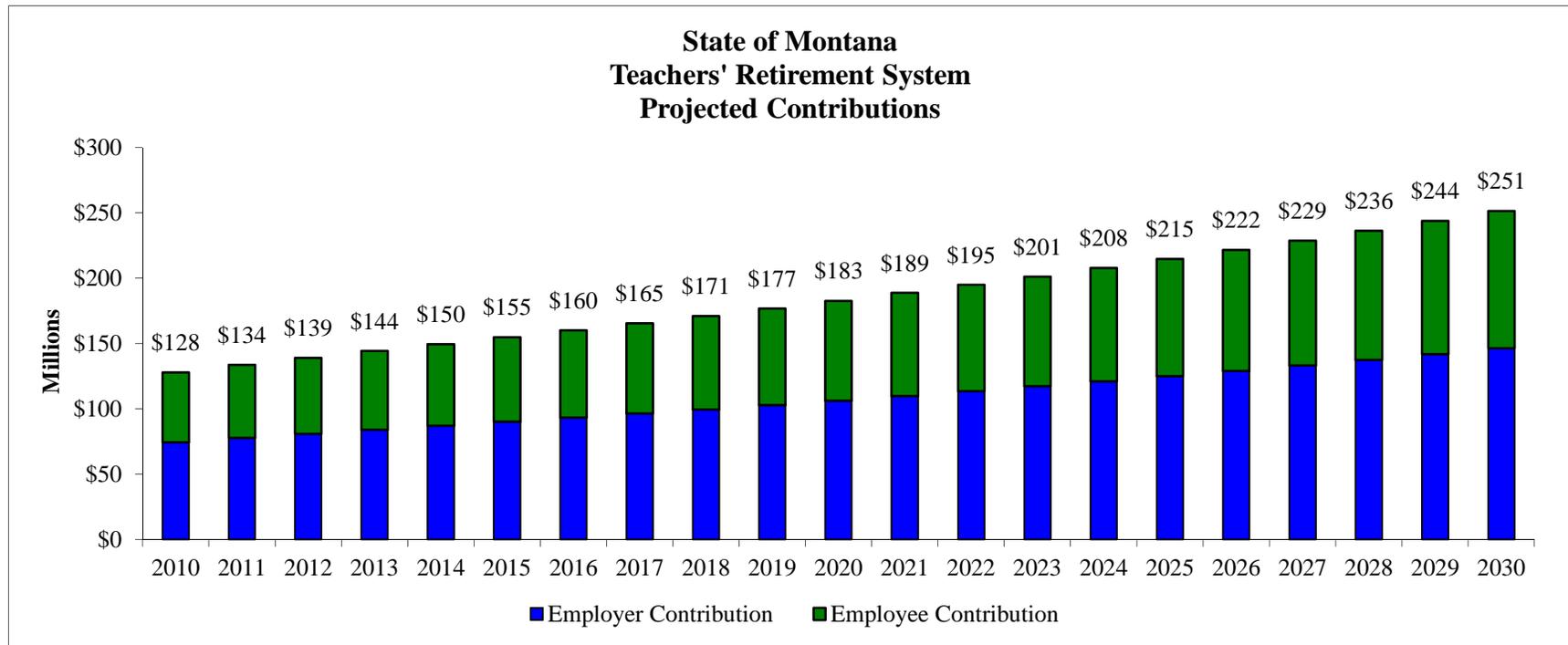
The chart below highlights the demographic and benefit payment projections shown on the prior pages, illustrating the comparison between the projected number of active and inactive participants and the projected benefit payments for plan years 2010 through 2030.



Deterministic Analysis (continued)

Contributions

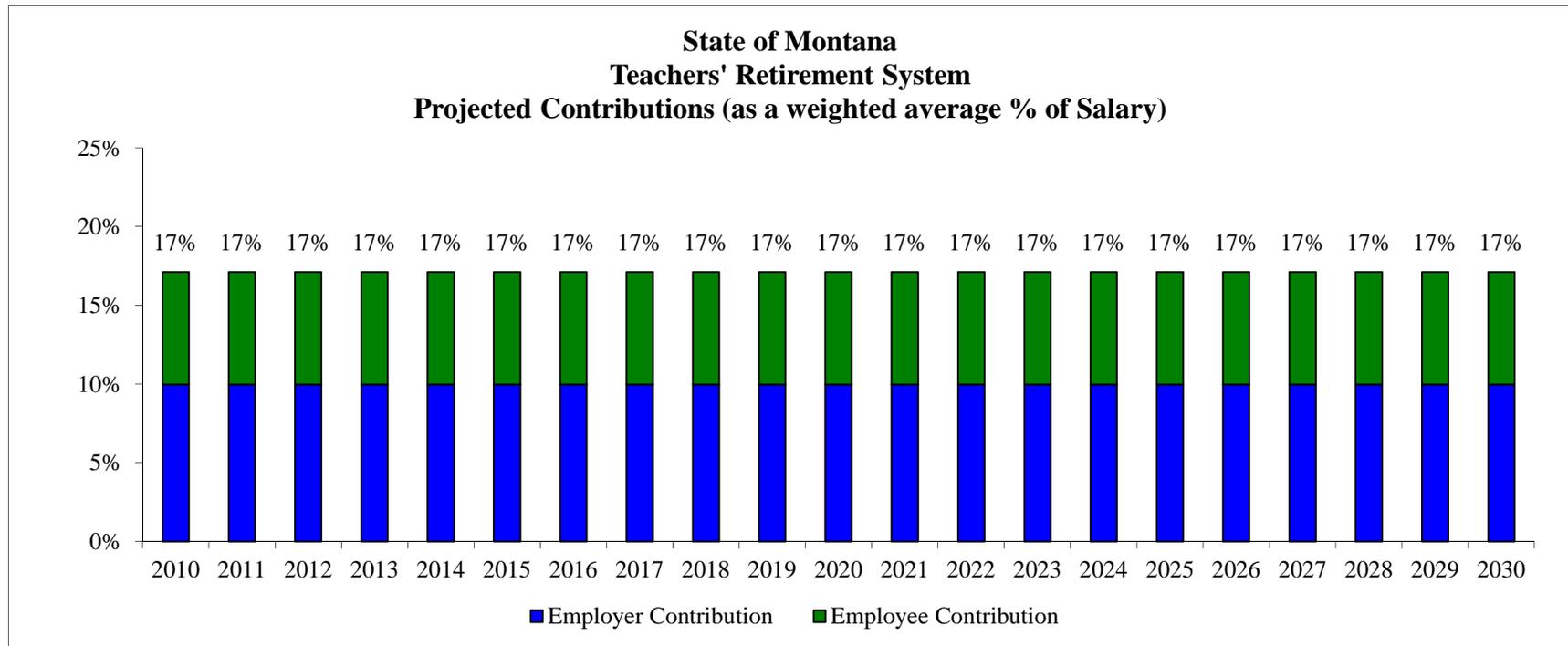
The Plan’s assumed projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years.



Deterministic Analysis (continued)

Contributions

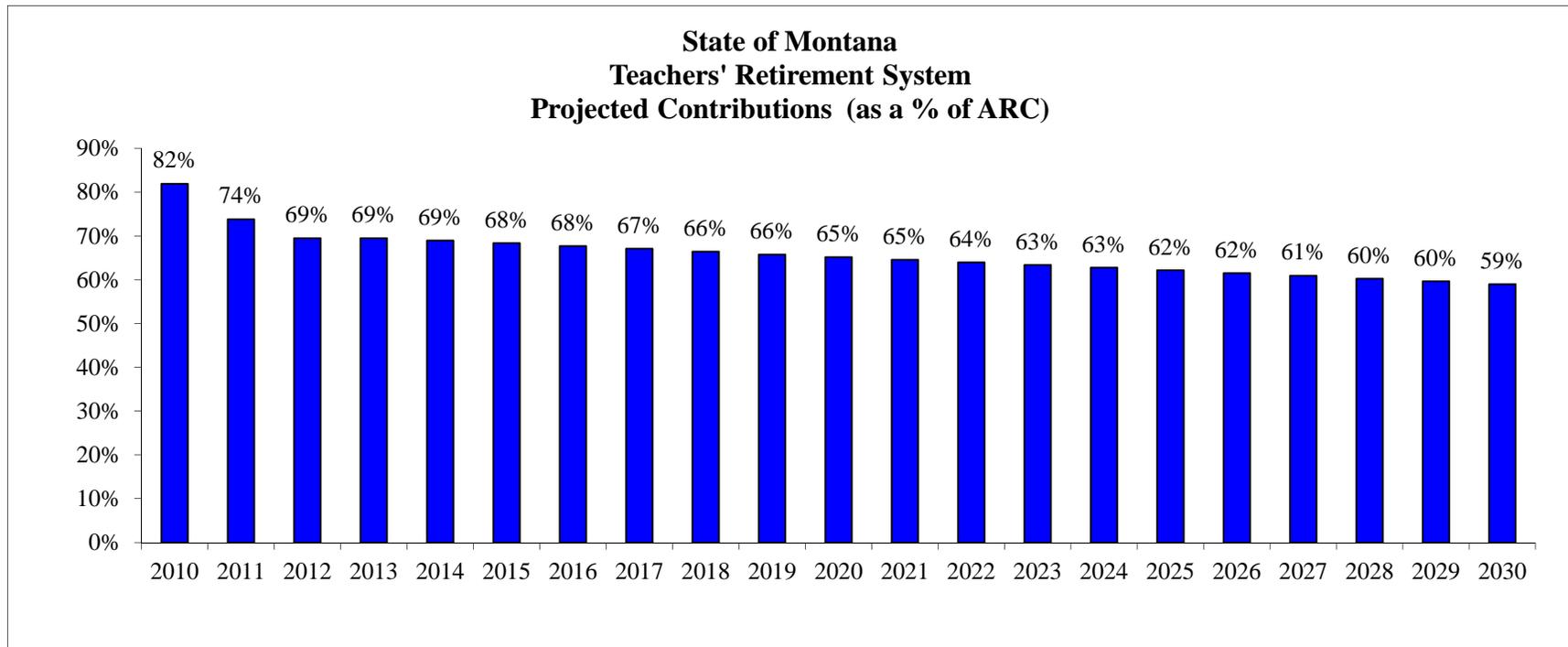
The Plan’s assumed projected contributions, expressed as a weighted average percentage of salary, are shown below. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years.



Deterministic Analysis (continued)

Contributions

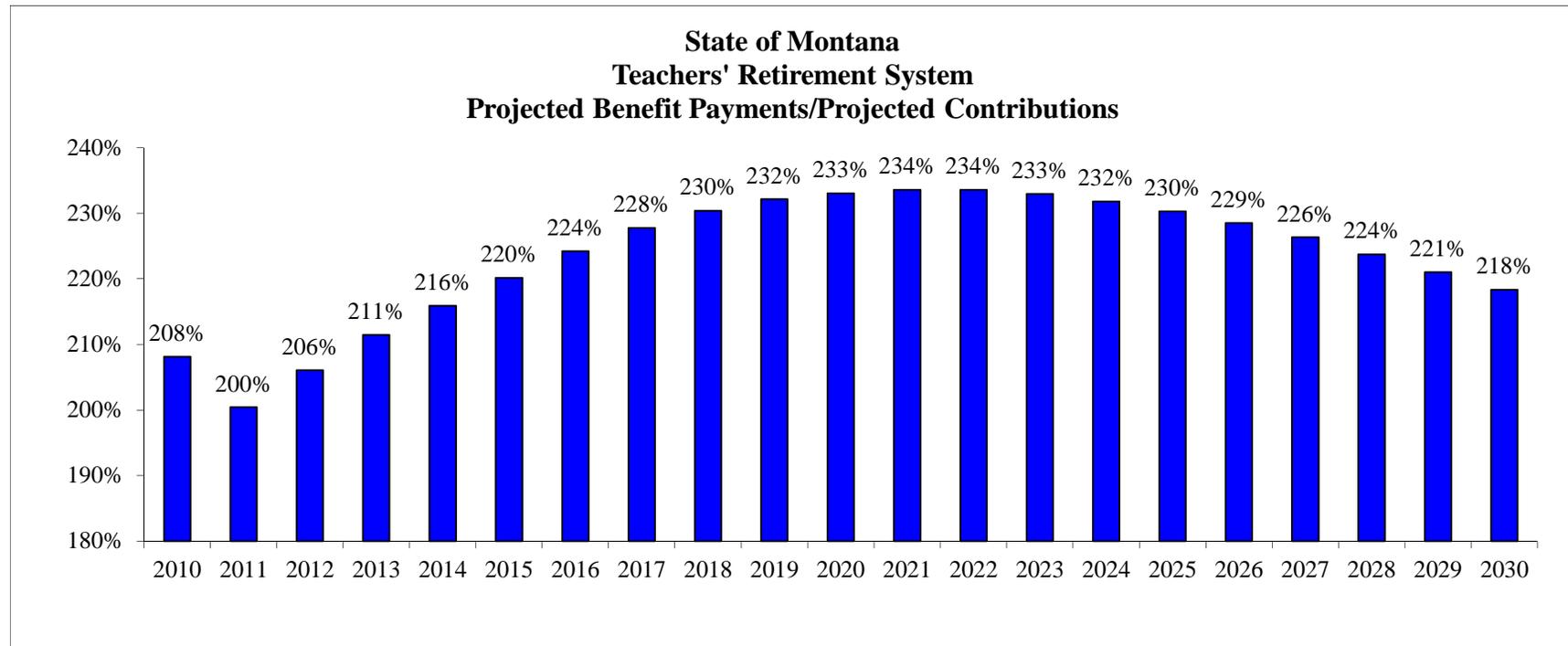
The Plan’s assumed projected contributions, expressed as a percentage of the Annual Required Contribution (ARC), are shown below. ARC is calculated using a 30 year declining amortization period. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years.



Deterministic Analysis (continued)

Benefit Payments/Contributions

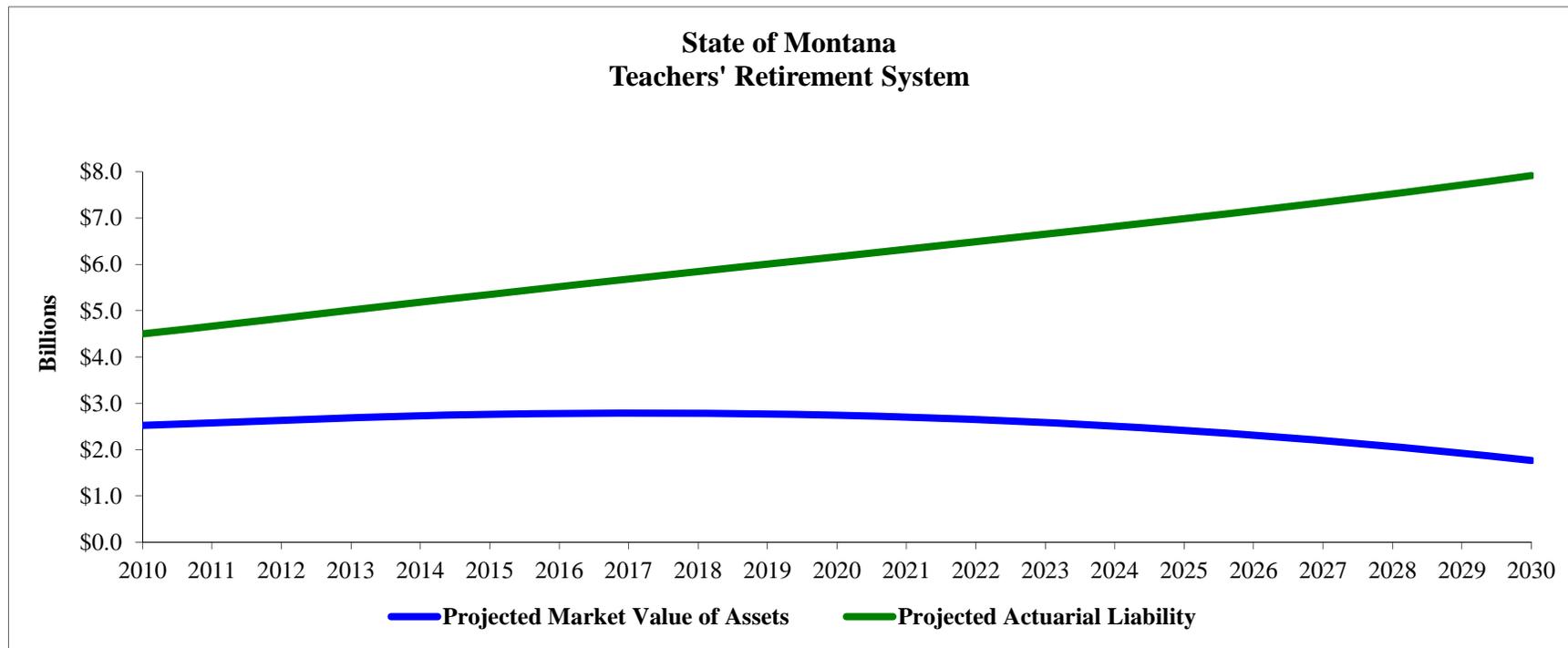
The Plan's assumed projected benefit payments divided by projected contributions are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 7.75% each year without exception for all projection years.



Deterministic Analysis (continued)

Actuarial Accrued Liabilities and Market Value of Assets

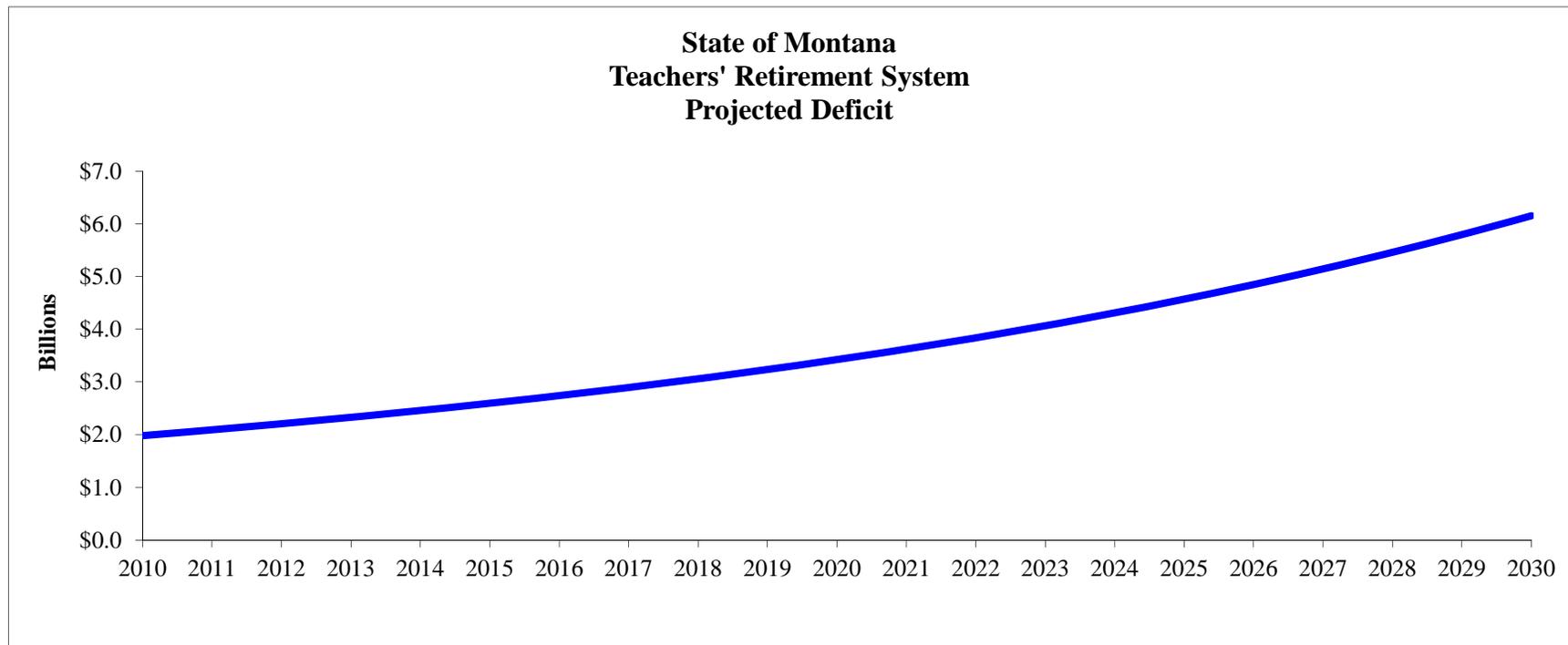
The Plan’s projected actuarial accrued liabilities and market value of assets are shown below. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to increase through the end of the projection period. The actuarial funded ratio (based on actuarial value of assets) is expected to fall from about 66% currently to near 20% at the end of the projection period. This is shown more clearly on the following pages.



