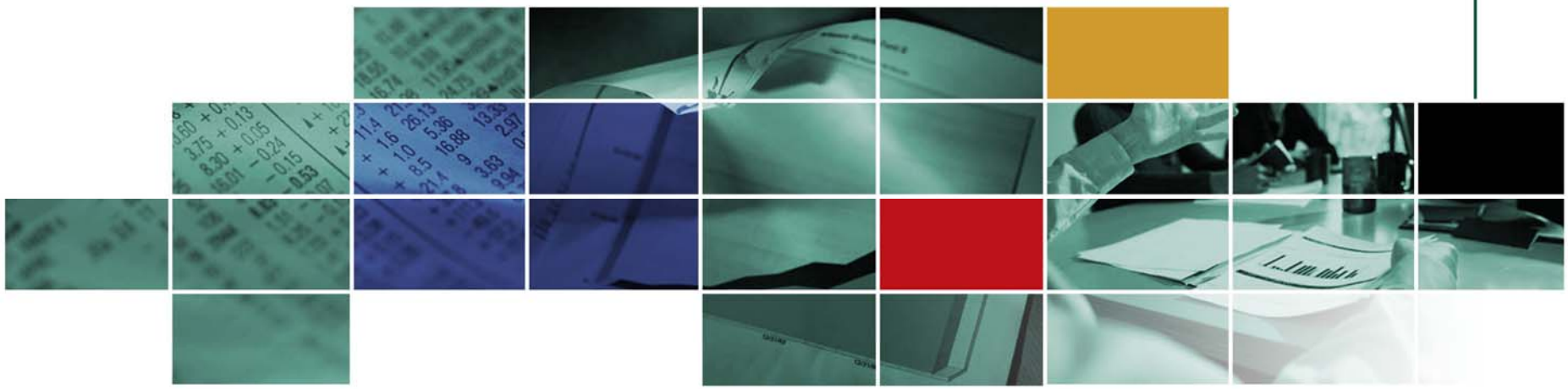
RVKuhns

& ASSOCIATES, INC.

City of Phoenix Employees' Retirement System

Asset/Liability Study

April 2011



MEMORANDUM

RVKuhns & ASSOCIATES, INC.

To: City of Phoenix Employees' Retirement System

From: R.V. Kuhns & Associates, Inc. (RVK)

Subject: City of Phoenix Employees' Retirement System - Asset/Liability Study

Date: April 27, 2011

Overview

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability (A/L) study regarding the City of Phoenix Employees' Retirement System (COPERS). 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 the entire study.

	Funded Ratio Comparison			
	Smoothing	**Affects**	**Directionality**	**Funded Ratio as of 6/30/2010**
Actuarial Funded Ratio	Gains and losses are smoothed over a 4-year period	Pace at which contributions adjust	Ratio is higher after investment losses	69%
Market Funded Ratio	Gains and losses are recognized immediately	Funds available for benefits and investments	Ratio is higher after investment gains	57%

As of June 30, 2010, the start date of the projections in this study, COPERS was notably underfunded with assets (on a market value basis) available to cover only 57% of liabilities (see table above for comparison of market and actuarial funded ratios). This equates to a shortfall of approximately $1.2 billion. Although the magnitude of the current shortfall may be cause for alarm, this study shows the Plan remains solvent with a potential for improving the funding gap over the next 20 years. This result may be surprising given the Plan's substantial current deficit, but it rests largely on the relative "youth" of the Plan. The Plan's positive demographics (ratio of contributing active participants versus benefit drawing retirees) creates an extended window of opportunity to address the Plan's underfunding. Thus, by maintaining a strong contribution policy and a prudent asset allocation, possibly with some incremental changes to the targeted allocation, COPERS has an opportunity to gradually improve the overall health of the Plan. In our judgment, it is important that this opportunity be fully exploited since when the Plan's demographics mature and retirees begin to outnumber active participants, a funding level as low as the current one will become far more difficult to address.

Purpose

The central purpose of an A/L study is to examine the likely future consequences of applying a series of different allocation strategies to the assets invested in order to meet the liabilities created by the benefit provisions in the COPERS Plan. In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes both on a deterministic (assumed drivers such as investment return adhere precisely without variance to forecast each and every year) and stochastic (outcomes vary each year according to estimated volatility for these parameters) basis.

Key Conclusions

Below find a series of important findings, forecasts and conclusions drawn from the body of the study which follows. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We cannot emphasize enough that a solid understanding of each of them requires that they be reviewed as they are presented in the study itself within their surrounding context. This is especially important to understanding the findings which represent *probable, but not certain,* outcomes.

General:

- As of June 30, 2010 (the date of the actuarial valuation used to model liabilities), the COPERS market funded ratio (available assets to benefit obligations) was 57% - implying a shortfall of approximately $1.2 billion (page 6). Sustained increases in both savings (contributions) and investments are needed to restore the Plan to fully funded status. The analysis does not support the view that investment returns alone are likely to restore the Plan to full, or even near full funding. Indeed, even with full actuarially required contribution rates (ARC) reaching as high as 20% of payroll (excluding member contributions) during this period (page 13) plus unvarying investment returns of 8.0% annually, the fund will not reach full funding for many decades.