Deterministic Analysis (continued)

Deficit (market value of assets – actuarial accrued liabilities)

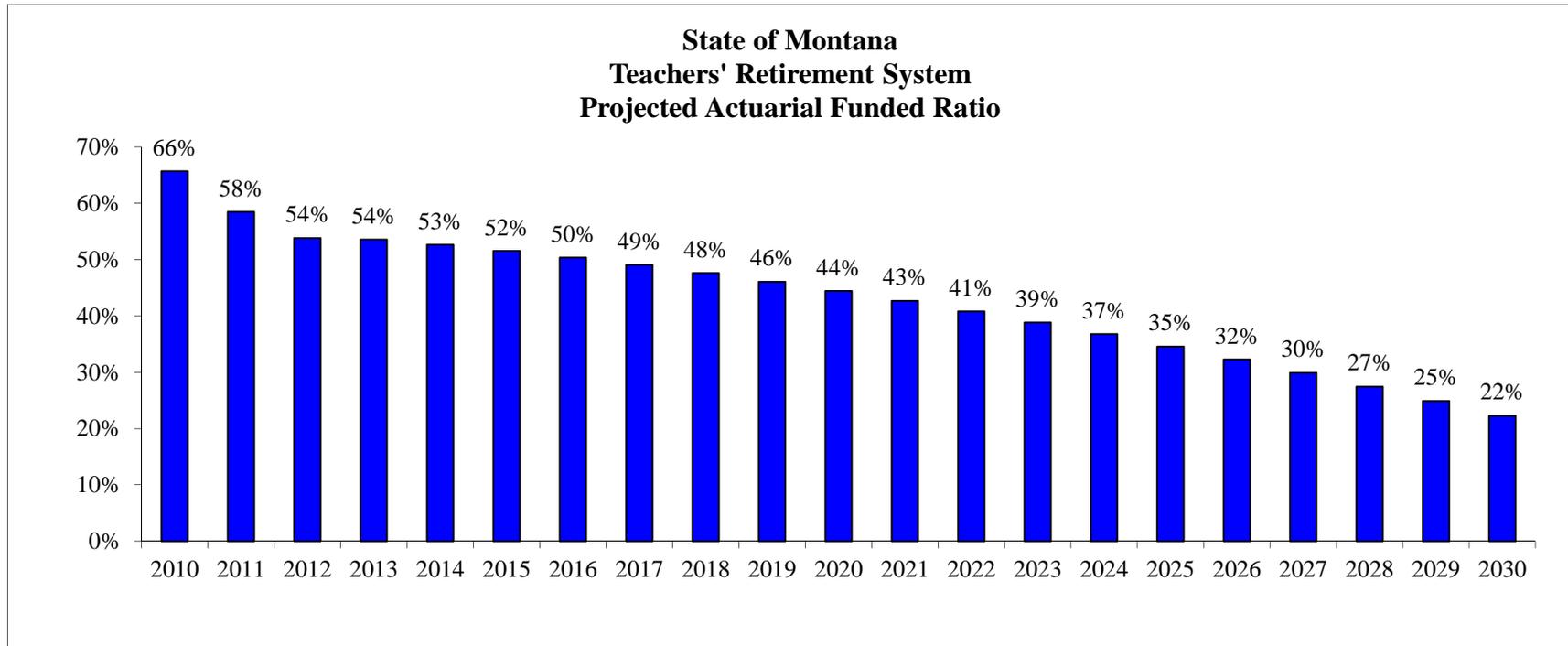
The Plan’s projected deficit of assets is shown below. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to increase through the end of the projection period. This can also be seen on the following page, where the funded ratio (based on actuarial value of assets) is projected to decrease from the current level of approximately 66% to 22% in 2030.



Deterministic Analysis (continued)

Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

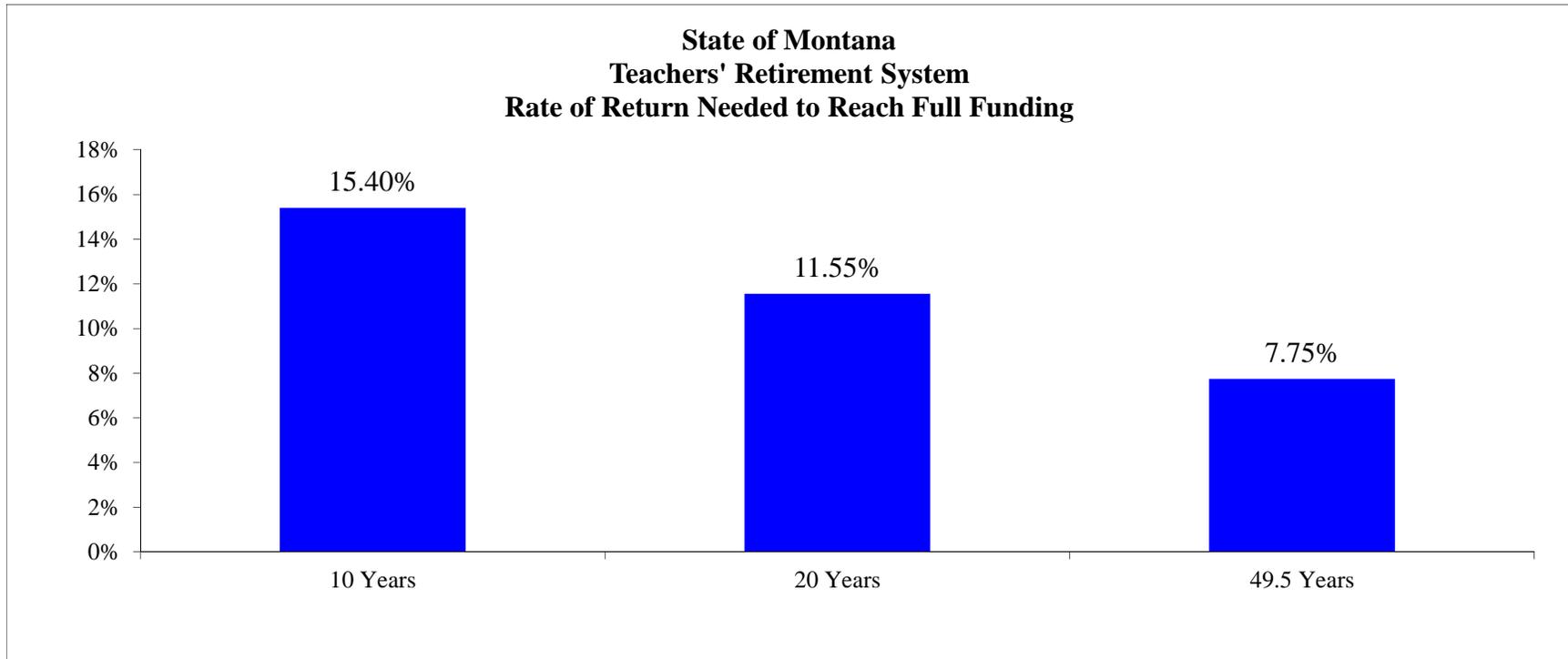
The Plan’s projected actuarial funded ratio is shown below. The chart shows the actual funded ratio for 2010 and then outlines the projected funded ratio for years 2011 through 2030. The Plan is expected to end the projection period at approximately 22% funded. The results assume the current contribution policy remains unchanged and that the Plan’s assets return precisely 7.75% each year without exception for all projection years.



Deterministic Scenario Analysis

Full Funding Implied Returns

As of July 1, 2010 the Plan's unfunded actuarial accrued liability (UAAL) had an amortization period of 49.5 years. Assuming the current contribution policy remains unchanged, the Plan would need to experience an investment rate of return greater than 7.75% to bring the Plan to a fully funded status prior to 49.5 years. If all actuarial assumptions are met, the returns needed to reach 100% funded over the next 10 and 20 years are shown in the table below.



Deterministic Scenario Analysis (continued)

Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a funded ratio of 22% in 20 years. The table below summarizes the projected funding ratio and other key statistics in 2030 assuming the Plan experiences an annualized investment return of 50 basis points lower (7.25%) than the actuarially assumed rate of return (7.75%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

	Value in 2030			
	7.75% Return	7.25% Return	Change	
Projected Payout Ratio	31%	44%	13%	▲
Projected Employer Contributions (millions)	\$146.3	\$146.3	\$0.0	▬
Projected Contributions (Weighted Average % of Salary)	17.11%	17.11%	0.00%	▬
Projected Contributions/Projected Annual Required Contribution	59%	59%	0%	▬
Projected Benefit Payments/Projected Total Contributions	218%	218%	0%	▬
Projected Actuarial Accrued Liabilities (billions)	\$7.9	\$7.9	\$0.0	▬
Projected Market Value of Assets (billions)	\$1.8	\$1.2	(\$0.6)	▼
Projected Deficit (billions)	\$6.2	\$6.7	\$0.5	▲
Projected Funded Ratio	22%	16%	-6%	▼
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	\$2.3	\$2.3	\$0.0	▬

Deterministic Scenario Analysis (continued)

Sensitivity Analysis – Increased Contributions

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a funded ratio of 22% in 20 years. The table below summarizes the projected funding ratio and other key statistics in 2030 assuming the Plan experiences employer contribution rates (as a percentage of pay) that are 2 percentage points higher (11.96%) than the current employer contribution rate (9.96%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

	Value in 2030			
	Legislated Contributions	Increased Contributions	Change	
Projected Payout Ratio	31%	21%	-10.00%	▼
Projected Employer Contributions (millions)	\$146.3	\$175.7	\$29.4	▲
Projected Contributions (Weighted Average % of Salary)	17.11%	19.11%	2.00%	▲
Projected Contributions/Projected Annual Required Contribution	59%	66%	7%	▲
Projected Benefit Payments/Projected Total Contributions	218%	196%	-22%	▼
Projected Actuarial Accrued Liabilities (billions)	\$7.9	\$7.9	\$0.0	▬
Projected Market Value of Assets (billions)	\$1.8	\$2.7	\$0.9	▲
Projected Deficit (billions)	\$6.2	\$5.2	(\$1.0)	▼
Projected Funded Ratio	22%	34%	12%	▲
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	\$2.3	\$2.7	\$0.4	▲

Stochastic Analysis

This section analyzes Plan assets and liabilities under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

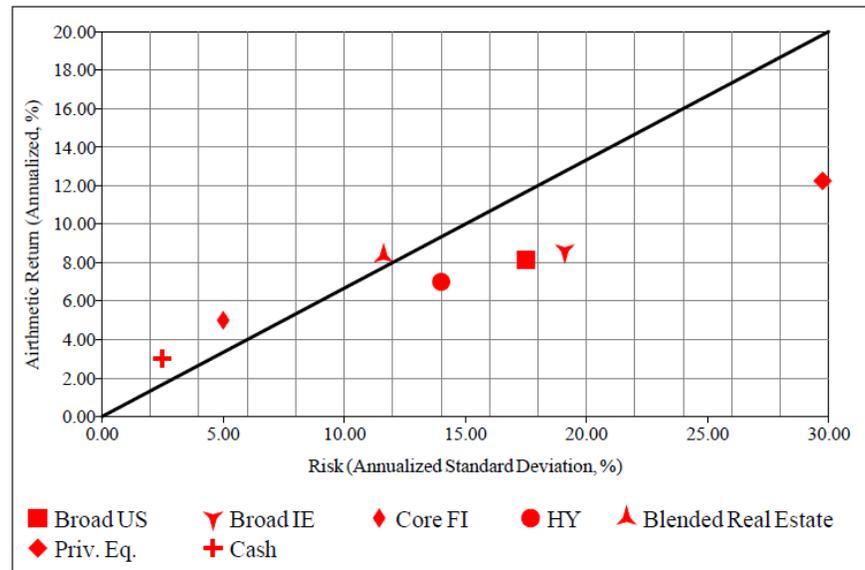
Using the expected values and variances of the returns and inflation, along with their correlations, 2000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all assumptions are exactly met.

Stochastic Analysis (continued)

Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Broad US Equity to return, annually on average, 8.15% with a standard deviation of 17.50%, meaning that two-thirds of the time we expect its return to lie between -9.35% (= 8.15 - 17.50) and 25.65% (= 8.15 + 17.50). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Broad US Equity will either fall below -26.85% or rise above 43.15%. The risk and return assumptions used in this study are outlined in the charts below:

Asset Class	Arithmetic Return Assumption	Standard Deviation Assumption
Broad US Equity	8.15	17.50
Broad International Equity	8.60	19.10
Core Fixed Income	5.00	5.00
High Yield Fixed Income	7.00	14.00
Blended Real Estate	8.35	11.62
Private Equity	12.25	29.75
Cash Equivalents	3.00	2.50



The Blended Real Estate assumption consists of 50% Core Real Estate, 25% Value Added Real Estate, 10% Opportunistic Real Estate, and 15% Timber.

Stochastic Analysis (continued)

Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is “risk” or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

	Broad US Equity	Broad International Equity	Core Fixed Income	High Yield Fixed Income	Blended Real Estate	Private Equity	Cash Equivalents
Broad US Equity	1.00	0.74	0.24	0.60	0.33	0.67	0.04
Broad International Equity	0.74	1.00	0.14	0.55	0.23	0.60	-0.07
Core Fixed Income	0.24	0.14	1.00	0.30	-0.18	-0.11	0.26
High Yield Fixed Income	0.60	0.55	0.30	1.00	-0.07	0.40	-0.06
Blended Real Estate	0.33	0.23	-0.18	-0.07	1.00	0.56	0.35
Private Equity	0.67	0.60	-0.11	0.40	0.56	1.00	0.13
Cash Equivalents	0.04	-0.07	0.26	-0.06	0.35	0.13	1.00

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

Stochastic Analysis (continued)

Efficient Portfolios

Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under “Min” and “Max.” In addition to the 10 efficient portfolios, the table shows the Current Allocation (as of 9/30/2010) of the Plan, as well as two Potential Policy Targets for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes throughout this study.

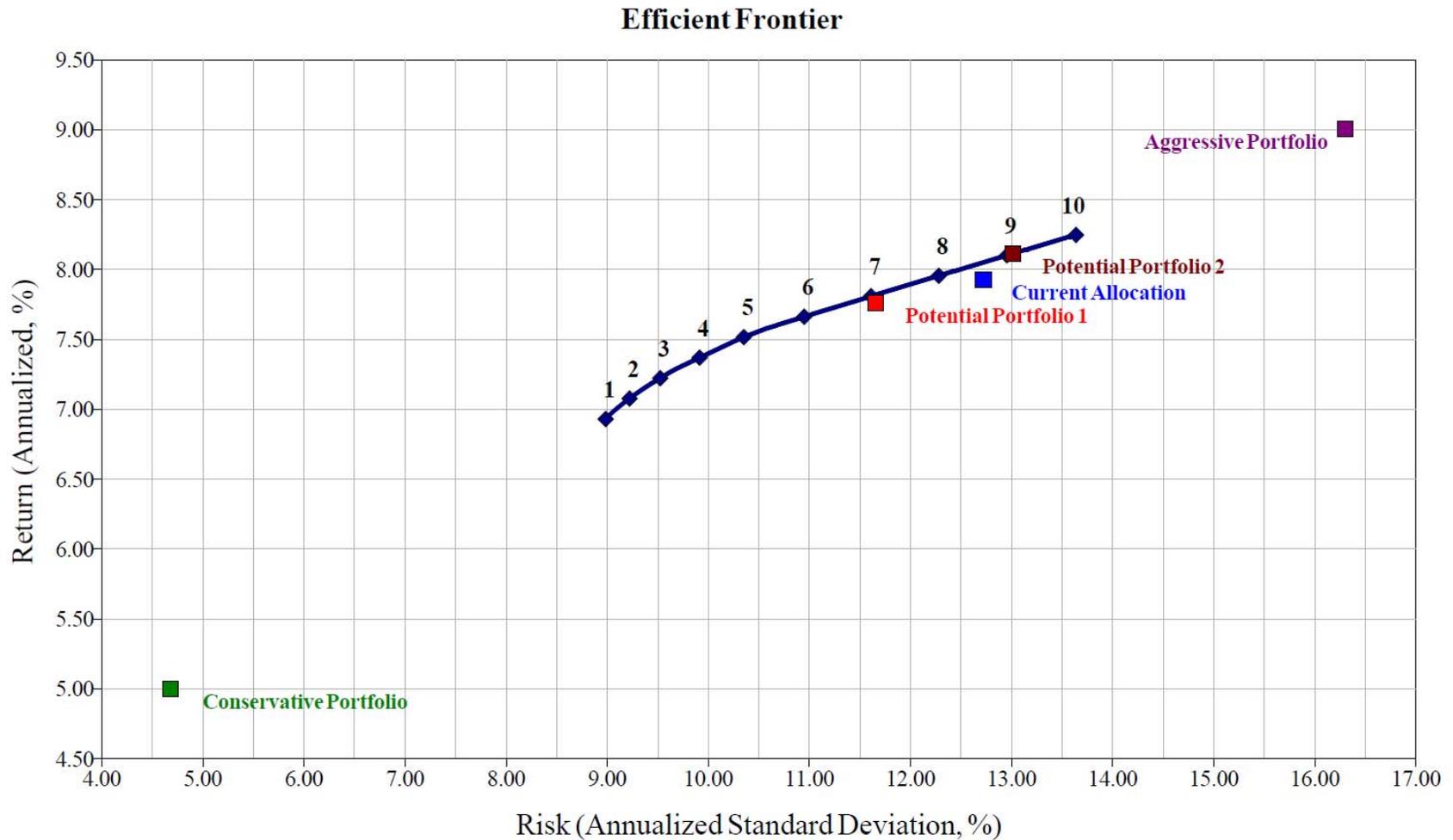
	Min	Max	1	2	3	4	5	6	7	8	9	10	Current Allocation	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Aggressive Portfolio
Broad US Equity	10	50	24	21	19	19	21	22	24	27	30	32	35.5	0.0	28	30	30
Broad International Equity	10	50	17	16	14	14	15	16	18	20	22	24	18.6	0.0	18	22	30
Core Fixed Income	15	40	40	40	40	40	39	34	29	25	20	16	24.9	80.0	30	20	0
High Yield Fixed Income	0	4	0	0	0	0	1	4	4	4	4	4	2.4	10.0	2	4	10
Blended Real Estate	4	9	9	9	9	9	9	9	9	9	9	9	5.8	0.0	8	9	10
Private Equity	5	14	5	9	12	14	14	14	14	14	14	14	12.4	0.0	13	14	20
Cash Equivalents	1	5	5	5	5	3	1	1	1	1	1	1	0.3	10.0	1	1	0
Total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			46	46	46	48	51	56	61	65	70	74	69	10	61	70	90
Capital Preservation			45	45	45	43	40	35	30	26	21	17	25	90	31	21	0
Alpha			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inflation			9	9	9	9	9	9	9	9	9	9	6	0	8	9	10
Expected Return			6.93	7.08	7.22	7.37	7.52	7.66	7.81	7.96	8.10	8.25	7.93	5.00	7.76	8.11	9.01
Risk (Standard Deviation)			8.99	9.22	9.52	9.91	10.35	10.95	11.61	12.28	12.95	13.64	12.72	4.68	11.66	13.01	16.30
Return (Compound)			6.55	6.69	6.80	6.92	7.03	7.11	7.19	7.27	7.33	7.40	7.19	4.90	7.13	7.34	7.81
Return/Risk Ratio			0.77	0.77	0.76	0.74	0.73	0.70	0.67	0.65	0.63	0.60	0.62	1.07	0.67	0.62	0.55
RVK Expected Eq. Beta (LC: US Eq = 1)			0.55	0.56	0.57	0.58	0.61	0.64	0.68	0.72	0.75	0.79	0.73	0.10	0.68	0.76	0.91
RVK Liquidity Metric (T-Bills = 100)			78	74	71	70	69	68	69	69	69	70	74	83	71	69	62

Total Equity must be between 40% and 70%. Total Fixed Income must not exceed 40%. Broad International Equity must not be greater than 75% of Broad US Equity.

Stochastic Analysis (continued)

Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the “efficient frontier.” The upward slope of the efficient frontier indicates the direct relationship between return and risk.