- COPERS is an open plan in which active members still exceed retired members and is expected to be the case for at least the next eight years (page 8). Indeed, the data suggest that the ratio of retirees to actives will not exceed 1.25x until approximately calendar year 2025. This is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below. As noted earlier, it creates a valuable, extended window of opportunity for significantly improving the Plan's funding ratio and overall financial health before it must address the challenge of a rising retiree to active ratio.

- Thus, it is not too early to recognize that given the actuary's current demographic and benefit projections, a higher state of Plan "maturity" lies ahead beginning post-2020 and, based on our experience with defined benefit plan dynamics, will continue steadily in the years that follow. This plan "aging" is also accompanied by higher levels of annual benefit obligations and a shrinking ratio of active to retired participants. While we do not

feel this likelihood should materially affect the Board's choice of investment strategy at this point, it will become an increasingly important factor within the next ten years (page 11). Should capital market and Plan returns fall short of 8% or contributions fall short of the ARC, this would certainly require a comprehensive reassessment of the conclusions reached in this analysis.

Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular investment returns. Its virtues are that it is simple and that the findings reflect what will happen if the future turns out to be precisely as forecasted—no better, but also no worse.

- Using deterministic methods, contributions rates are forecasted to rise for the next three years before gradually falling back to slightly below current levels by 2030, a result dependent on the embedded assumption of unvarying 8% returns to the fund throughout this period. Dollar contributions are expected to increase by almost 75% over the next 20 years. Please note, however, that precise actuarially required rates are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values for the Plan (page 13).

- Benefit payments are expected to increase by more than 180% over the 20 years but remain roughly constant relative to Plan assets (pages 9 and 10). As a percentage of contributions, benefit payments are expected to increase from about 110% of contributions to about 180% of contributions by the end of the projection period (page 14). The expectation that benefits payments can remain roughly constant relative to Plan assets is a key positive. Should the Plan's payout ratio climb significantly, the resulting liquidity demands would, at some point, begin to limit COPERS ability to employ higher risk (volatility)/higher return asset classes and in particular highly illiquid assets. For the time being, that is an issue to monitor, but need not impinge upon asset allocation decisions.

- Funding ratio on a market value basis is expected to gradually increase from 57% to approximately 77% by 2030 as the constant, unvarying assumed rate of return and consistent adherence to the current ARC-based contribution policy slowly grows the market value of assets (page 17). Assuming the current contribution policy remains unchanged, COPERS would need to experience annual returns in excess of 9.9% without exception each and every year for the next 20 years in order to reach full funding (page 18). This is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding or even close to it.

- Experiencing a return of just 50 basis points below (7.5%) the assumed rate of return (8.0%) each year for the 20 year projection period would result in additional employer contribution requirements of over $160 million over this period. This minor decrease in the realized rate of return would also result in a funding ratio of 72% in year 20 versus 77% at the current assumed rate of return, despite the additional, actuarially-required contributions (page 19). Given the widely shared concerns about a low return environment in the capital markets over the next ten years, this is a conclusion that should be thoroughly understood. It is encouraging, nonetheless, to see—at least under the terms

of this analysis—that such a shortfall in returns versus the actuarial expectations does not eliminate the expectation that funding levels would improve over time, just not to the same level and not with the same cost (i.e., necessary contributions).

- Increasing employer contributions by $15 million per year (about 15%) results in an end-of-projection period funding ratio near 83%, or about 6 percentage points higher than under the base scenario. Due to the compounding effect of investment returns this also results in a year 20 employer contribution that is actually lower than the base scenario by more than $8 million (page 20). We realize only too well the fiscal challenges faced at all levels within the public sector. However, we would be remiss not to point out that this finding emphasizes the critical importance of the Plan's contribution policy generally, and the beneficial effect that substantial and persistent contributions can have on Plan's funding ratio and overall financial health.

Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for COPERS; some are more likely, others less likely, but still possible.

The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer greater insights.

Uncertainty in future investment returns is taken into account via stochastic analysis of six different investment approaches (page 26) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial risk), including the current strategy in place at COPERS. At the heart of the COPERS situation is a simple question that is difficult to answer: whether the Plan, currently well below full funding levels on an MVA basis, is better off following a strategy that:

(A) falls in the general category of higher prospective return with greater risk (i.e. potential for more widely varying outcomes), or
(B) falls in the general category of lower prospective return with concomitantly lower risk (i.e. a tighter band of likely outcomes).

Part of this question is precisely how COPERS and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are twofold:

(1) The effect on funding ratio (and thus on contribution rates which decline with higher funding ratios).
(2) The effect on Plan liquidity (i.e. the fund's ability to pay annual benefits without major disruption of its strategic asset allocation—its investment strategy).