Stochastic Analysis (continued)

Asset Mixes

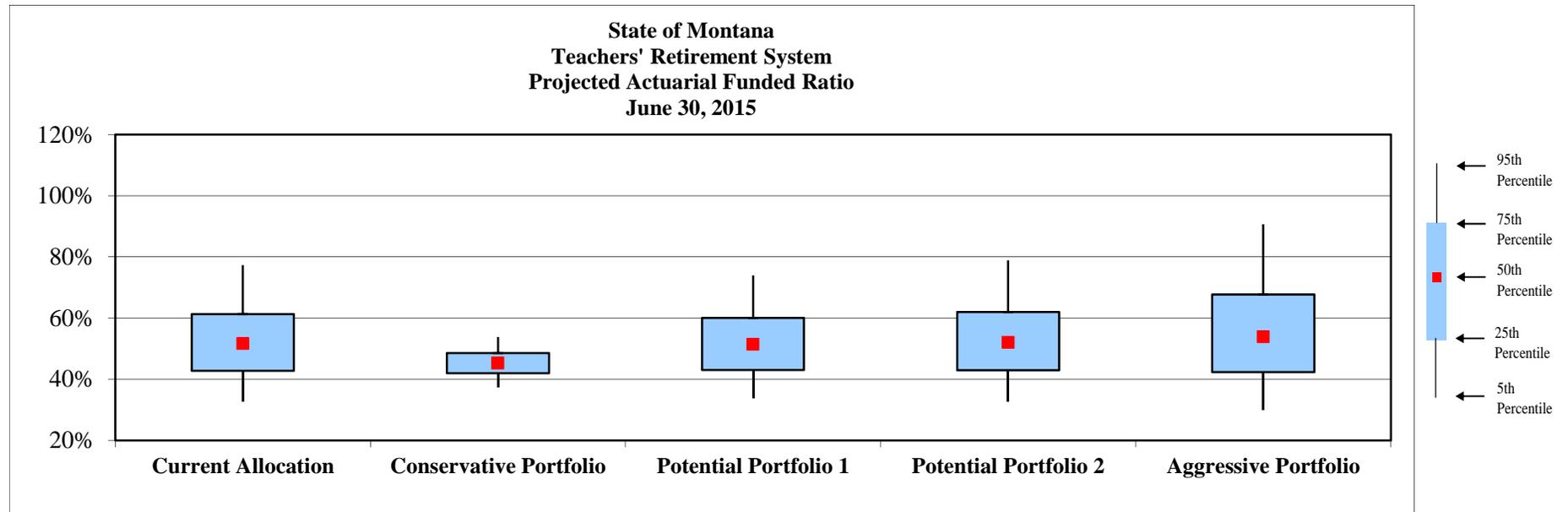
Outlined below are the Current Allocation (as of 9/30/2010) and four other mixes to be examined in this stochastic analysis. The expected return and expected risk, as measured by standard deviation, for each is also shown.

Asset Class	Current Allocation	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Aggressive Portfolio
Broad US Equity	35.5%	0.0%	28.0%	30.0%	30.0%
Broad International Equity	18.6%	0.0%	18.0%	22.0%	30.0%
Core Fixed Income	24.9%	80.0%	30.0%	20.0%	0.0%
High Yield Fixed Income	2.4%	10.0%	2.0%	4.0%	10.0%
Blended Real Estate	5.8%	0.0%	8.0%	9.0%	10.0%
Private Equity	12.4%	0.0%	13.0%	14.0%	20.0%
Cash Equivalents	0.3%	10.0%	1.0%	1.0%	0.0%
Expected Return	7.93%	5.00%	7.76%	8.11%	9.01%
Expected Risk	12.72%	4.68%	11.66%	13.01%	16.30%

Stochastic Analysis (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



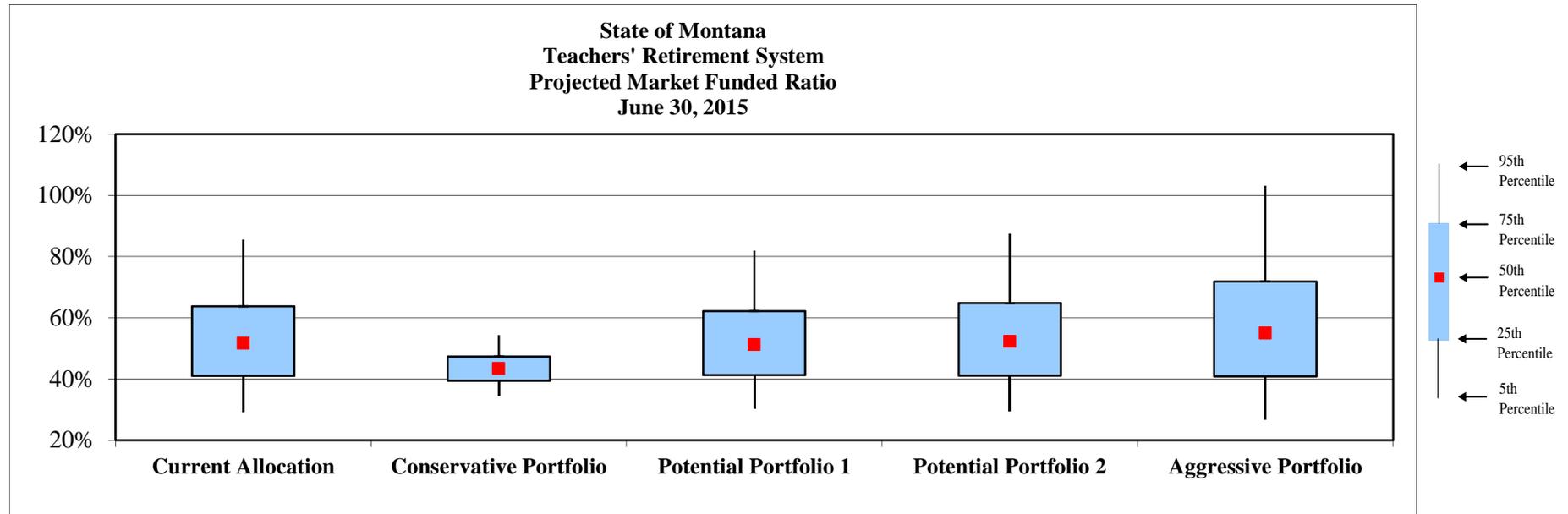
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$3,533.1	32.8%	\$3,293.6	37.5%	\$3,488.0	33.8%	\$3,542.8	32.6%	\$3,691.3	29.9%
25th Percentile	\$3,029.6	42.7%	\$3,052.0	42.0%	\$3,017.8	43.0%	\$3,022.5	42.9%	\$3,047.0	42.3%
50th Percentile	\$2,564.1	51.7%	\$2,907.9	45.2%	\$2,577.5	51.4%	\$2,542.9	52.1%	\$2,443.1	53.9%
75th Percentile	\$2,059.1	61.3%	\$2,737.9	48.5%	\$2,117.4	60.0%	\$2,014.6	62.0%	\$1,733.8	67.7%
95th Percentile	\$1,219.2	77.3%	\$2,476.2	53.9%	\$1,374.0	74.0%	\$1,143.8	78.9%	\$499.3	90.6%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



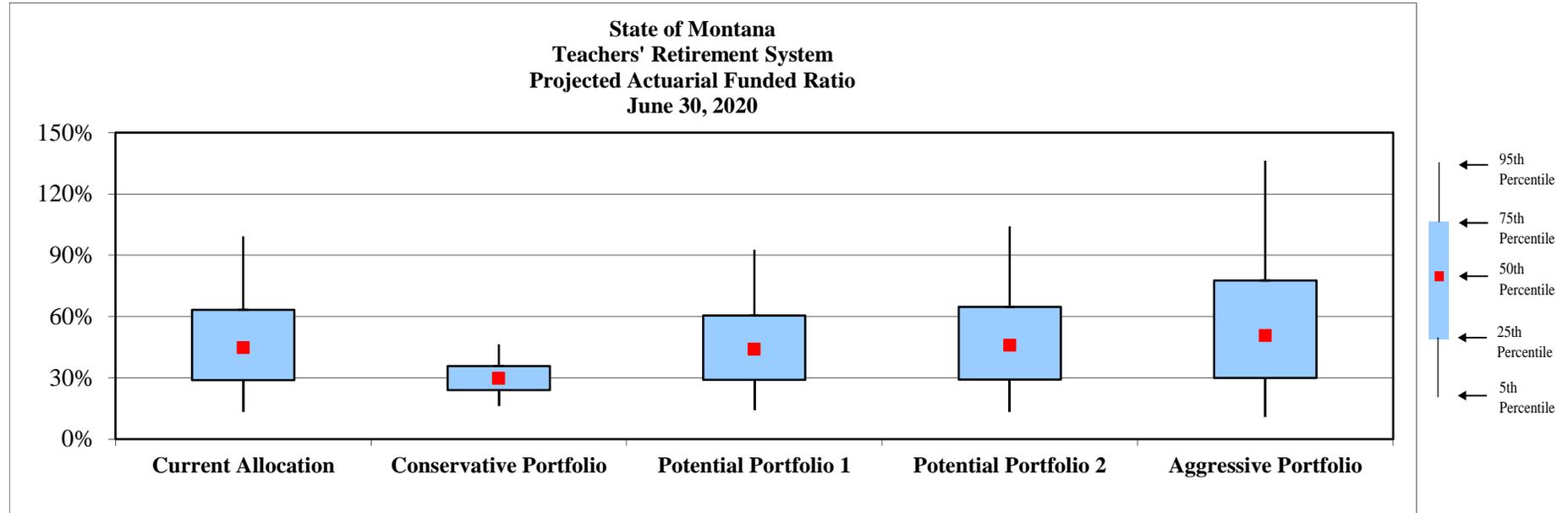
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$3,690.0	29.3%	\$3,428.3	34.4%	\$3,633.3	30.5%	\$3,692.9	29.4%	\$3,830.5	26.8%
25th Percentile	\$3,102.5	41.0%	\$3,178.9	39.4%	\$3,089.9	41.3%	\$3,098.6	41.1%	\$3,096.6	40.8%
50th Percentile	\$2,560.8	51.7%	\$3,003.9	43.4%	\$2,581.4	51.2%	\$2,523.3	52.3%	\$2,378.9	55.0%
75th Percentile	\$1,929.3	63.8%	\$2,807.2	47.3%	\$2,029.8	62.2%	\$1,890.3	64.8%	\$1,505.0	71.9%
95th Percentile	\$770.3	85.5%	\$2,479.8	54.4%	\$972.2	81.9%	\$667.5	87.5%	(\$171.5)	103.2%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



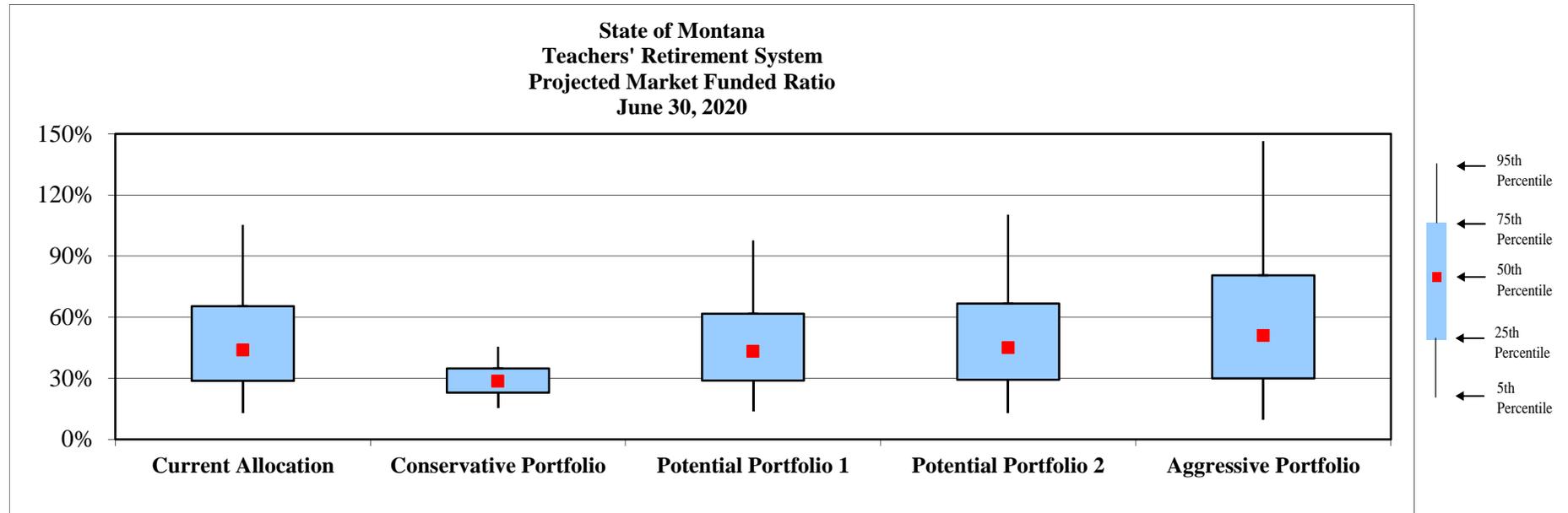
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$5,241.9	13.3%	\$4,975.3	16.3%	\$5,161.8	14.2%	\$5,217.7	13.3%	\$5,378.5	10.8%
25th Percentile	\$4,283.6	28.9%	\$4,572.1	24.0%	\$4,263.8	29.0%	\$4,245.0	29.1%	\$4,232.8	29.9%
50th Percentile	\$3,396.8	44.8%	\$4,278.8	29.7%	\$3,435.5	44.0%	\$3,323.2	45.9%	\$3,037.1	50.6%
75th Percentile	\$2,275.8	63.3%	\$3,973.9	35.7%	\$2,421.1	60.5%	\$2,148.3	64.7%	\$1,375.3	77.7%
95th Percentile	\$41.9	99.3%	\$3,433.3	46.3%	\$454.3	92.6%	(\$266.0)	104.2%	(\$2,259.5)	136.3%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



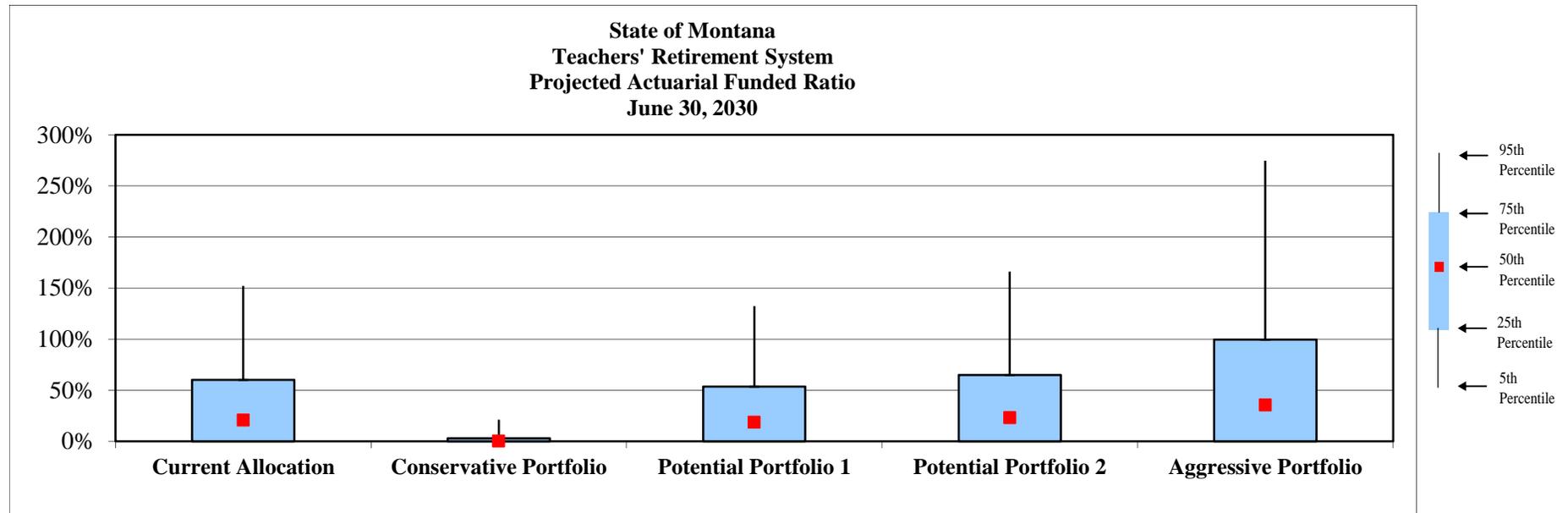
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$5,242.9	12.7%	\$5,009.7	15.5%	\$5,164.4	13.8%	\$5,229.5	12.8%	\$5,373.8	9.9%
25th Percentile	\$4,325.3	28.7%	\$4,642.2	22.9%	\$4,297.5	28.8%	\$4,276.8	29.3%	\$4,228.3	29.9%
50th Percentile	\$3,419.5	43.8%	\$4,355.6	28.5%	\$3,485.9	43.1%	\$3,362.9	45.0%	\$3,014.9	51.0%
75th Percentile	\$2,172.8	65.4%	\$4,044.1	34.7%	\$2,352.8	61.7%	\$2,034.4	66.7%	\$1,183.3	80.6%
95th Percentile	(\$315.8)	105.4%	\$3,499.9	45.5%	\$151.6	97.7%	(\$617.2)	110.3%	(\$2,898.7)	146.5%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



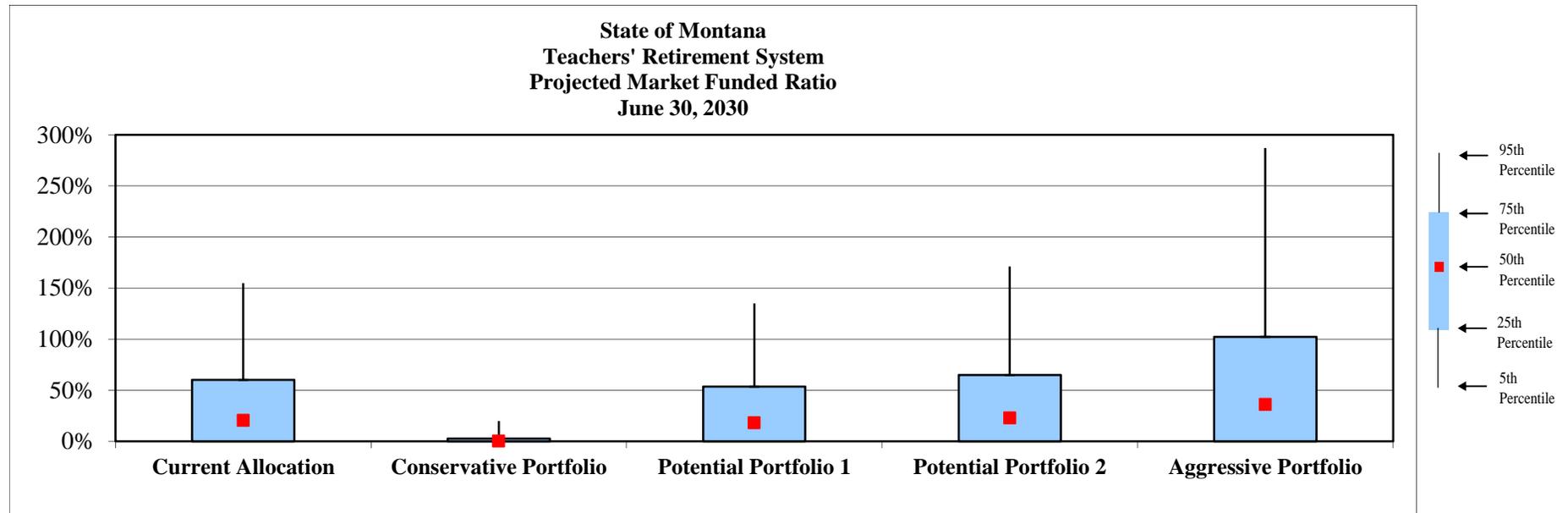
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$8,632.7	0.0%	\$9,181.2	0.0%	\$8,575.6	0.0%	\$8,545.4	0.0%	\$8,480.0	0.0%
25th Percentile	\$7,318.3	0.0%	\$8,215.4	0.0%	\$7,324.9	0.0%	\$7,235.5	0.0%	\$7,069.8	0.0%
50th Percentile	\$6,135.0	20.6%	\$7,592.9	0.0%	\$6,248.0	18.6%	\$5,988.3	23.0%	\$5,110.9	35.4%
75th Percentile	\$3,206.2	60.1%	\$6,979.6	2.8%	\$3,750.3	53.5%	\$2,885.0	64.8%	\$32.1	99.6%
95th Percentile	(\$4,446.9)	152.1%	\$6,121.7	20.9%	(\$2,600.5)	132.3%	(\$5,389.6)	166.2%	(\$13,784.8)	274.6%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$8,622.1	0.0%	\$9,196.3	0.0%	\$8,575.6	0.0%	\$8,545.4	0.0%	\$8,481.2	0.0%
25th Percentile	\$7,309.4	0.0%	\$8,218.3	0.0%	\$7,324.9	0.0%	\$7,249.1	0.0%	\$7,051.3	0.0%
50th Percentile	\$6,134.3	20.3%	\$7,600.3	0.0%	\$6,237.7	18.1%	\$5,988.1	22.6%	\$5,067.9	36.1%
75th Percentile	\$3,235.4	60.1%	\$6,986.7	2.5%	\$3,774.1	53.6%	\$2,782.9	64.9%	(\$178.8)	102.3%
95th Percentile	(\$4,544.1)	154.9%	\$6,149.7	19.6%	(\$2,748.6)	134.9%	(\$5,766.4)	171.2%	(\$15,519.2)	287.1%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Stochastic Analysis (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 20 Years