The results of this analysis are displayed on pages 27 through 41 of the accompanying A/L study. But for purposes of this summary, the consequences of choosing A versus B, as described above, are summarized most clearly on page 41 and copied below followed by explanatory comments.

	Actuarial Funded Ratio in Year 20			Market Funded Ratio in Year 20			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20 Median	2010-2030 Peak	2010-2030 Trough
Current Allocation	68.8%	35.4%	131.6%	67.6%	32.8%	136.4%	10.6%	10.6%	9.6%
Target Allocation	72.0%	36.7%	141.9%	71.0%	34.1%	144.9%	10.2%	10.2%	9.6%
Conservative Portfolio	46.8%	31.2%	65.4%	44.2%	28.7%	62.9%	16.3%	16.3%	9.6%
Potential Portfolio 1	68.8%	36.6%	123.0%	67.6%	34.4%	125.7%	10.7%	10.7%	9.6%
Potential Portfolio 2	74.7%	36.6%	164.8%	73.7%	33.9%	168.0%	9.8%	9.8%	9.6%
Aggressive Portfolio	83.1%	35.1%	242.7%	83.2%	32.2%	251.2%	8.8%	9.6%	8.6%

- Moving to a more diversified portfolio that is characterized by higher expected returns and higher risk, can improve the median expected funding ratio outcome of COPERS with limited downside costs and slightly improved payout ratios. Potential Portfolio 2 has a median market funded ratio of 73.7% compared to 67.6% for the Current Allocation. Further Potential Portfolio 2 has a worst case outcome slightly better than that of the Current Allocation and a substantially better best case outcome (page 41).

- Potential Portfolio 2 also has a higher chance of elevating COPERS to a fully funded status over the next 20 years when compared to the Current Allocation (27% vs. 19%) while better protecting the Plan on the downside with only a 20% probability of having the Plan drop below 50% funding compared to a 24% likelihood for the Current Allocation (page 33).

- Required employer contributions (as a percentage of pay) are also lower under the median (50^{th} percentile) scenario for Potential Portfolio 2 at 16.0% in 2030 compared to 17.9% for the Current Allocation (page 40).

- We should note that these advantages for Portfolio 2 do not lead us to conclude that it is unquestionably the optimal asset allocation. Other factors, besides the ones analyzed here, can play a role in the final strategy determined for the Plan. As illustrated in the table above, significant progress can be made toward the beneficial outcomes noted in the preceding bullet points by merely completing the transition from the Current Allocation to the Target Allocation—this should, at the very least, provide support for such a shift.

- While RVK supports the recommendations of the study, assuming our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. This analysis can be found in Appendices 1 and 2 (beginning on pages 42 and 58 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal 1.00). The results of these additional analyses show that the recommended portfolio composition does not change but that the range of potential results widens

indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

Final Comment

This A/L study shows that COPERS is currently underfunded but can improve its most likely outcomes, as well as its worst and best outcomes, by initiating slight revisions to its asset allocation. Further diversification into higher expected returning, higher risk assets will allow the Plan to better reach its full funding goals without negatively impacting worst case scenarios or Plan liquidity. However, we also believe that the Plan's youthful demographics represent a window of opportunity to address the current low funding status. Progress should be monitored periodically through studies such as these and the consequences of lower returns in the capital markets (and thus for the Plan's assets) or contribution policy changes should be quickly assessed and evaluated.

Table of Contents

Acknowledgements

PREPARED BY:

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

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

RYAN HARVEY, CONSULTANT, R.V. KUHNS & ASSOCIATES, INC.

NICK WOODWARD, 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)

RODWAN CONSULTING COMPANY (PLAN ACTUARIES)

Introduction

R.V. Kuhns & Associates, Inc. has prepared this report for the City of Phoenix Employees' Retirement System (COPERS) 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 COPERS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.

An Asset/Liability Study is NOT . . .

- An actuarial study of the COPERS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the voters.

- 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.

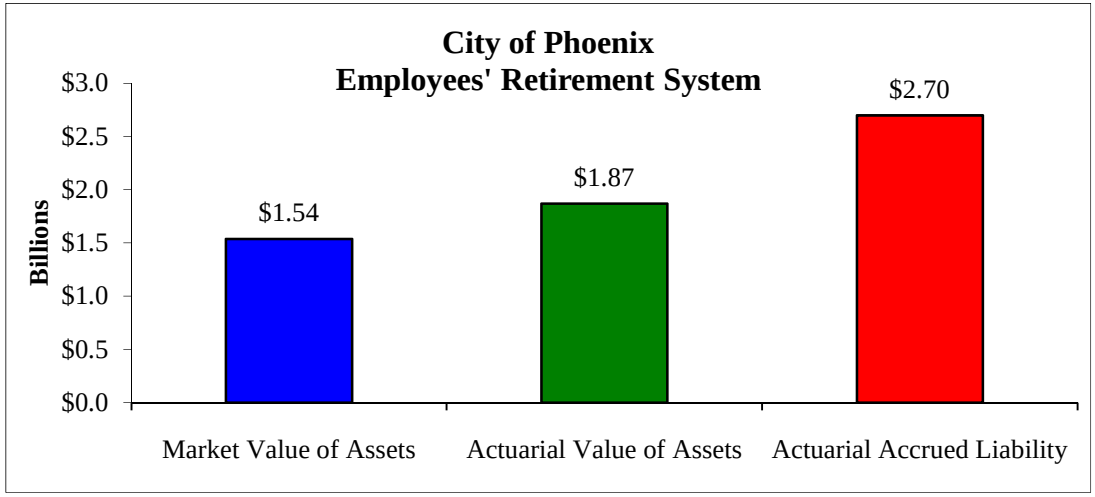
This Asset/Liability Study . . .