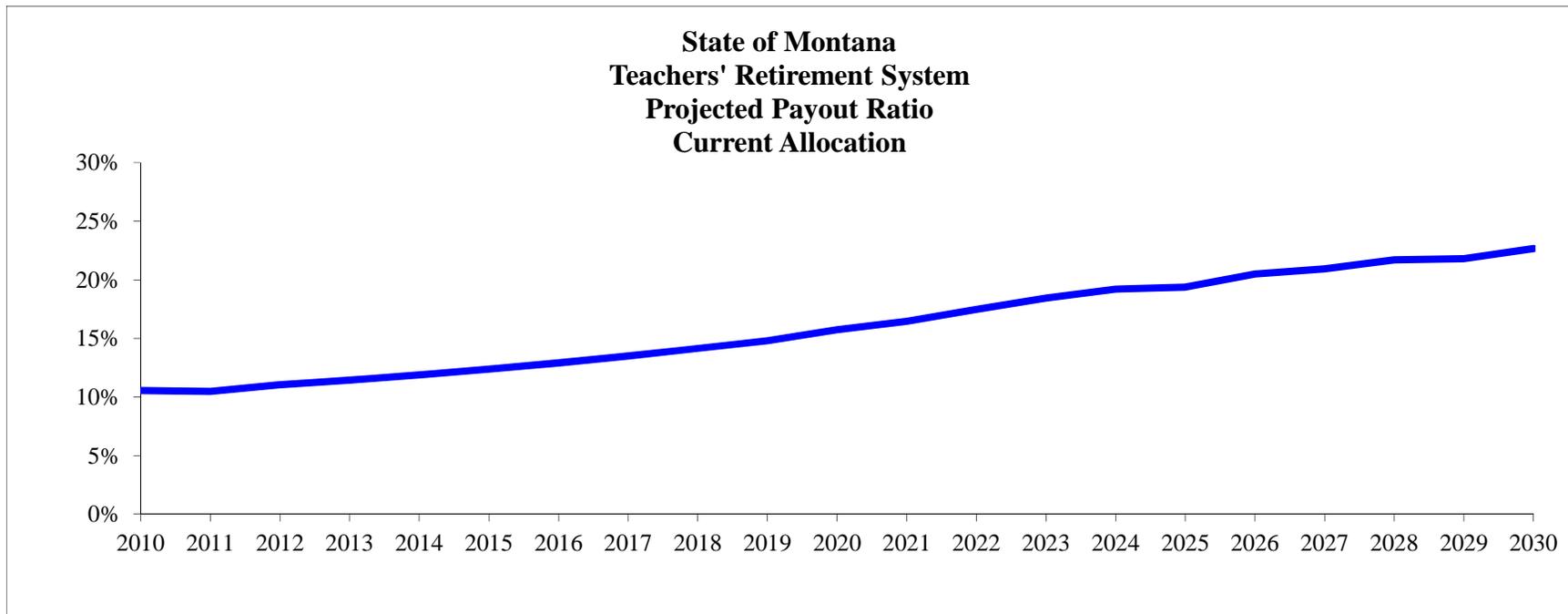
The table below shows the probability that the Plan will reach full funding (market value of assets meets or exceed liabilities) in 20 years and the probability the Plan will experience a total depletion of assets (market value equal to zero) for each of the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

	Probability of Full Funding in 2030	Probability of Market Value = \$0 in 2030
Current Allocation	13%	29%
Conservative Portfolio	0%	69%
Potential Portfolio 1	10%	30%
Potential Portfolio 2	15%	28%
Aggressive Portfolio	26%	25%

Stochastic Analysis (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Current Allocation**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Current Allocation (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.5% and 22.7%. There is a 10% chance by 2024 and 25% chance by 2029 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



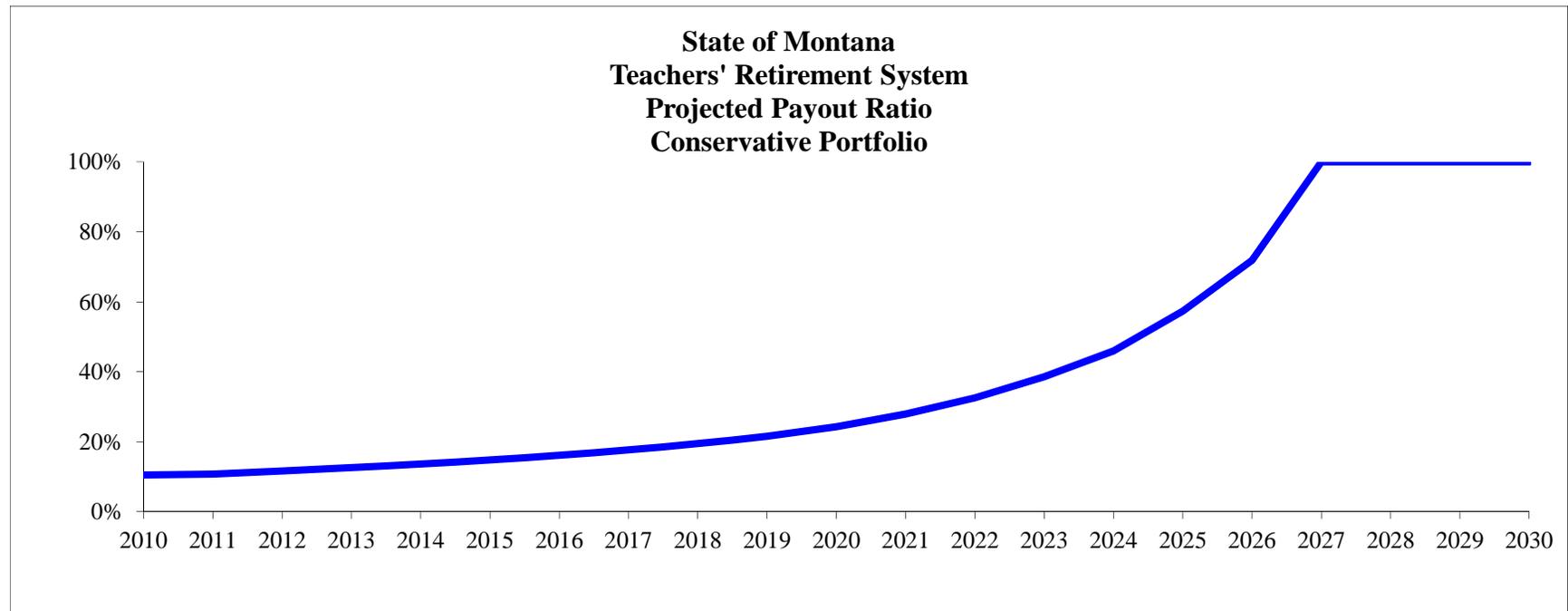
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.5%	11.0%	11.5%	11.9%	12.4%	12.9%	13.5%	14.2%	14.8%	15.7%	16.5%	17.5%	18.5%	19.2%	19.4%	20.5%	20.9%	21.7%	21.8%	22.7%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Conservative Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.6% and 100%. There is a 10% chance by 2023 and 25% chance by 2025 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



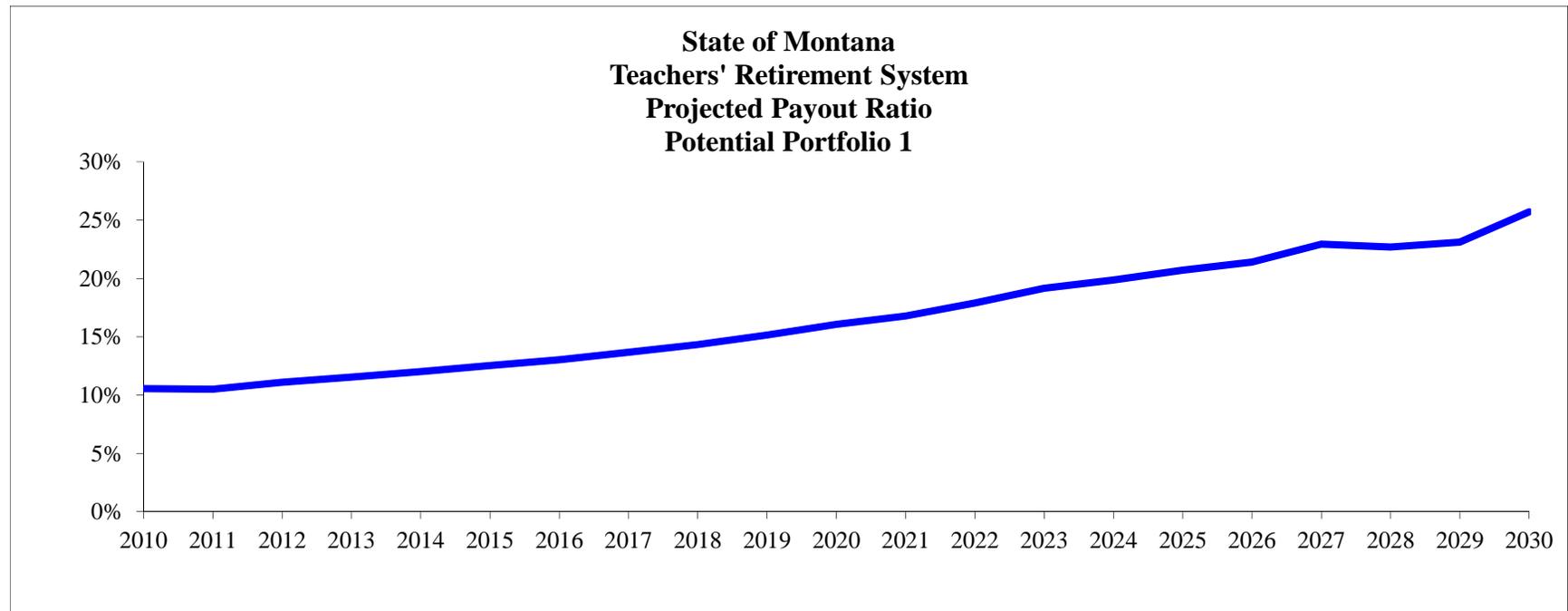
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.8%	11.7%	12.6%	13.7%	14.8%	16.2%	17.7%	19.5%	21.6%	24.3%	28.0%	32.6%	38.6%	46.0%	57.4%	71.9%	100.0%	100.0%	100.0%	100.0%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 1 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.5% and 25.7%. There is a 10% chance by 2024 and 25% chance by 2029 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



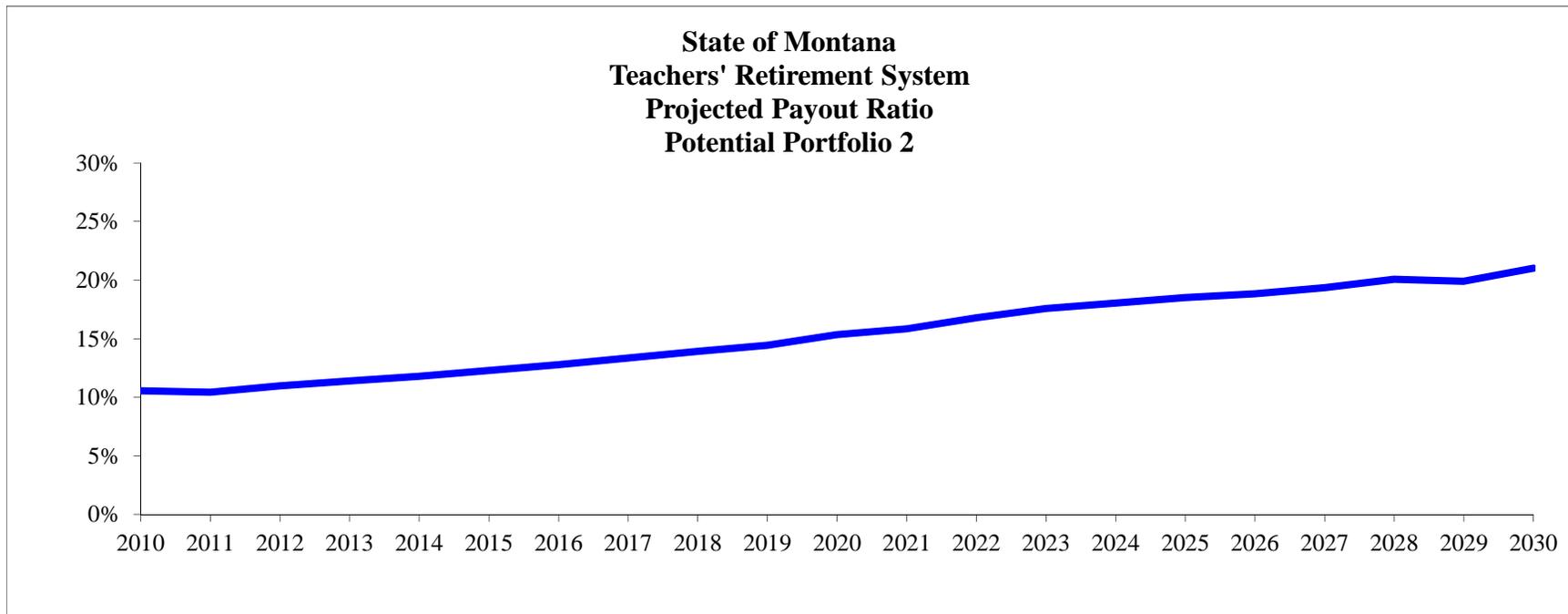
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.5%	11.1%	11.5%	12.0%	12.5%	13.0%	13.7%	14.3%	15.2%	16.1%	16.8%	17.9%	19.2%	19.9%	20.7%	21.4%	22.9%	22.7%	23.1%	25.7%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 2 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.4% and 21.0%. There is a 10% chance by 2024 and 25% chance by 2029 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



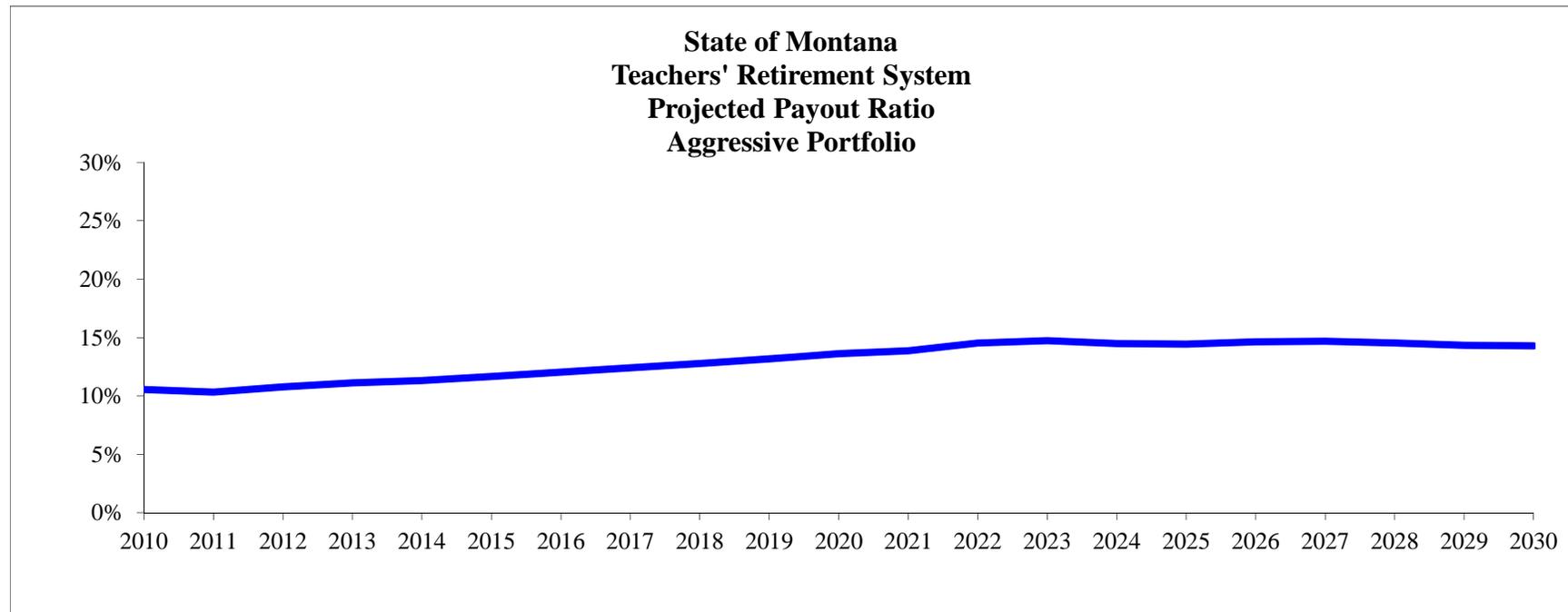
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.4%	11.0%	11.4%	11.8%	12.3%	12.8%	13.4%	13.9%	14.5%	15.4%	15.8%	16.8%	17.6%	18.1%	18.5%	18.8%	19.4%	20.1%	19.9%	21.0%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Aggressive Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.3% and 14.7%. There is a 10% chance by 2023 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%. Assets are projected to remain sufficient under bottom quartile results to pay benefits through the end of the projection period.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.3%	10.8%	11.1%	11.3%	11.7%	12.0%	12.4%	12.8%	13.2%	13.6%	13.9%	14.5%	14.7%	14.5%	14.5%	14.6%	14.7%	14.5%	14.3%	14.3%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

Employer Contributions (as a percentage of pay)

If the market value of assets falls below the level necessary to make the current year’s benefit payments, employer contributions would need to be increased to make up the difference. The current mandated employer contribution rate is 9.96%. The table below shows the distribution of employer contributions (as a percentage of pay) required in 2030 to make projected benefit payments for 2030, assuming the five different asset mixes highlighted on the prior pages. The last column indicates the probability of needing additional contributions in or before 2030.

	Required Employer Contribution in 2030 to Pay Benefits					Probability of Additional Contributions In or Before 2030
	5th	25th	Median	75th	95th	
Current Allocation	39.62%	29.19%	9.96%	9.96%	9.96%	35%
Conservative Portfolio	41.56%	34.26%	29.61%	14.21%	9.96%	76%
Potential Portfolio 1	39.83%	29.28%	9.96%	9.96%	9.96%	36%
Potential Portfolio 2	39.46%	28.29%	9.96%	9.96%	9.96%	34%
Aggressive Portfolio	38.29%	25.53%	9.96%	9.96%	9.96%	29%

Drawing Inferences

The table below compares the projected actuarial and market funded ratios 20 years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the five different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios in 2030, assuming the same five asset mixes being examined.