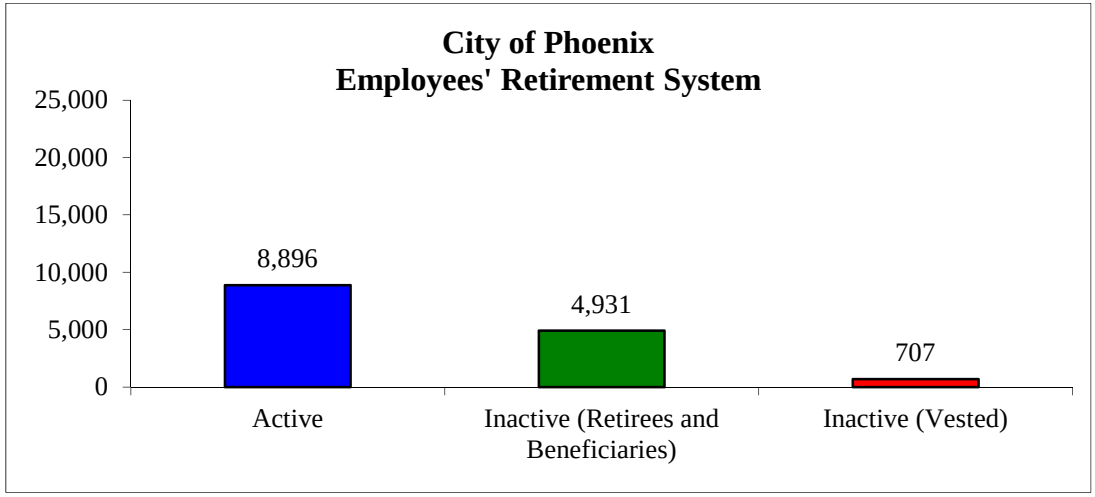
- Uses data from the most recent (June 30, 2010) COPERS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method and other assumptions described in the June 30, 2010 Actuarial Valuation.
- Compares these specific investment strategies—(A) Current Allocation, (B) a conservative 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	June 30, 2010
Market Value of Assets (MVA)	$1.54 billion
Actuarial Value of Assets (AVA)	$1.87 billion
Actuarial Accrued Liability (AAL)	$2.70 billion
Actuarial Funded Ratio (AVA/AAL)	69%
Market Value Funded Ratio (MVA/AAL)	57%
Active Participants	8,896
Inactive Participants	
Retirees and Beneficiaries	4,931
Vested	707





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 Rodwan Consulting Company (see summary in the Assumptions and Methods section of this report)

3. Assumed rate of return on Plan assets for all projection years: 8.00%

4. Employer contribution rates equal amount necessary to fund the actuarially computed normal cost, plus a 20-year amortization of the unfunded actuarial liability each year

5. Assumes a constant employee contribution rate of 5.00% of pay

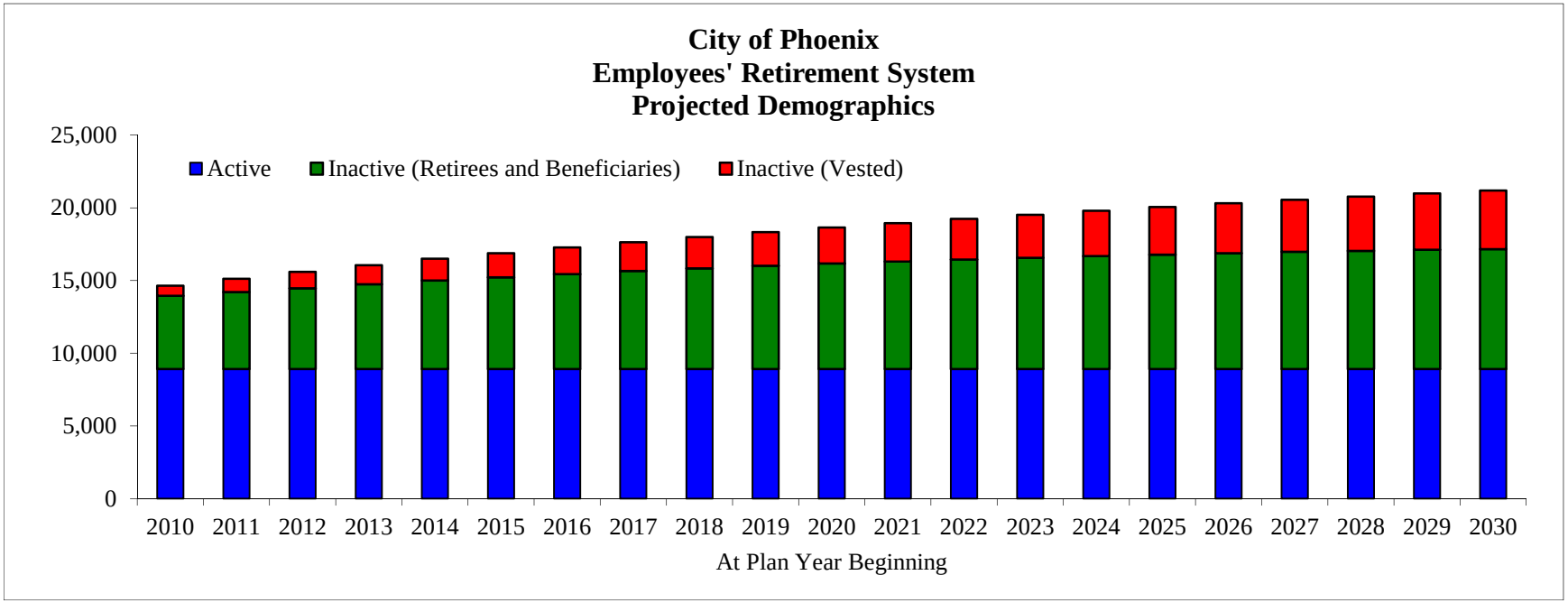
6. Open group analysis: New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

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 to recently hired participants. The number of inactive participants increases by more than 114% during the 20-year projection period shown.

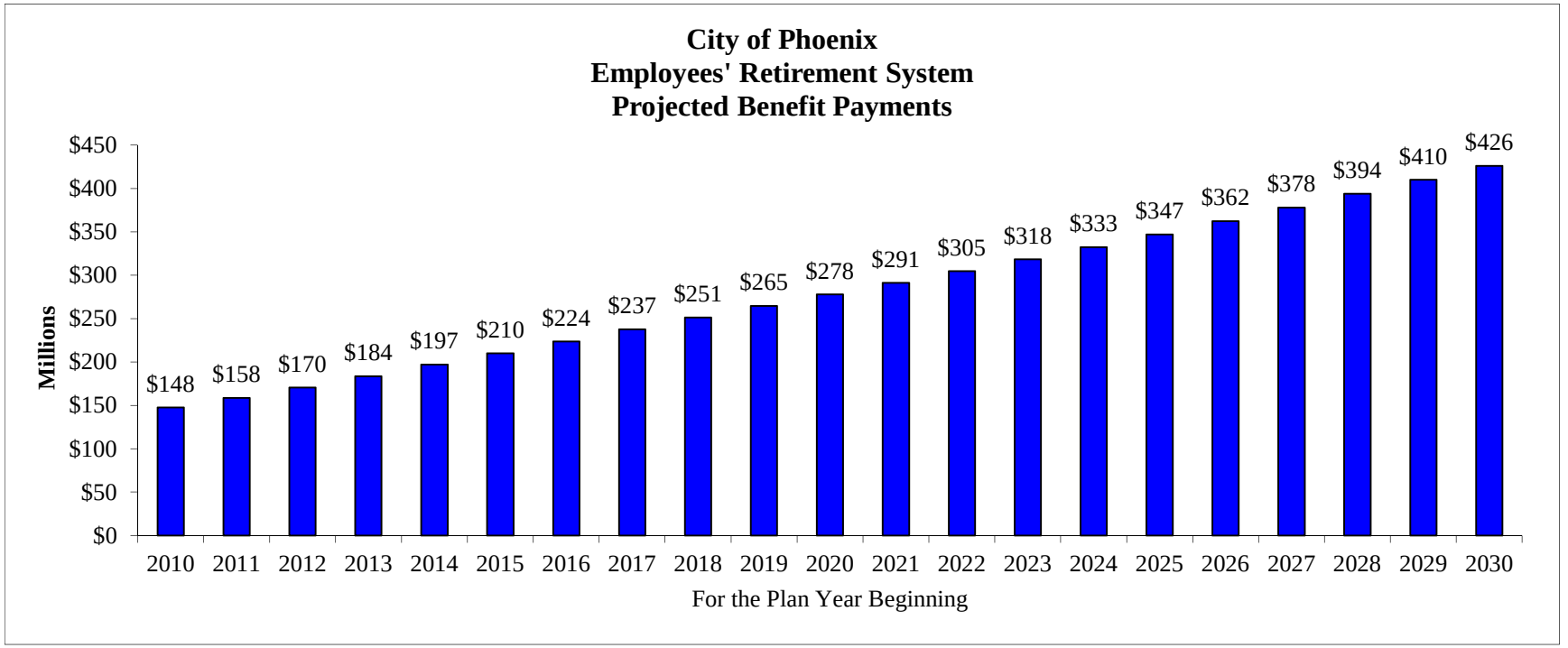


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Population																					
Annual Percent Change	N/A	3.2%	3.1%	3.0%	2.7%	2.4%	2.3%	2.1%	2.0%	1.9%	1.7%	1.6%	1.6%	1.5%	1.4%	1.3%	1.3%	1.2%	1.1%	1.0%	0.9%

Deterministic Analysis (continued)

Benefit Payments

The Plan's projected benefit payments are shown in the chart below. The projected benefit payments are expected to increase by more than 180% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to remain roughly constant through the end of the projection period (see next page).