	Actuarial Funded Ratio in 2030			Market Funded Ratio in 2030			Payout Ratios
	50th	5th	95th	50th	5th	95th	2030 Median
Current Allocation	20.6%	0.0%	152.1%	20.3%	0.0%	154.9%	22.7%
Conservative Portfolio	0.0%	0.0%	20.9%	0.0%	0.0%	19.6%	100.0%
Potential Portfolio 1	18.6%	0.0%	132.3%	18.1%	0.0%	134.9%	25.7%
Potential Portfolio 2	23.0%	0.0%	166.2%	22.6%	0.0%	171.2%	21.0%
Aggressive Portfolio	35.4%	0.0%	274.6%	36.1%	0.0%	287.1%	14.3%

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility”

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

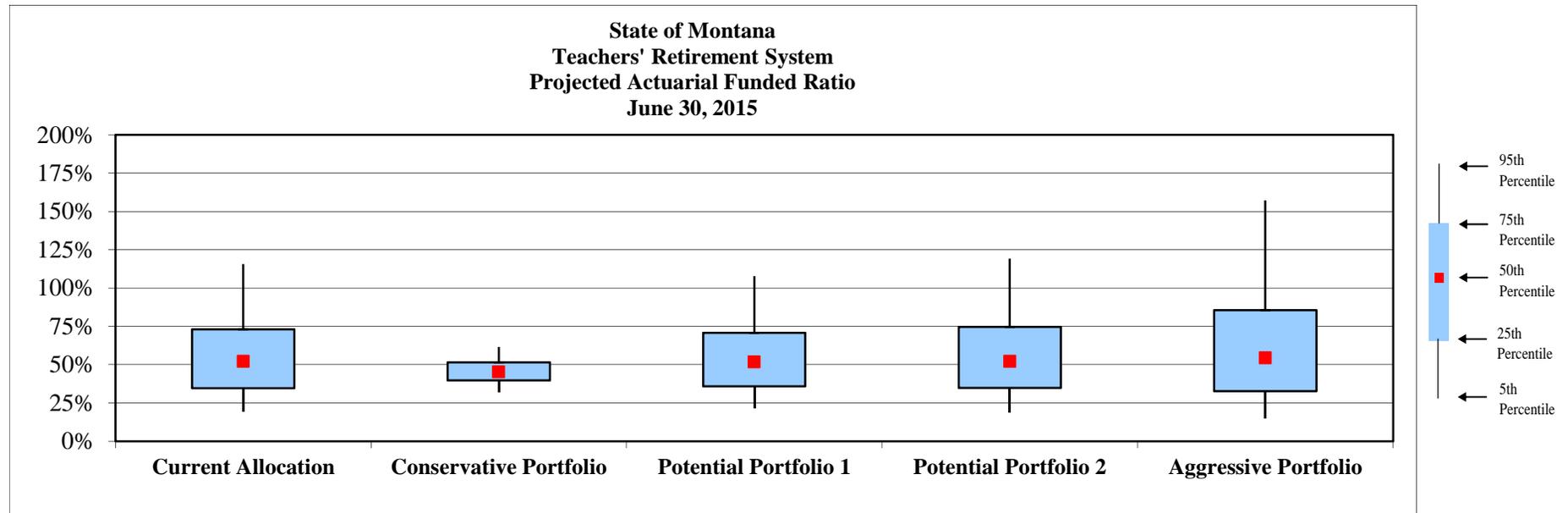
Asset Class	Arithmetic Return Assumption	Standard Deviation Assumption	Standard Deviation Assumption Doubled
Broad US Equity	8.15	17.50	35.00
Broad International Equity	8.60	19.10	38.20
Core Fixed Income	5.00	5.00	10.00
High Yield Fixed Income	7.00	14.00	28.00
Blended Real Estate	8.35	11.62	23.24
Private Equity	12.25	29.75	59.50
Cash Equivalents	3.00	2.50	5.00

RVK supports recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



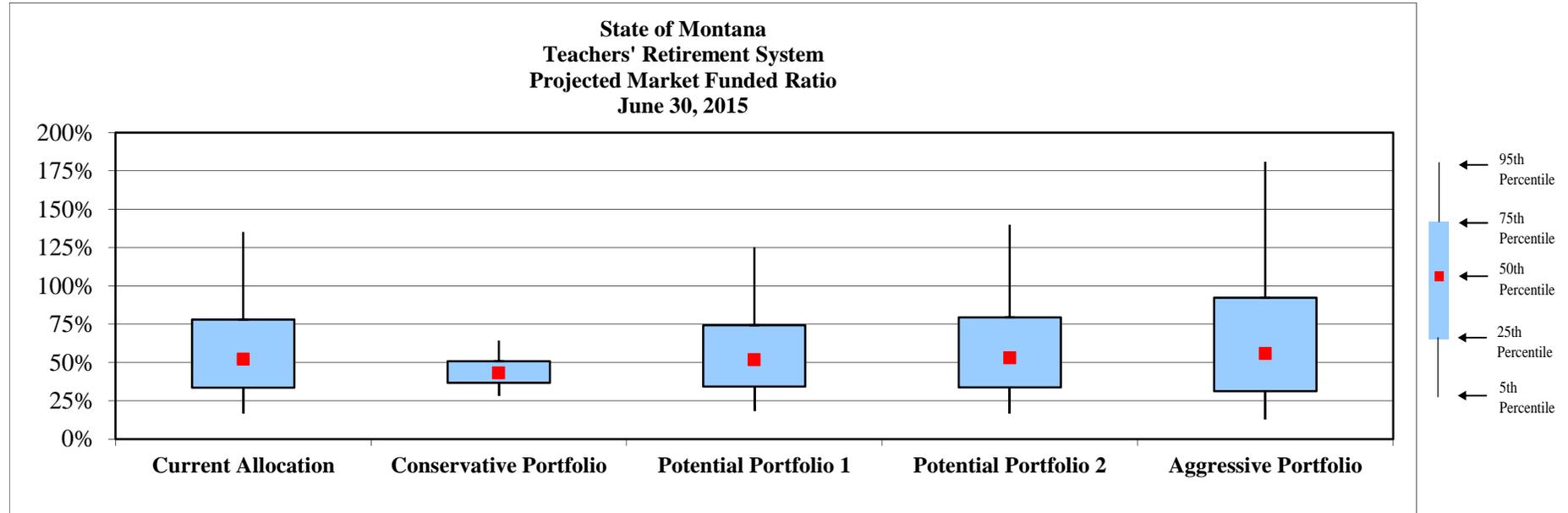
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$4,231.4	19.7%	\$3,613.7	32.0%	\$4,145.9	21.3%	\$4,252.7	19.0%	\$4,482.2	14.7%
25th Percentile	\$3,444.9	34.6%	\$3,184.3	39.8%	\$3,394.1	35.8%	\$3,458.1	34.8%	\$3,586.3	32.6%
50th Percentile	\$2,544.6	52.2%	\$2,900.5	45.2%	\$2,566.5	51.8%	\$2,518.5	52.1%	\$2,429.6	54.4%
75th Percentile	\$1,427.8	73.1%	\$2,565.0	51.5%	\$1,560.1	70.8%	\$1,353.3	74.7%	\$765.3	85.5%
95th Percentile	(\$805.9)	115.6%	\$2,051.0	61.5%	(\$417.9)	107.7%	(\$1,062.7)	119.1%	(\$3,100.4)	157.2%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



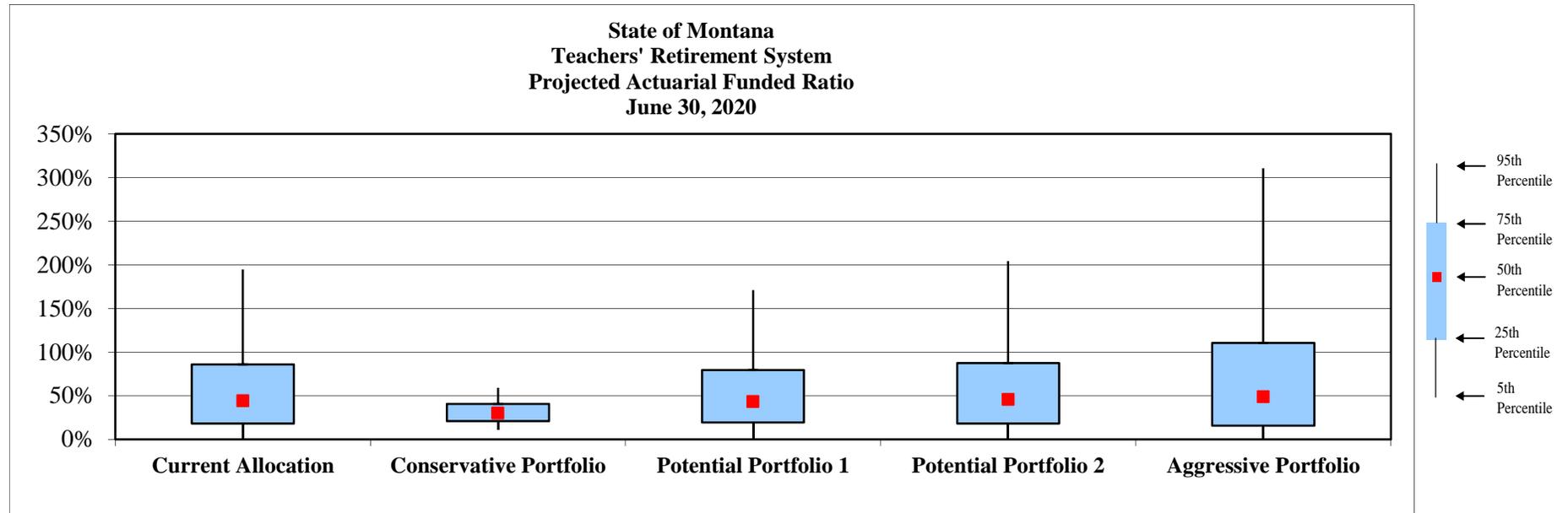
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$4,351.9	17.1%	\$3,773.8	28.5%	\$4,271.0	18.6%	\$4,364.0	16.8%	\$4,587.2	12.9%
25th Percentile	\$3,521.4	33.5%	\$3,344.7	36.8%	\$3,478.4	34.3%	\$3,519.9	33.7%	\$3,615.5	31.2%
50th Percentile	\$2,531.3	52.1%	\$3,004.0	43.2%	\$2,559.9	51.8%	\$2,495.2	52.9%	\$2,372.1	55.7%
75th Percentile	\$1,163.5	78.1%	\$2,607.7	50.9%	\$1,356.0	74.4%	\$1,103.4	79.4%	\$401.8	92.3%
95th Percentile	(\$1,903.7)	135.2%	\$1,913.6	64.3%	(\$1,372.8)	125.2%	(\$2,109.7)	139.9%	(\$4,435.1)	181.1%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



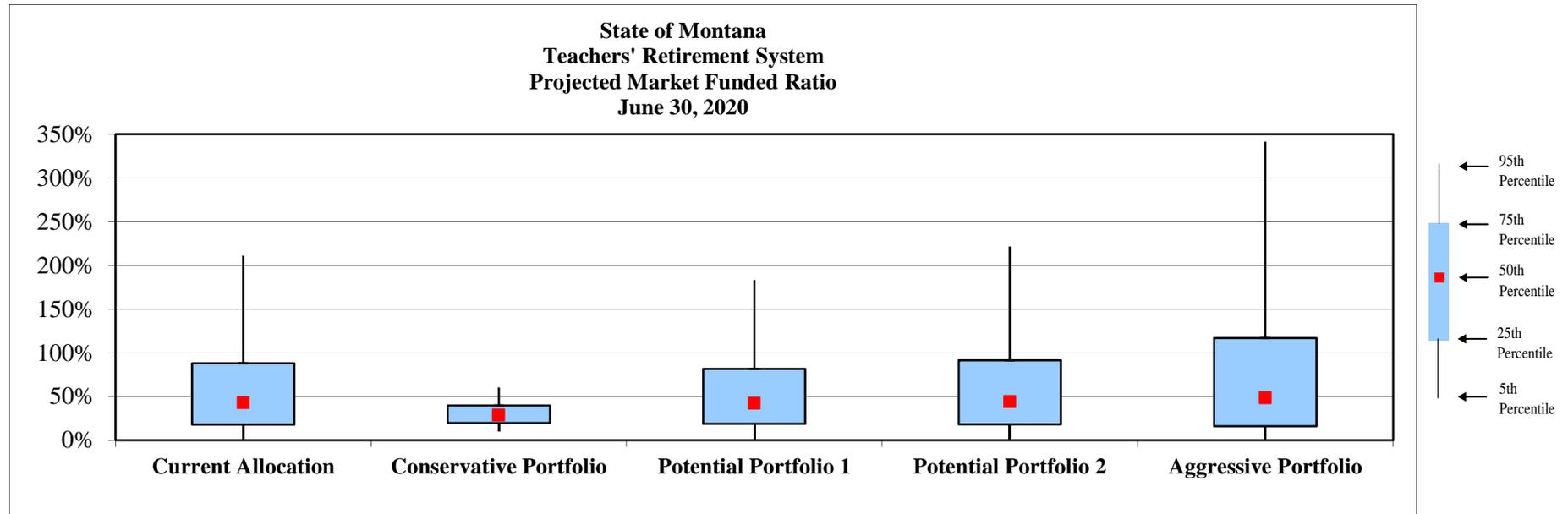
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$6,016.0	0.0%	\$5,466.6	10.3%	\$5,957.5	0.3%	\$6,012.2	0.0%	\$6,101.4	0.0%
25th Percentile	\$4,975.3	18.0%	\$4,805.4	20.9%	\$4,883.9	19.4%	\$4,955.3	18.1%	\$5,128.4	15.6%
50th Percentile	\$3,399.6	44.1%	\$4,282.0	29.8%	\$3,443.4	43.3%	\$3,340.3	45.5%	\$3,133.7	48.7%
75th Percentile	\$910.9	85.7%	\$3,666.9	40.5%	\$1,291.2	79.3%	\$779.4	87.2%	(\$611.3)	110.3%
95th Percentile	(\$5,829.7)	194.6%	\$2,518.5	59.1%	(\$4,458.1)	171.1%	(\$6,545.6)	204.2%	(\$13,034.3)	310.7%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



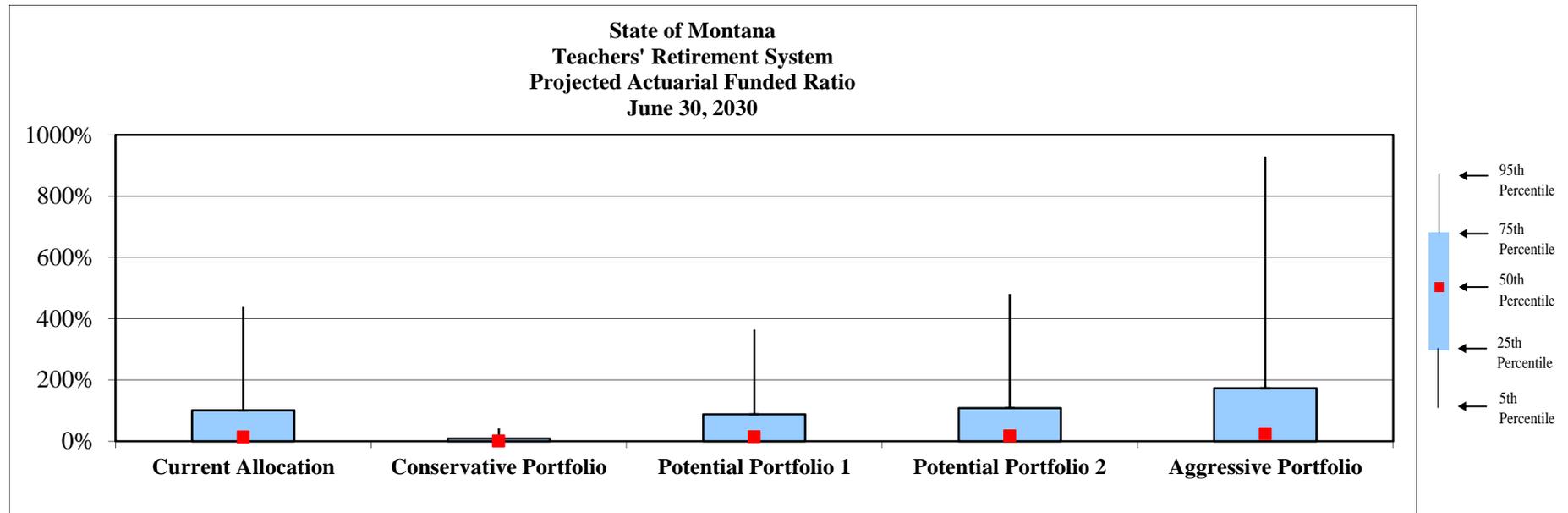
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$6,022.1	0.0%	\$5,531.2	9.6%	\$5,963.5	0.3%	\$6,005.0	0.0%	\$6,111.1	0.0%
25th Percentile	\$5,038.8	17.7%	\$4,879.5	19.6%	\$4,957.6	18.8%	\$4,994.2	18.1%	\$5,120.7	16.0%
50th Percentile	\$3,458.6	42.9%	\$4,355.2	28.5%	\$3,521.5	42.1%	\$3,439.2	44.1%	\$3,130.3	48.5%
75th Percentile	\$775.0	87.8%	\$3,728.0	39.5%	\$1,140.5	81.4%	\$554.5	91.4%	(\$1,040.9)	117.0%
95th Percentile	(\$6,762.0)	210.9%	\$2,531.2	60.1%	(\$5,160.3)	183.2%	(\$7,299.0)	221.5%	(\$14,991.6)	341.5%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



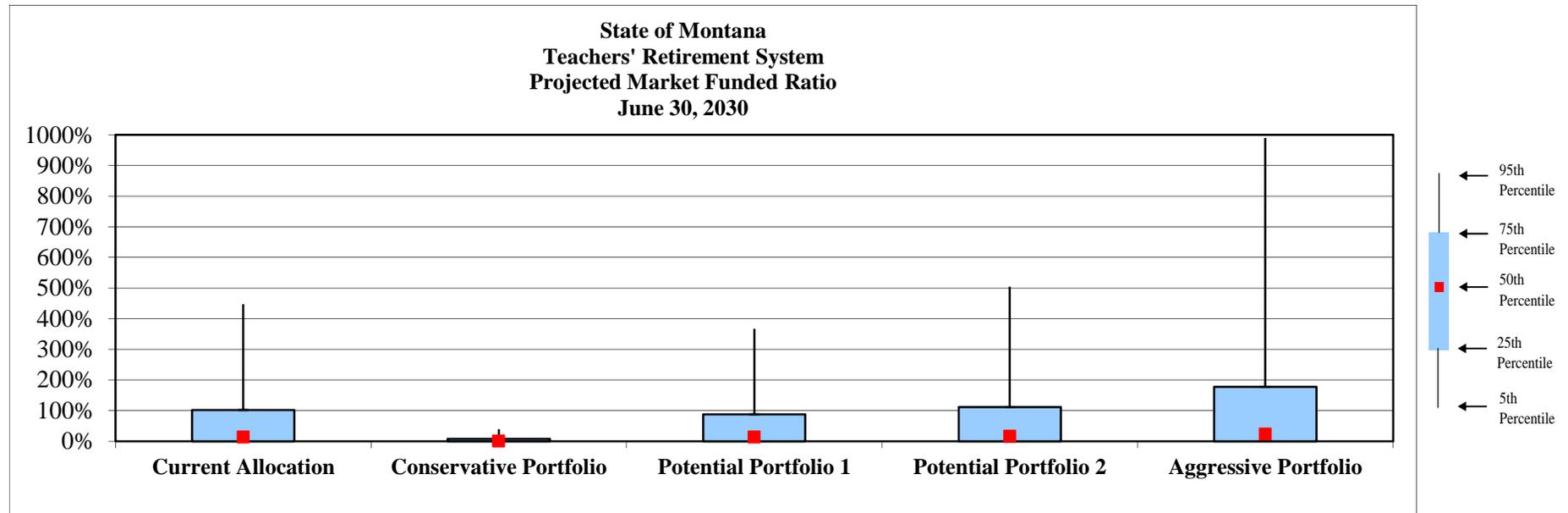
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$9,036.2	0.0%	\$9,239.9	0.0%	\$9,009.3	0.0%	\$9,008.4	0.0%	\$9,006.5	0.0%
25th Percentile	\$7,659.7	0.0%	\$8,151.1	0.0%	\$7,653.0	0.0%	\$7,613.9	0.0%	\$7,585.1	0.0%
50th Percentile	\$6,335.3	13.8%	\$7,420.6	0.0%	\$6,357.9	13.9%	\$6,209.0	16.6%	\$5,799.7	23.8%
75th Percentile	(\$64.6)	101.0%	\$6,631.7	8.3%	\$914.3	87.8%	(\$690.8)	108.0%	(\$6,063.5)	172.7%
95th Percentile	(\$26,194.9)	438.9%	\$4,794.7	41.9%	(\$20,947.4)	364.6%	(\$30,642.9)	480.8%	(\$68,203.2)	929.6%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$9,036.2	0.0%	\$9,242.9	0.0%	\$9,009.3	0.0%	\$9,008.4	0.0%	\$9,006.5	0.0%
25th Percentile	\$7,682.0	0.0%	\$8,168.0	0.0%	\$7,653.0	0.0%	\$7,620.3	0.0%	\$7,600.3	0.0%
50th Percentile	\$6,329.5	13.6%	\$7,424.5	0.0%	\$6,363.7	13.1%	\$6,195.5	16.2%	\$5,860.6	23.0%
75th Percentile	(\$125.2)	101.3%	\$6,651.5	7.7%	\$980.8	87.9%	(\$867.0)	111.1%	(\$6,383.2)	177.0%
95th Percentile	(\$27,750.7)	447.6%	\$4,958.6	39.4%	(\$21,139.2)	367.2%	(\$31,760.7)	504.5%	(\$70,952.6)	989.7%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); **20 Years**