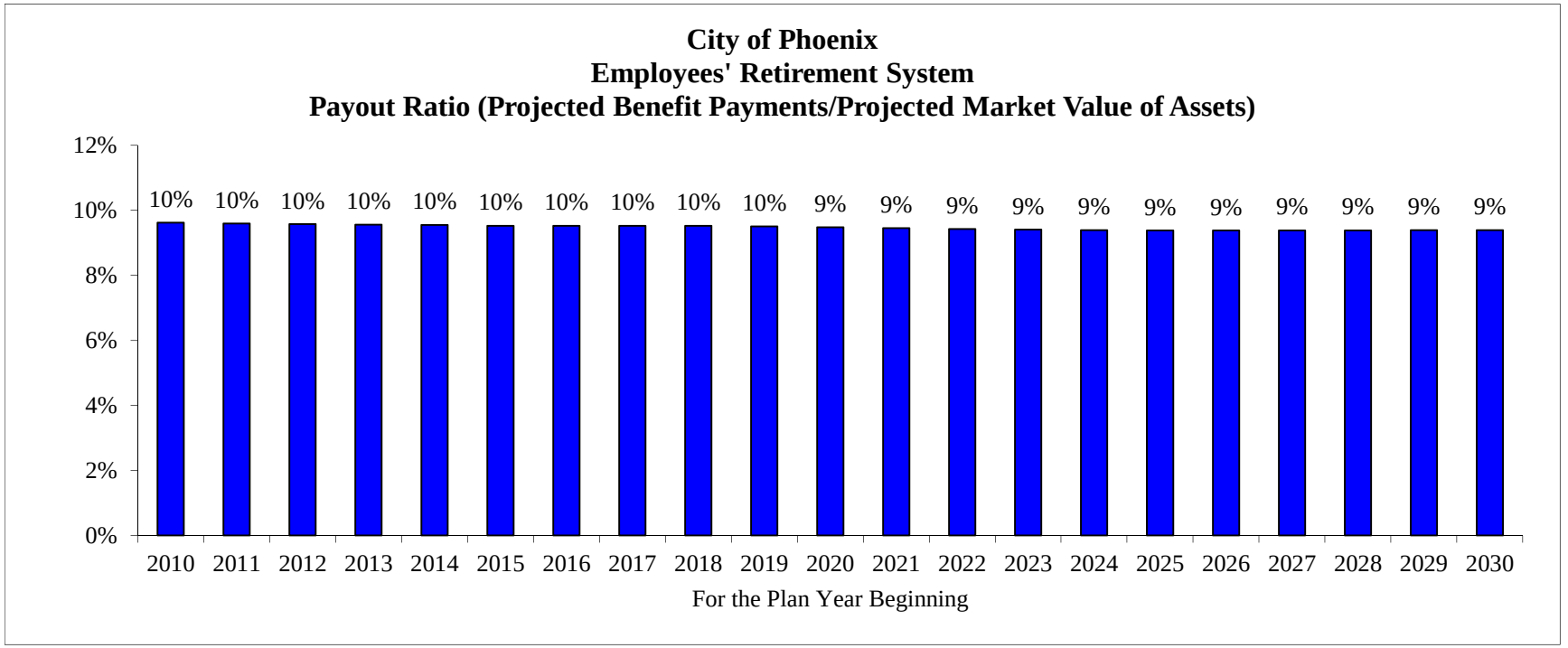


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual Percent Change	N/A	7.3%	7.6%	7.7%	7.3%	6.7%	6.4%	6.2%	5.8%	5.3%	5.0%	4.8%	4.7%	4.5%	4.4%	4.4%	4.4%	4.3%	4.2%	4.1%	3.9%

Deterministic Analysis (continued)

Payout Ratio (benefit payments/market value of assets)

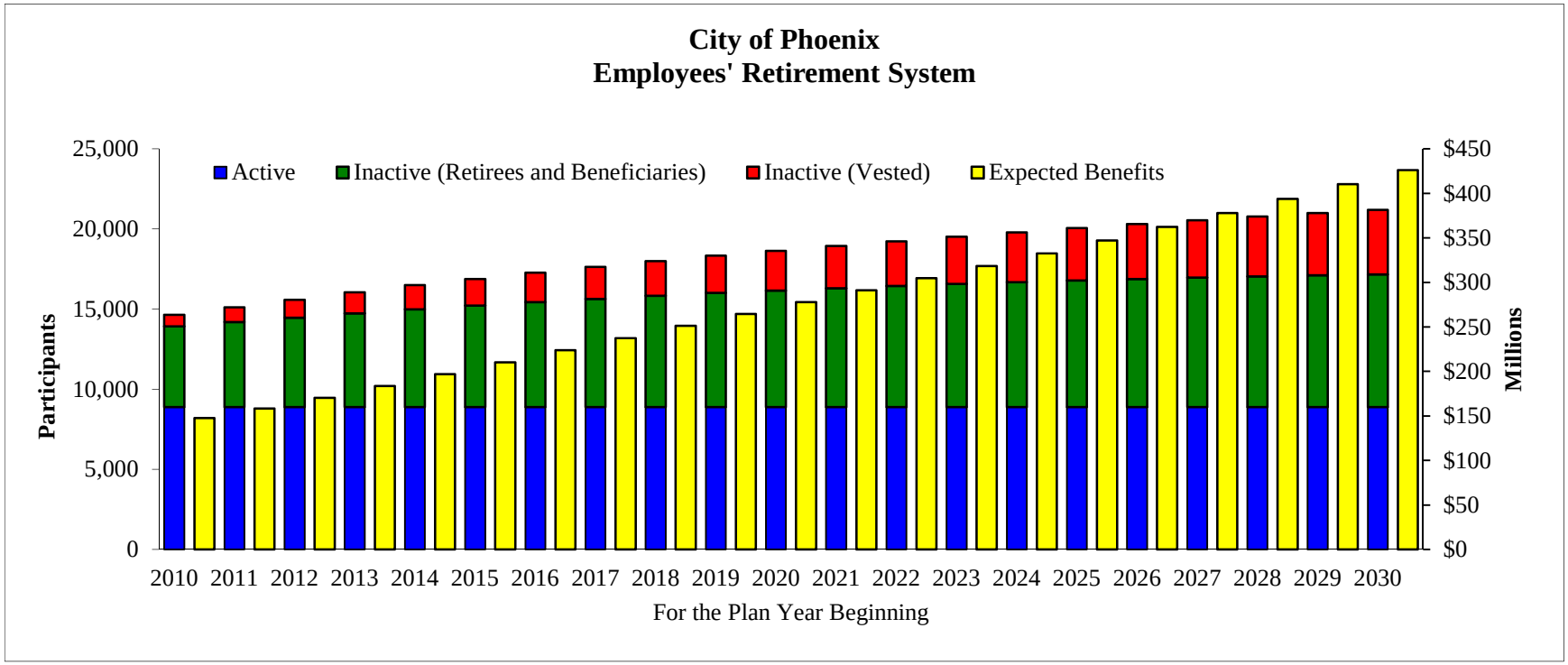
The Plan's projected payout ratios are shown in the chart below. The expected payout ratios are expected to remain roughly constant through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years.



Deterministic Analysis (continued)

Demographics and Benefit Payments

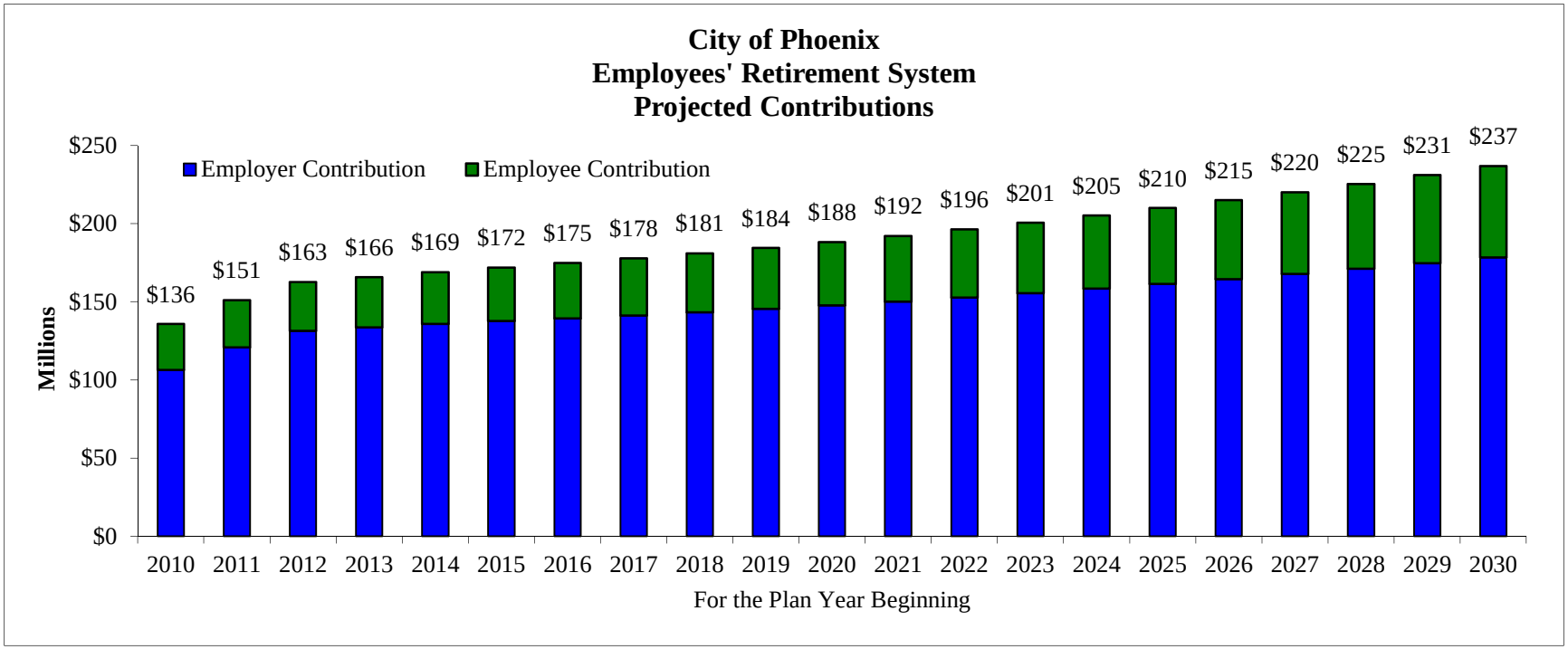
The chart below highlights the demographic and benefit payment projections shown on the prior pages, illustrating the comparison between the projected number of active and inactive participants and the projected benefit payments through the plan year beginning July 1, 2030.