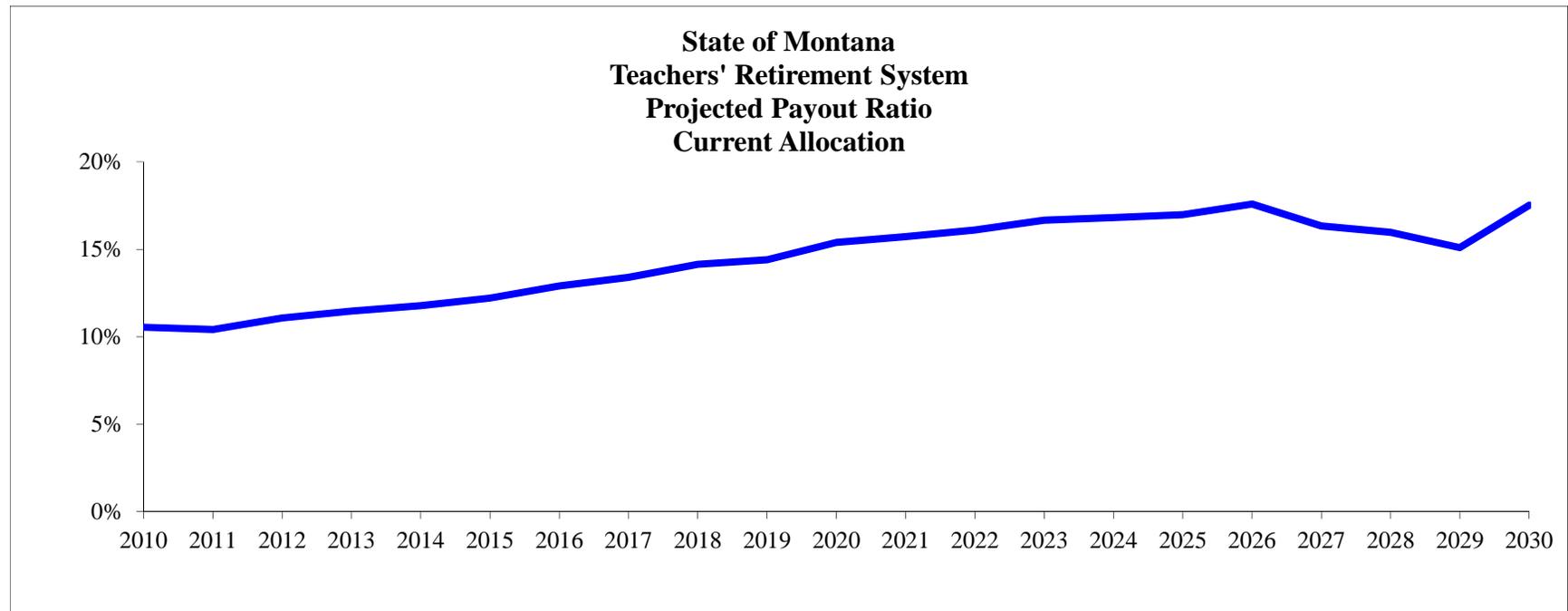
The table below shows the probability that the Plan will reach full funding (market value of assets meets or exceed liabilities) in 20 years and the probability the Plan will experience a total depletion of assets (market value equal to zero) for each of the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

	Probability of Full Funding in 2030	Probability of Market Value = \$0 in 2030
Current Allocation	25%	40%
Conservative Portfolio	0%	64%
Potential Portfolio 1	23%	40%
Potential Portfolio 2	26%	40%
Aggressive Portfolio	33%	39%

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Current Allocation

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Current Allocation (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.4% and 17.6%. There is a 10% chance by 2020 and 25% chance by 2025 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



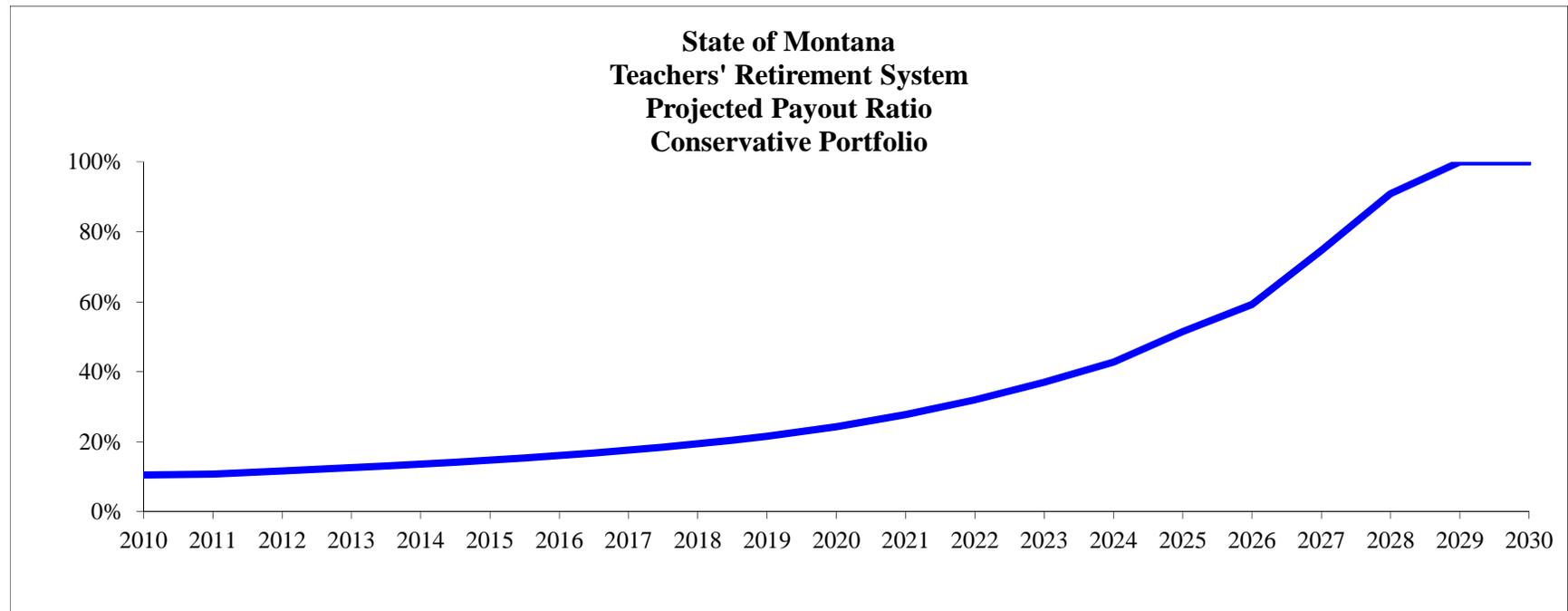
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.4%	11.1%	11.5%	11.8%	12.2%	12.9%	13.4%	14.2%	14.4%	15.4%	15.7%	16.1%	16.7%	16.8%	17.0%	17.6%	16.3%	16.0%	15.1%	17.5%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Conservative Portfolio

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Conservative Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.6% and 100%. There is a 10% chance by 2022 and 25% chance by 2024 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



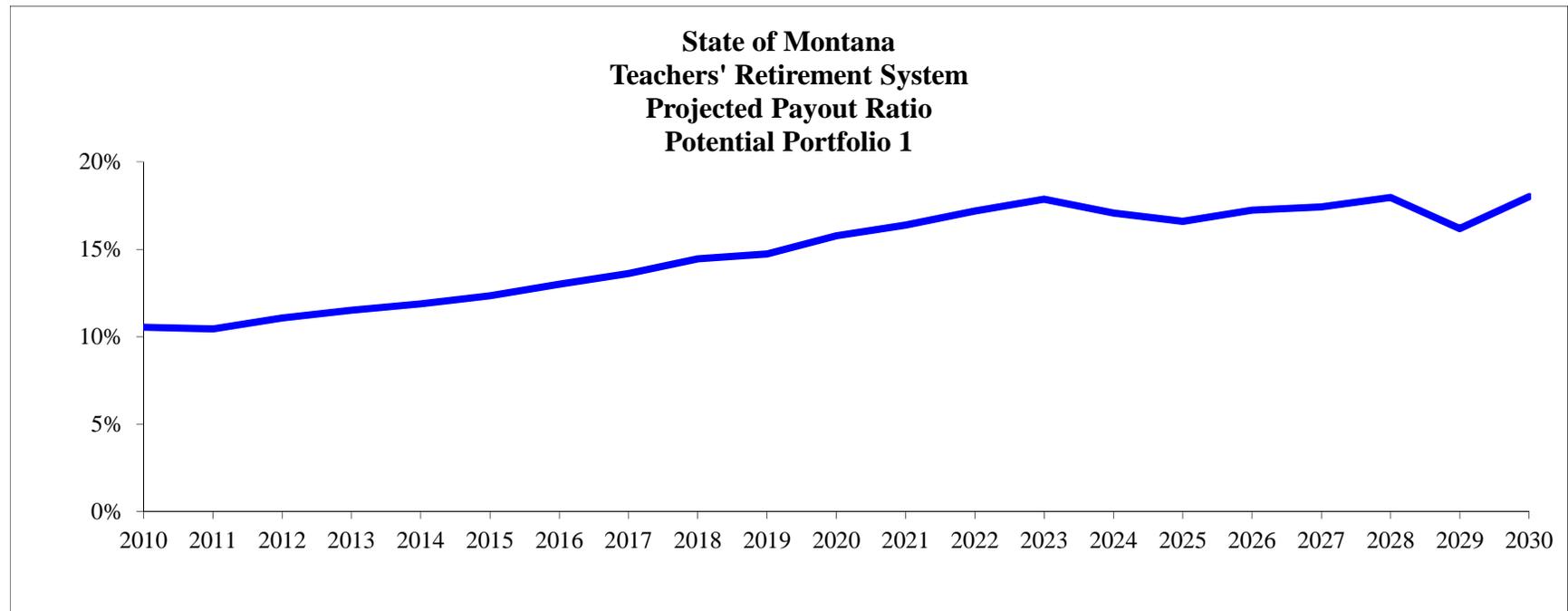
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.8%	11.7%	12.6%	13.7%	14.8%	16.0%	17.7%	19.5%	21.6%	24.3%	27.8%	32.0%	37.0%	42.8%	51.5%	59.3%	74.7%	91.0%	100.0%	100.0%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Potential Portfolio 1

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 1 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.5% and 18.0%. There is a 10% chance by 2020 and 25% chance by 2026 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



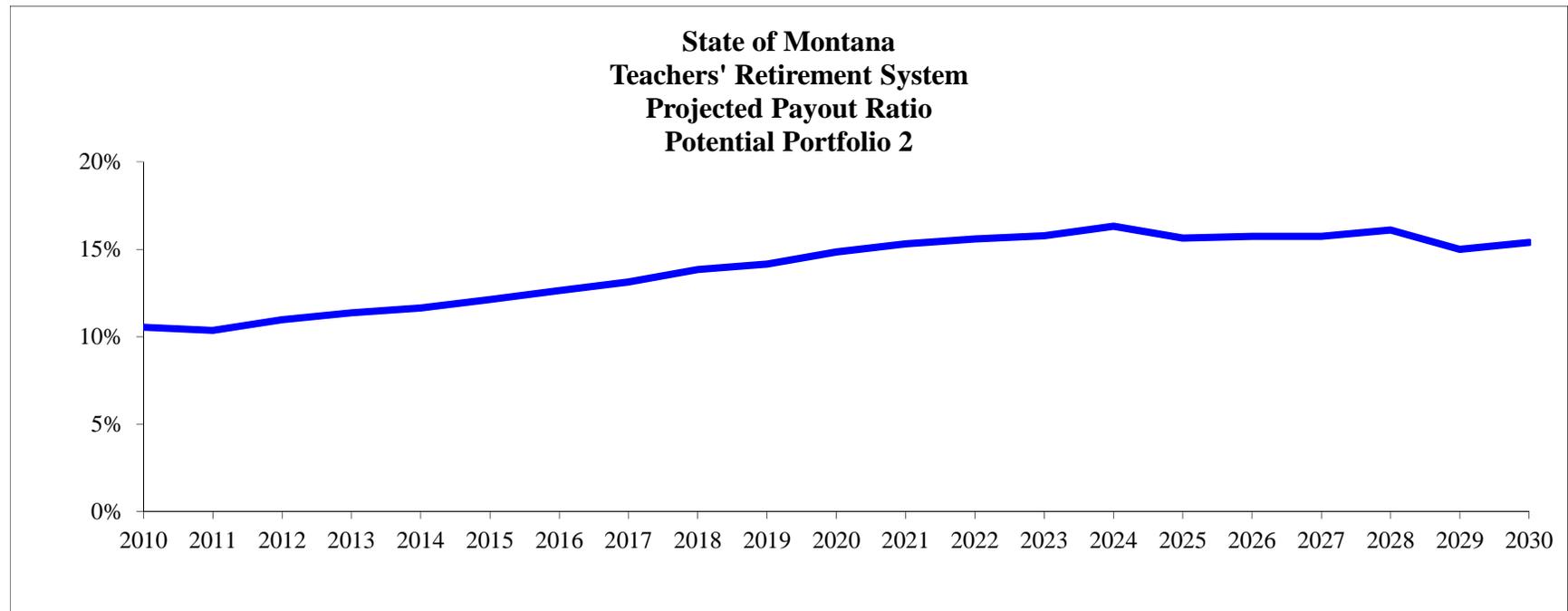
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.5%	11.1%	11.5%	11.9%	12.4%	13.0%	13.6%	14.5%	14.7%	15.8%	16.4%	17.2%	17.9%	17.1%	16.6%	17.3%	17.4%	18.0%	16.2%	18.0%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Potential Portfolio 2

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 2 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.4% and 16.3%. There is a 10% chance by 2020 and 25% chance by 2026 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



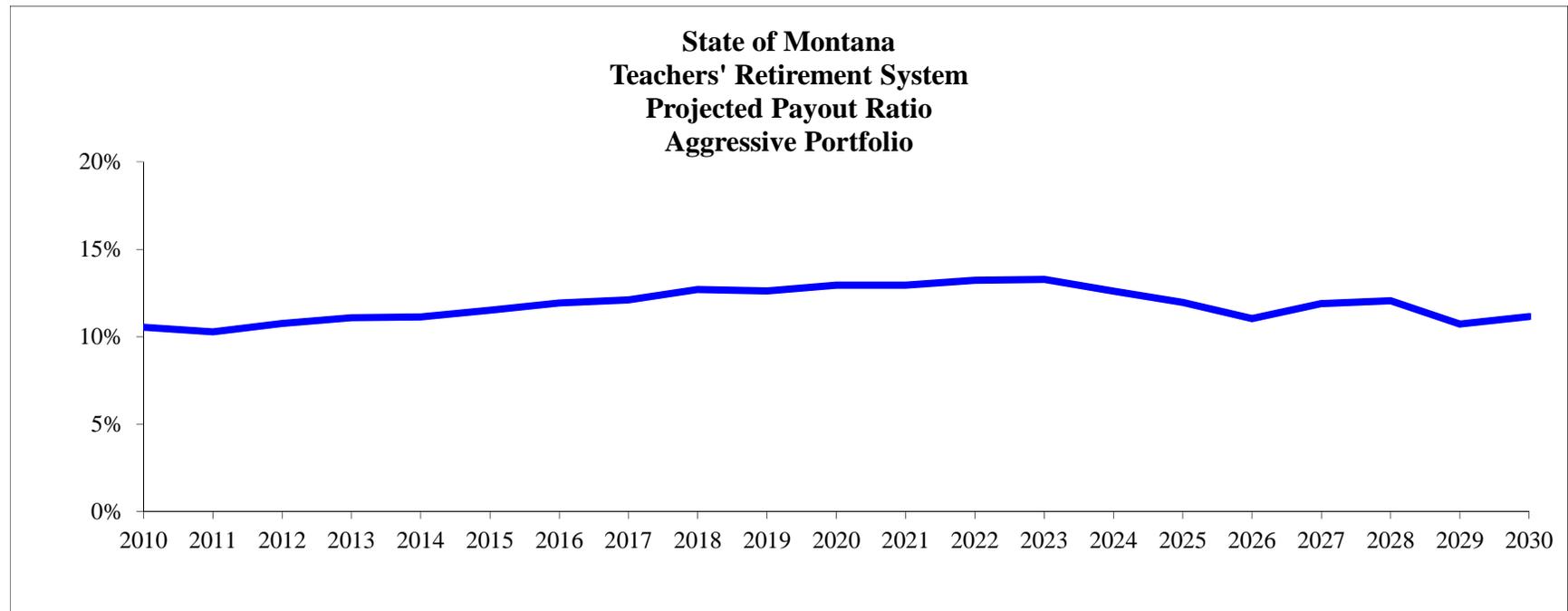
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.4%	11.0%	11.4%	11.7%	12.1%	12.7%	13.1%	13.8%	14.2%	14.9%	15.3%	15.6%	15.8%	16.3%	15.6%	15.7%	15.8%	16.1%	15.0%	15.4%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Aggressive Portfolio

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Aggressive Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.3% and 13.3%. There is a 10% chance by 2019 and 25% chance by 2026 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.3%	10.8%	11.1%	11.2%	11.5%	11.9%	12.1%	12.7%	12.6%	13.0%	13.0%	13.2%	13.3%	12.6%	12.0%	11.0%	11.9%	12.1%	10.7%	11.2%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Employer Contributions (as a percentage of pay)

If the market value of assets falls below the level necessary to make the current year’s benefit payments, employer contributions would need to be increased to make up the difference. The current mandated employer contribution rate is 9.96%. The table below shows the distribution of employer contributions (as a percentage of pay) required in 2030 to make projected benefit payments for 2030, assuming the five different asset mixes highlighted on the prior pages. The last column indicates the probability of needing additional contributions in or before 2030.

	Required Employer Contribution in 2030 to Pay Benefits					Probability of Additional Contributions In or Before 2030
	5th	25th	Median	75th	95th	
Current Allocation	39.46%	30.22%	9.96%	9.96%	9.96%	44%
Conservative Portfolio	41.14%	33.21%	28.06%	9.96%	9.96%	70%
Potential Portfolio 1	39.48%	30.31%	9.96%	9.96%	9.96%	44%
Potential Portfolio 2	39.46%	30.18%	9.96%	9.96%	9.96%	43%
Aggressive Portfolio	38.84%	29.90%	9.96%	9.96%	9.96%	42%

Appendix 1: Sensitivity Analysis: “Effect of Higher Volatility” (continued)

Drawing Inferences

The table below compares the projected actuarial and market funded ratios 20 years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the five different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios in 2030, assuming the same five asset mixes being examined.

	Actuarial Funded Ratio in 2030			Market Funded Ratio in 2030			Payout Ratios
	50th	5th	95th	50th	5th	95th	2030 Median
Current Allocation	13.8%	0.0%	438.9%	13.6%	0.0%	447.6%	17.5%
Conservative Portfolio	0.0%	0.0%	41.9%	0.0%	0.0%	39.4%	100.0%
Potential Portfolio 1	13.9%	0.0%	364.6%	13.1%	0.0%	367.2%	18.0%
Potential Portfolio 2	16.6%	0.0%	480.8%	16.2%	0.0%	504.5%	15.4%
Aggressive Portfolio	23.8%	0.0%	929.6%	23.0%	0.0%	989.7%	11.2%

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations”

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

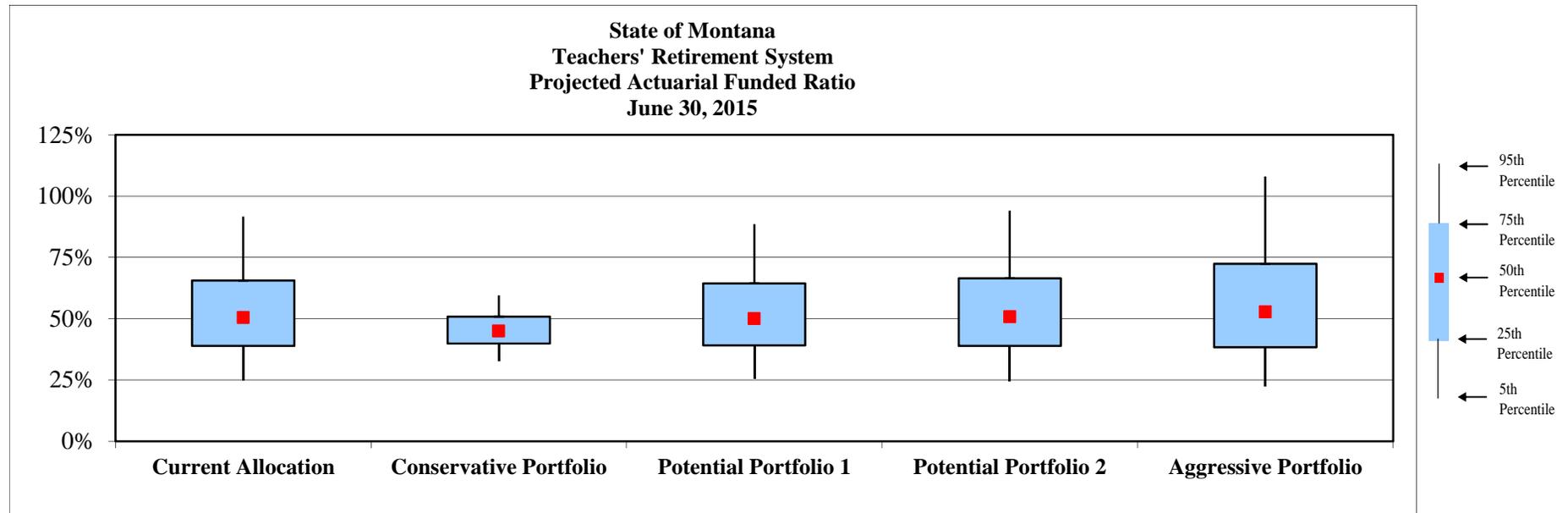
	Broad US Equity	Broad International Equity	Core Fixed Income	High Yield Fixed Income	Blended Real Estate	Private Equity	Cash Equivalents
Broad US Equity	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Broad International Equity	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Core Fixed Income	1.00	1.00	1.00	1.00	1.00	1.00	1.00
High Yield Fixed Income	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Blended Real Estate	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Private Equity	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cash Equivalents	1.00	1.00	1.00	1.00	1.00	1.00	1.00

RVK supports recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



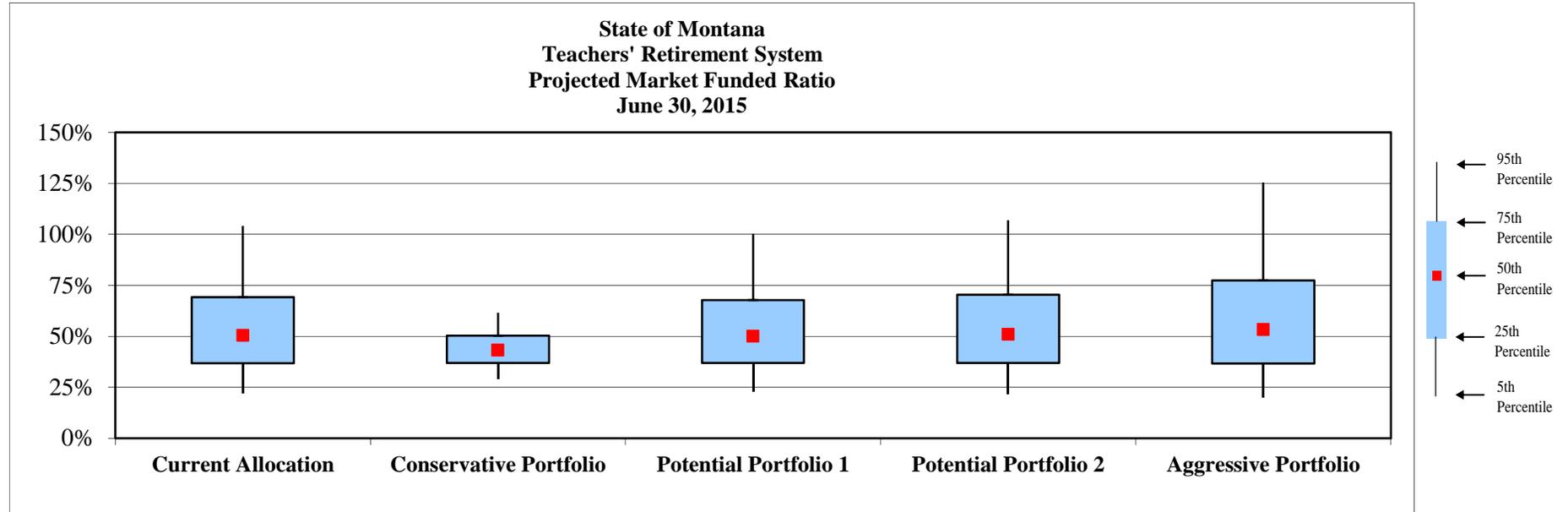
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$3,757.6	24.8%	\$3,371.0	32.8%	\$3,720.8	25.4%	\$3,770.8	24.5%	\$3,882.5	22.3%
25th Percentile	\$3,168.4	38.9%	\$3,113.8	39.9%	\$3,152.0	39.1%	\$3,164.9	38.8%	\$3,188.6	38.3%
50th Percentile	\$2,623.5	50.5%	\$2,914.9	45.0%	\$2,640.1	50.1%	\$2,599.9	50.8%	\$2,502.4	52.7%
75th Percentile	\$1,873.7	65.5%	\$2,670.5	50.9%	\$1,938.0	64.4%	\$1,822.7	66.4%	\$1,500.6	72.4%
95th Percentile	\$474.4	91.6%	\$2,274.3	59.5%	\$645.7	88.5%	\$334.1	94.1%	(\$451.9)	108.0%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



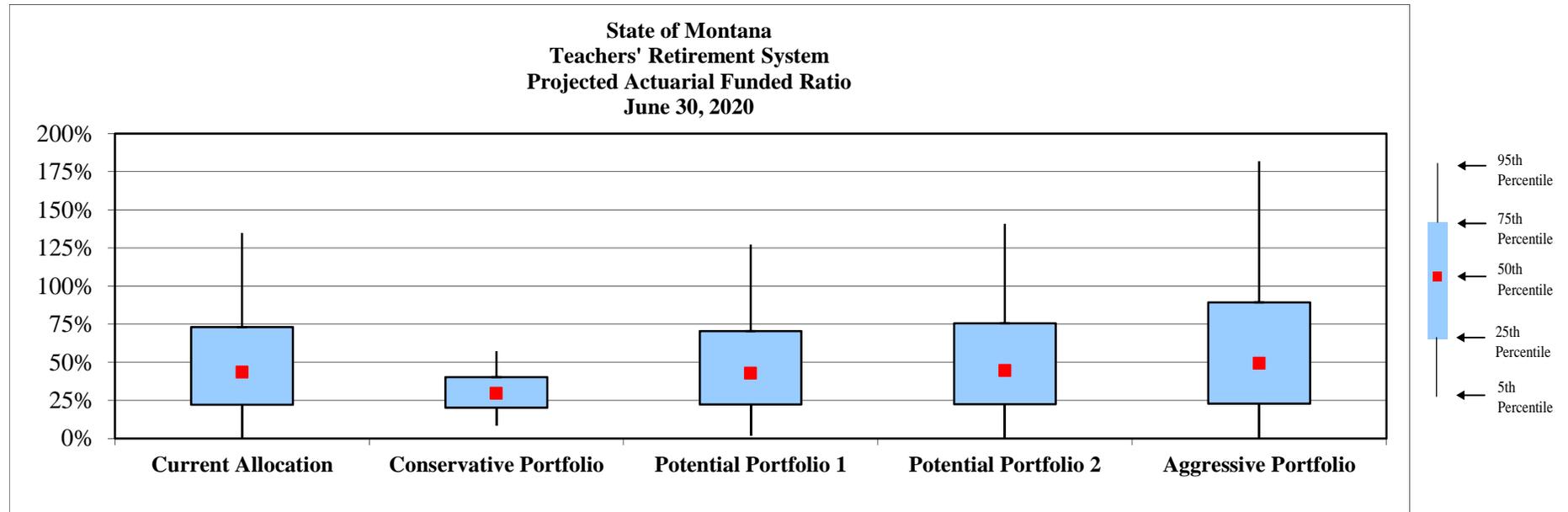
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$3,897.3	22.1%	\$3,546.7	29.0%	\$3,866.7	22.7%	\$3,910.5	21.8%	\$4,010.3	19.8%
25th Percentile	\$3,274.9	36.7%	\$3,260.8	36.9%	\$3,264.7	36.9%	\$3,270.2	36.8%	\$3,280.0	36.7%
50th Percentile	\$2,630.8	50.4%	\$3,012.3	43.1%	\$2,652.4	50.0%	\$2,604.4	50.9%	\$2,474.4	53.3%
75th Percentile	\$1,677.4	69.2%	\$2,696.6	50.4%	\$1,755.2	67.8%	\$1,614.5	70.4%	\$1,222.0	77.3%
95th Percentile	(\$231.7)	104.1%	\$2,162.3	61.6%	(\$16.7)	100.3%	(\$390.0)	106.9%	(\$1,430.3)	125.4%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



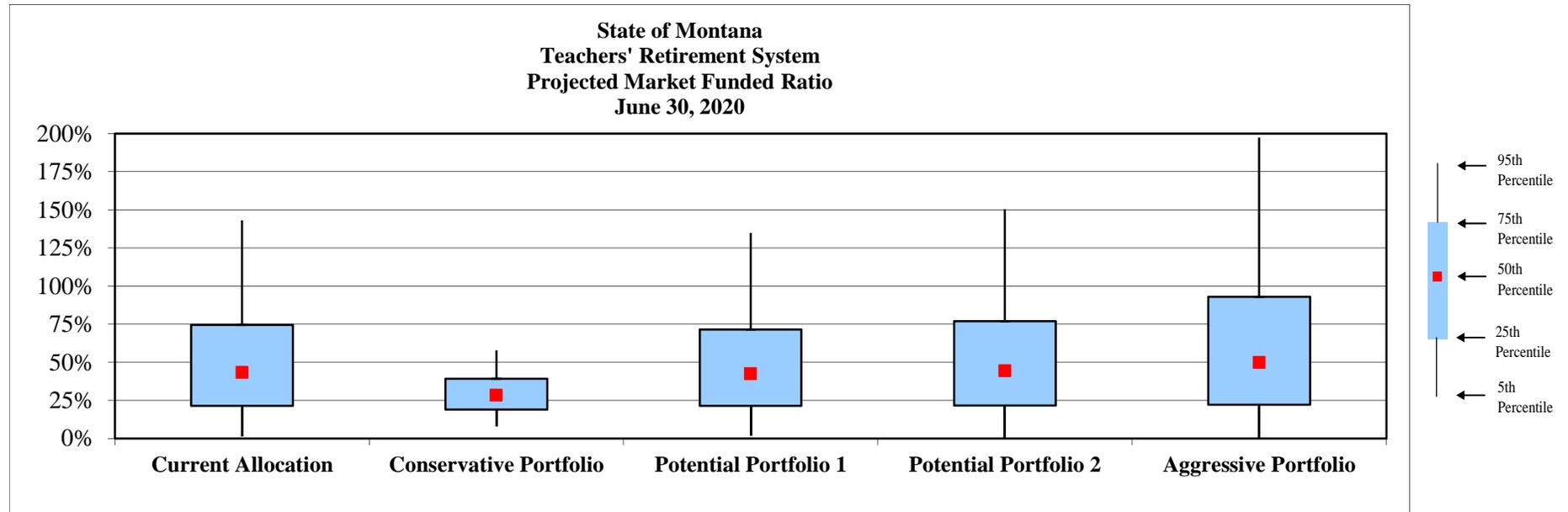
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$5,369.8	1.3%	\$5,093.2	8.3%	\$5,345.6	1.9%	\$5,374.6	1.0%	\$5,424.0	0.1%
25th Percentile	\$4,554.1	22.2%	\$4,684.4	20.2%	\$4,549.5	22.3%	\$4,540.0	22.4%	\$4,504.6	22.8%
50th Percentile	\$3,439.0	43.5%	\$4,280.9	29.6%	\$3,498.8	42.7%	\$3,375.9	44.5%	\$3,071.1	49.3%
75th Percentile	\$1,691.0	73.1%	\$3,807.7	40.2%	\$1,860.7	70.5%	\$1,558.2	75.5%	\$671.8	89.4%
95th Percentile	(\$2,386.2)	134.7%	\$2,903.1	57.3%	(\$1,861.4)	127.2%	(\$2,796.2)	140.8%	(\$5,569.9)	181.9%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



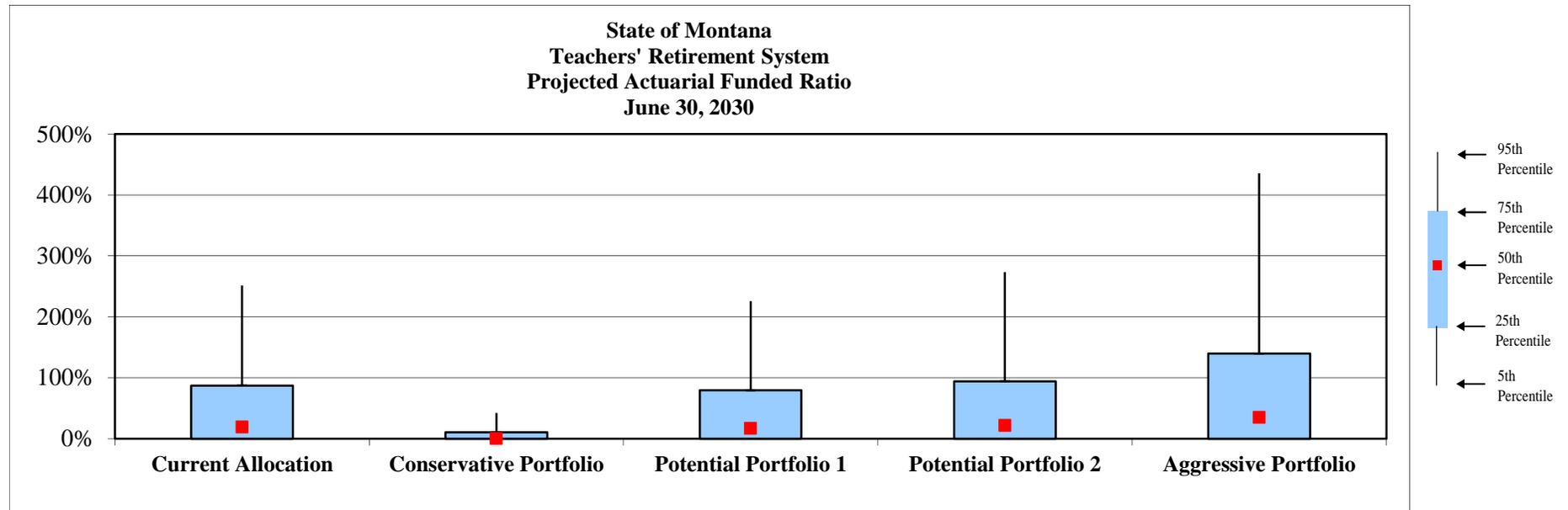
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$5,352.8	1.4%	\$5,099.3	7.8%	\$5,336.9	2.0%	\$5,360.4	1.1%	\$5,419.0	0.1%
25th Percentile	\$4,591.6	21.3%	\$4,735.7	19.0%	\$4,581.5	21.4%	\$4,574.3	21.6%	\$4,531.3	22.1%
50th Percentile	\$3,456.5	43.3%	\$4,355.6	28.4%	\$3,511.3	42.4%	\$3,391.0	44.4%	\$3,061.3	49.8%
75th Percentile	\$1,619.5	74.4%	\$3,871.7	39.2%	\$1,810.8	71.5%	\$1,456.8	77.0%	\$455.2	92.9%
95th Percentile	(\$2,947.7)	143.1%	\$2,888.6	57.8%	(\$2,368.0)	134.7%	(\$3,442.6)	150.4%	(\$6,657.5)	197.5%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



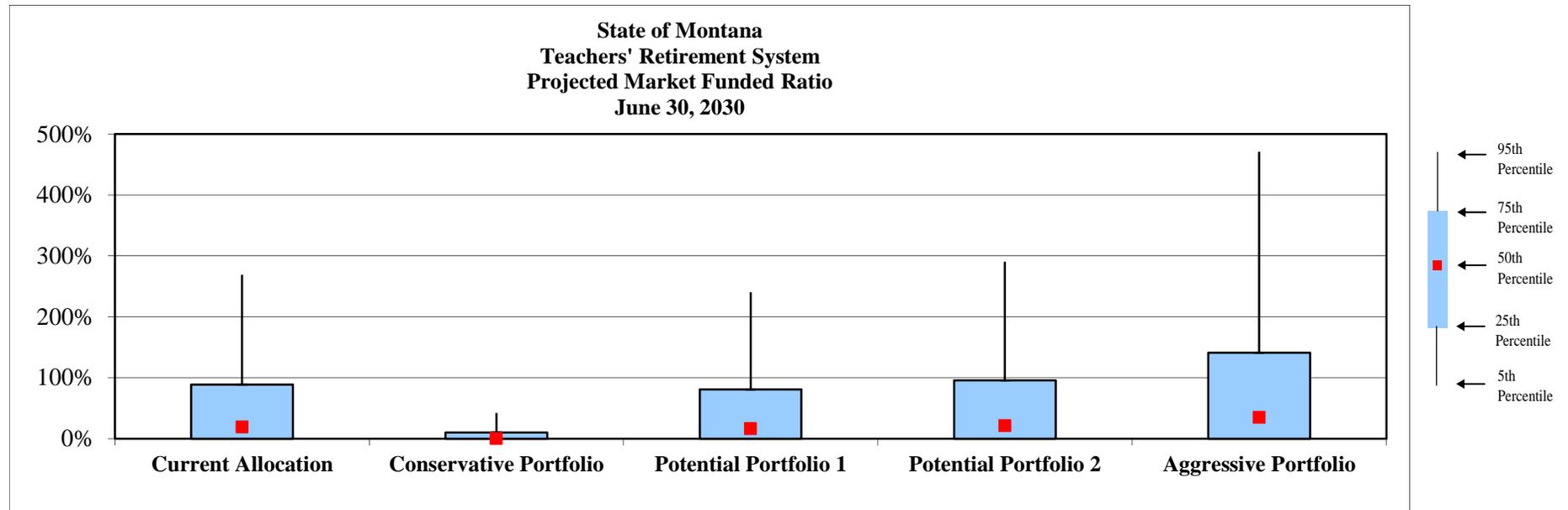
	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$7,792.6	0.0%	\$8,540.9	0.0%	\$7,801.6	0.0%	\$7,785.4	0.0%	\$7,717.6	0.0%
25th Percentile	\$7,034.0	0.0%	\$7,792.3	0.0%	\$7,050.3	0.0%	\$6,999.6	0.0%	\$6,863.7	0.0%
50th Percentile	\$6,025.5	19.0%	\$7,292.9	0.0%	\$6,119.7	16.6%	\$5,911.4	21.5%	\$5,047.4	35.0%
75th Percentile	\$1,103.7	87.1%	\$6,715.5	10.7%	\$1,729.8	79.7%	\$498.2	94.0%	(\$3,361.6)	139.9%
95th Percentile	(\$14,884.9)	251.4%	\$5,466.1	42.3%	(\$12,022.4)	226.0%	(\$16,972.7)	273.5%	(\$32,408.5)	435.3%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



	Current Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio								
5th Percentile	\$7,792.6	0.0%	\$8,540.9	0.0%	\$7,798.1	0.0%	\$7,782.3	0.0%	\$7,701.9	0.0%
25th Percentile	\$7,032.1	0.0%	\$7,787.8	0.0%	\$7,041.9	0.0%	\$7,003.6	0.0%	\$6,864.7	0.0%
50th Percentile	\$6,016.6	19.1%	\$7,304.1	0.0%	\$6,093.8	16.6%	\$5,917.8	21.3%	\$5,072.5	34.7%
75th Percentile	\$979.3	88.5%	\$6,741.6	10.1%	\$1,671.0	80.7%	\$387.6	95.5%	(\$3,550.7)	140.8%
95th Percentile	(\$16,219.0)	268.7%	\$5,486.5	42.0%	(\$13,429.0)	240.5%	(\$18,643.8)	290.5%	(\$35,989.8)	471.0%

Percentiles indicate the probability of achieving a Funded Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile indicates that 50% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected. For further example, the 25th percentile indicates that 25% of the time the Plan can expect a Funded Ratio lower than the ratio shown, and 75% of the time a higher ratio is expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 20 Years

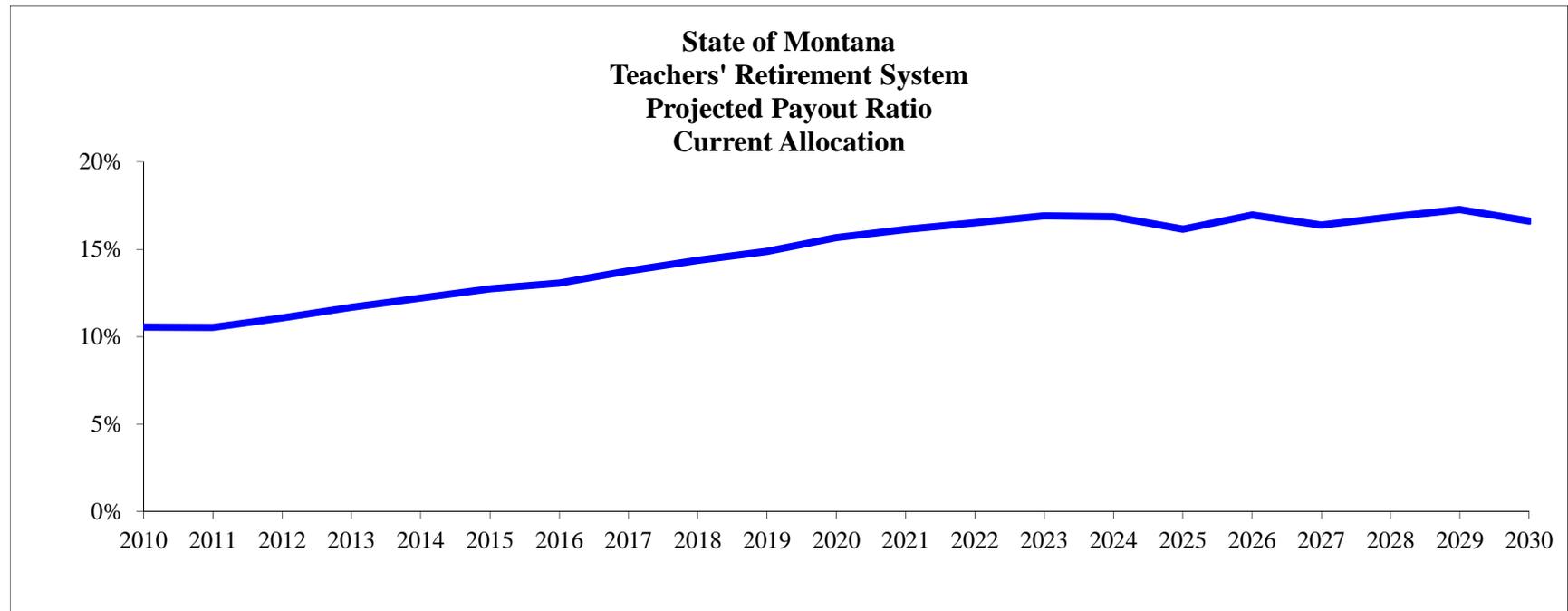
The table below shows the probability that the Plan will reach full funding (market value of assets meets or exceed liabilities) in 20 years and the probability the Plan will experience a total depletion of assets (market value equal to zero) for each of the five different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

	Probability of Full Funding in 2030	Probability of Market Value = \$0 in 2030
Current Allocation	22%	38%
Conservative Portfolio	0%	61%
Potential Portfolio 1	20%	39%
Potential Portfolio 2	24%	38%
Aggressive Portfolio	32%	35%

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Current Allocation

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Current Allocation (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.5% and 17.3%. There is a 10% chance by 2021 and 25% chance by 2026 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



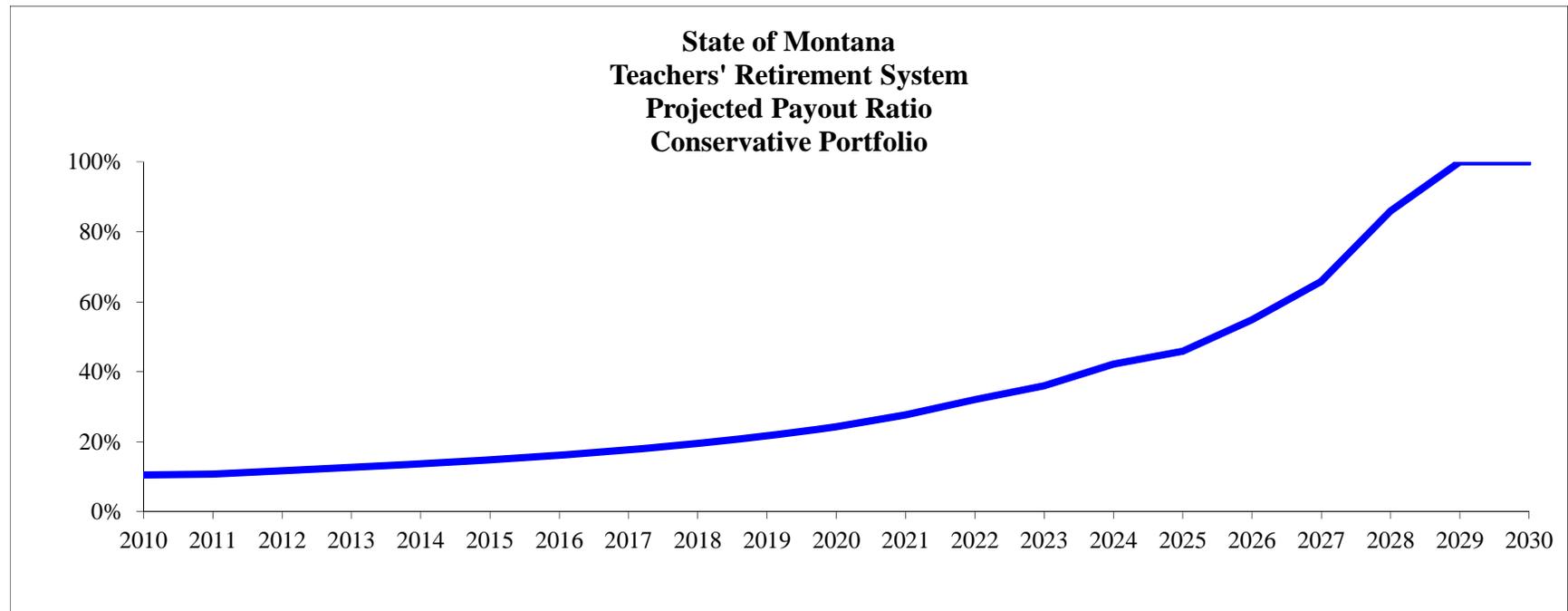
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.5%	11.1%	11.7%	12.2%	12.8%	13.1%	13.8%	14.4%	14.9%	15.7%	16.1%	16.5%	16.9%	16.9%	16.2%	17.0%	16.4%	16.9%	17.3%	16.6%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Conservative Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.6% and 100%. There is a 10% chance by 2022 and 25% chance by 2024 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



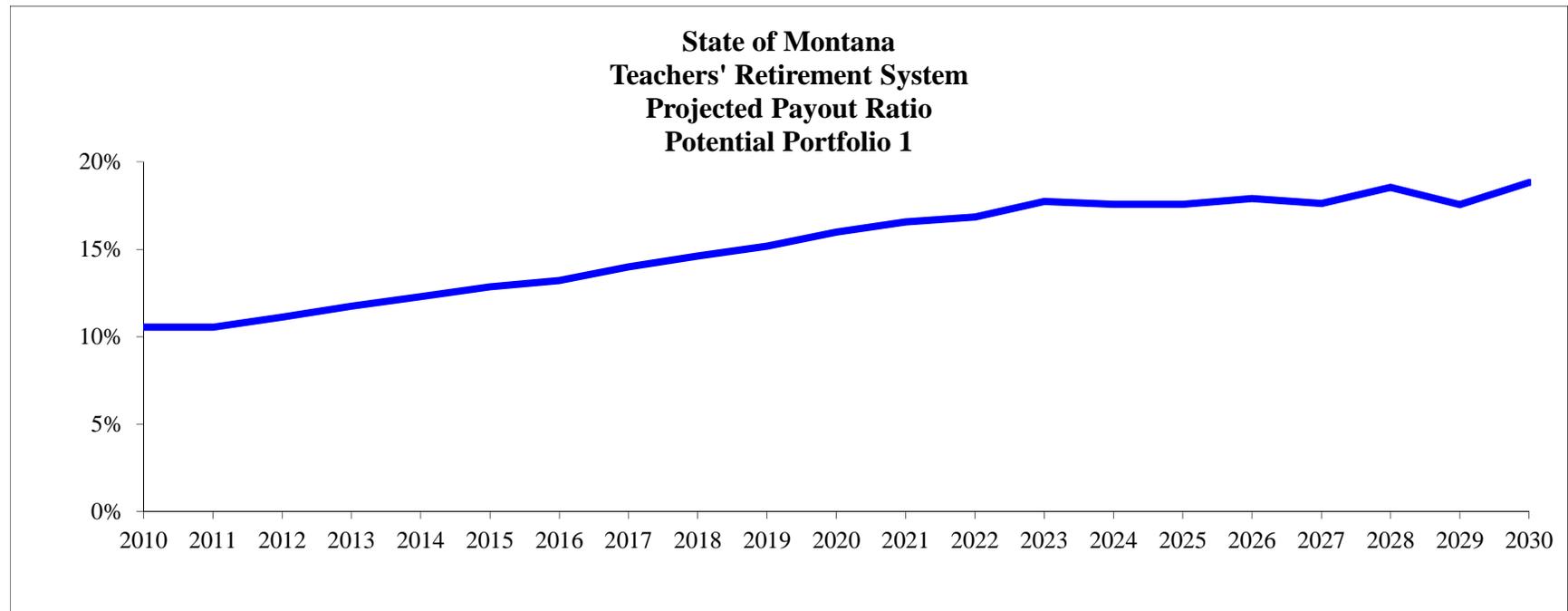
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.8%	11.7%	12.7%	13.7%	14.9%	16.1%	17.7%	19.5%	21.8%	24.3%	27.7%	32.0%	36.0%	42.2%	45.9%	54.9%	65.9%	86.0%	100.0%	100.0%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Potential Portfolio 1

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 1 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.6% and 18.8%. There is a 10% chance by 2021 and 25% chance by 2026 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



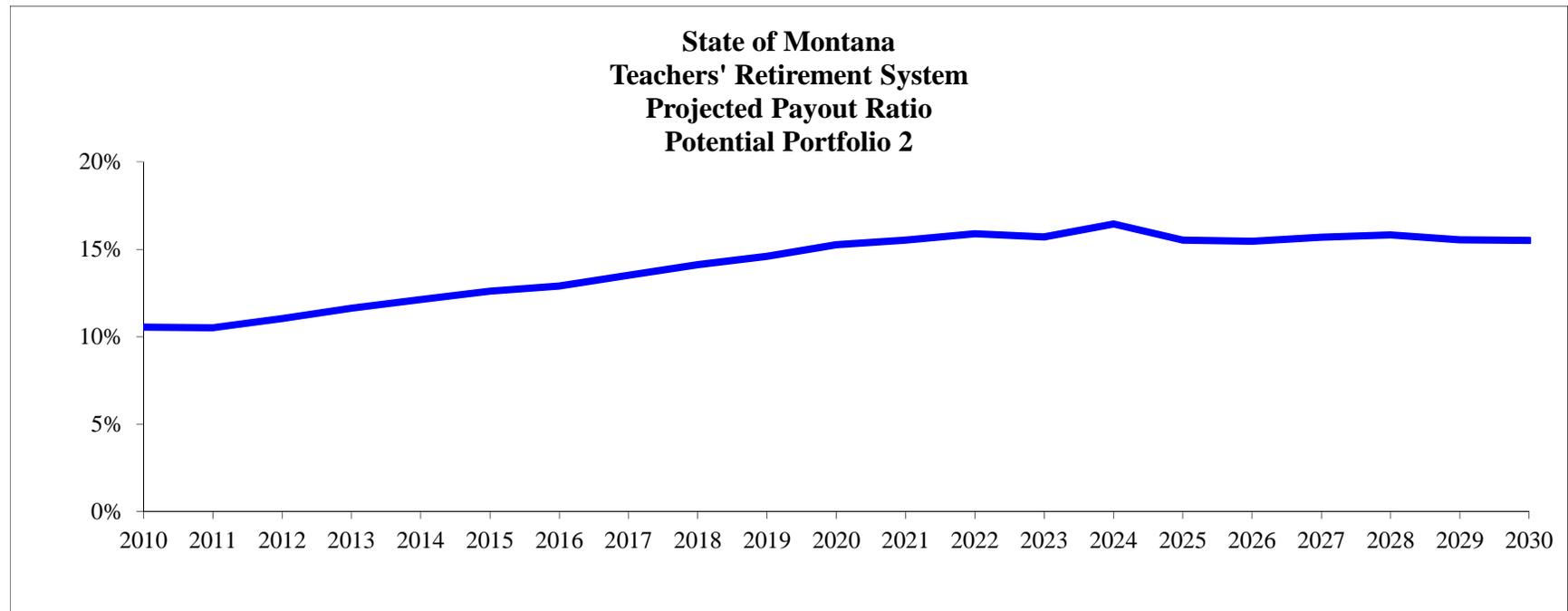
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.6%	11.1%	11.8%	12.3%	12.9%	13.2%	14.0%	14.6%	15.2%	16.0%	16.6%	16.9%	17.7%	17.6%	17.6%	17.9%	17.6%	18.5%	17.6%	18.8%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Potential Portfolio 2

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to Potential Portfolio 2 (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.5% and 16.5%. There is a 10% chance by 2021 and 25% chance by 2027 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



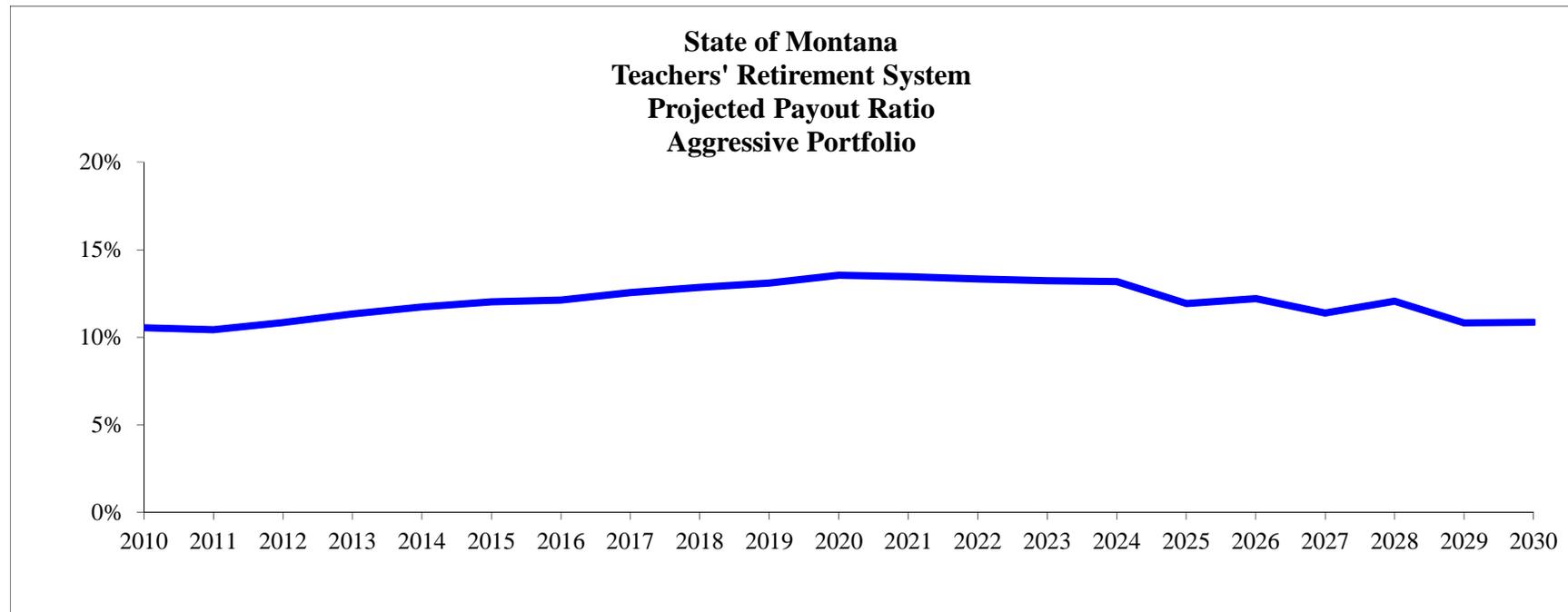
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.5%	11.0%	11.6%	12.1%	12.6%	12.9%	13.5%	14.1%	14.6%	15.3%	15.5%	15.9%	15.7%	16.5%	15.5%	15.5%	15.7%	15.8%	15.5%	15.5%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Projected Payout Ratio (expected benefit payments/market value of assets); Aggressive Portfolio

The graph below displays the median payout ratios over the next twenty years assuming the Plan’s assets are allocated according to the Aggressive Portfolio (highlighted on the prior pages). The results below assume the current contribution policy remains unchanged for all projection years. The annual median benefit payment as percentage of market value of assets is expected to range between 10.4% and 13.6%. There is a 10% chance by 2020 and 25% chance by 2028 that assets will be insufficient to cover benefit payments implying a payout ratio of 100%.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	10.6%	10.4%	10.9%	11.3%	11.7%	12.0%	12.1%	12.6%	12.9%	13.1%	13.6%	13.5%	13.3%	13.2%	13.2%	11.9%	12.2%	11.4%	12.1%	10.8%	10.9%

Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Employer Contributions (as a percentage of pay)

If the market value of assets falls below the level necessary to make the current year’s benefit payments, employer contributions would need to be increased to make up the difference. The current mandated employer contribution rate is 9.96%. The table below shows the distribution of employer contributions (as a percentage of pay) required in 2030 to make projected benefit payments for 2030, assuming the five different asset mixes highlighted on the prior pages. The last column indicates the probability of needing additional contributions in or before 2030.

	Required Employer Contribution in 2030 to Pay Benefits					Probability of Additional Contributions In or Before 2030
	5th	25th	Median	75th	95th	
Current Allocation	41.77%	34.14%	9.96%	9.96%	9.96%	43%
Conservative Portfolio	41.77%	34.54%	29.89%	9.96%	9.96%	68%
Potential Portfolio 1	41.77%	34.18%	9.96%	9.96%	9.96%	43%
Potential Portfolio 2	41.77%	34.02%	9.96%	9.96%	9.96%	42%
Aggressive Portfolio	41.77%	33.63%	9.96%	9.96%	9.96%	38%

Appendix 2: Sensitivity Analysis: “Effect of Higher Correlations” (continued)

Drawing Inferences

The table below compares the projected actuarial and market funded ratios 20 years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the five different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios in 2030, assuming the same five asset mixes being examined.

	Actuarial Funded Ratio in 2030			Market Funded Ratio in 2030			Payout Ratios
	50th	5th	95th	50th	5th	95th	2030 Median
Current Allocation	19.0%	0.0%	251.4%	19.1%	0.0%	268.7%	16.6%
Conservative Portfolio	0.0%	0.0%	42.3%	0.0%	0.0%	42.0%	100.0%
Potential Portfolio 1	16.6%	0.0%	226.0%	16.6%	0.0%	240.5%	18.8%
Potential Portfolio 2	21.5%	0.0%	273.5%	21.3%	0.0%	290.5%	15.5%
Aggressive Portfolio	35.0%	0.0%	435.3%	34.7%	0.0%	471.0%	10.9%

Appendix 3: Assumptions and Methods

Actuarial Valuation Assumptions and Methods: (as presented in the Montana TRS Pension Plan July 1, 2010 Actuarial Valuation, prepared by Cavanaugh Macdonald Consulting)

Actuarial Cost Method	Individual Entry-Age Actuarial Cost Method
Liability Discount Rate	7.75% compounded annually
Expenses	No explicit assumption. Assumed to be funded by returns in excess of 7.75%.
Future Salary Increases	Future salary increases are outlined in the table on page 33 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan and vary by participant years of service. These rates include a 4.5% base salary inflation rate.
Retirement	Retirement assumptions are outlined on page 34 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan
Mortality	Mortality assumptions are described on page 32 and are outlined on page 36 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan
Disability	Rates of disability as outlined on page 35 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan
Withdrawal	Rates of withdrawal as outlined on page 37 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan
Postretirement Benefit Increases	Rates of postretirement benefit increases as outlined on page 29 of the July 1, 2010 Actuarial Valuation for the Montana TRS Pension Plan
Asset Valuation Method	Four year smoothed market

Appendix 3: Assumptions and Methods (continued)

Projection Assumptions: (used in the deterministic and stochastic asset/liability projections)

Total Contributions	9.96% of pay Employer Contribution 7.15% of pay Employee Contribution
New Entrants	The Plan is open to new entrants and assumes a level future active population
Rate of Return on Assets	<u>Deterministic Analysis:</u> 7.75% compounded annually <u>Stochastic Analysis:</u> Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class. These assumptions are detailed in the Stochastic Analysis section of this report.
Inflation	2.50% per year with a standard deviation of 2.50%
Other	All other projection assumptions are the same as those chosen by the Plan's actuary, shown above. The participant data, Plan liabilities, and assets, as of July 1, 2010 were provided by Cavanaugh Macdonald Consulting.