Deterministic Analysis (continued)

Contributions

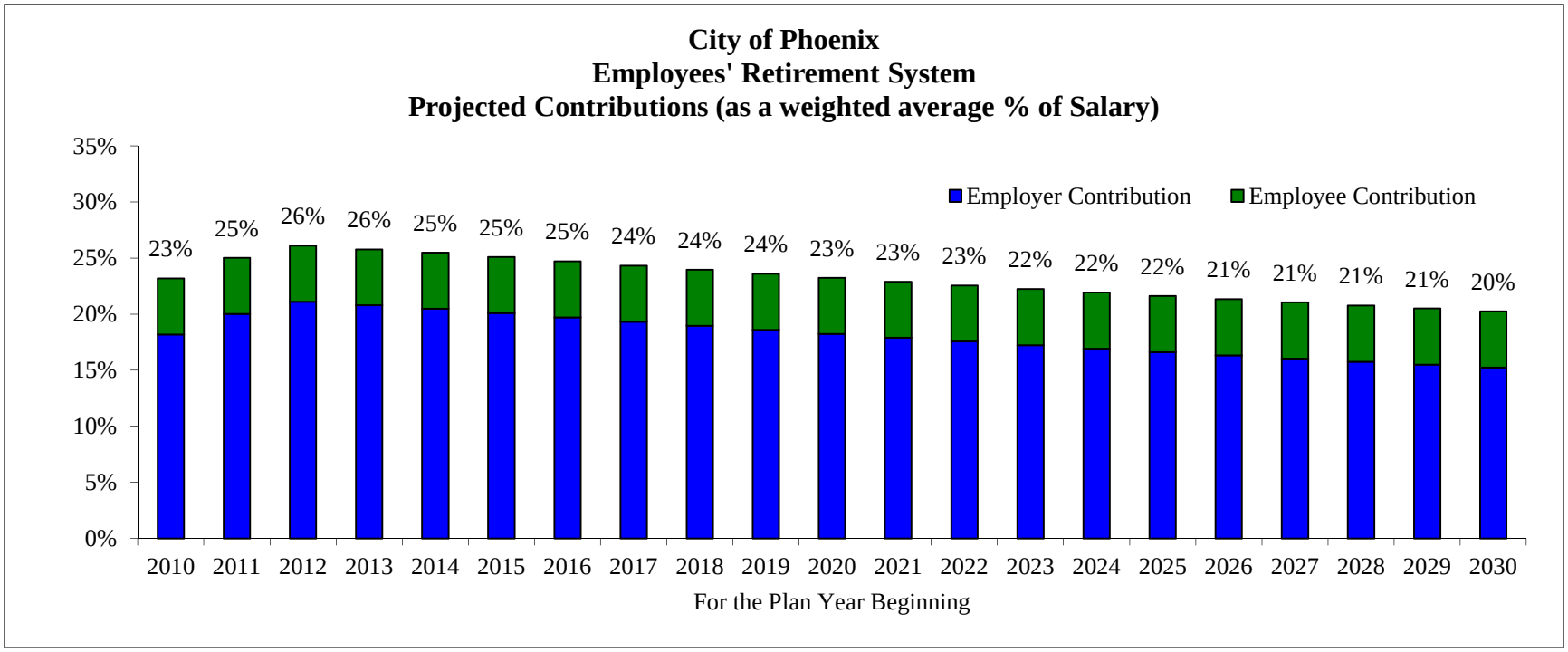
The Plan's assumed projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years.



Deterministic Analysis (continued)

Contributions

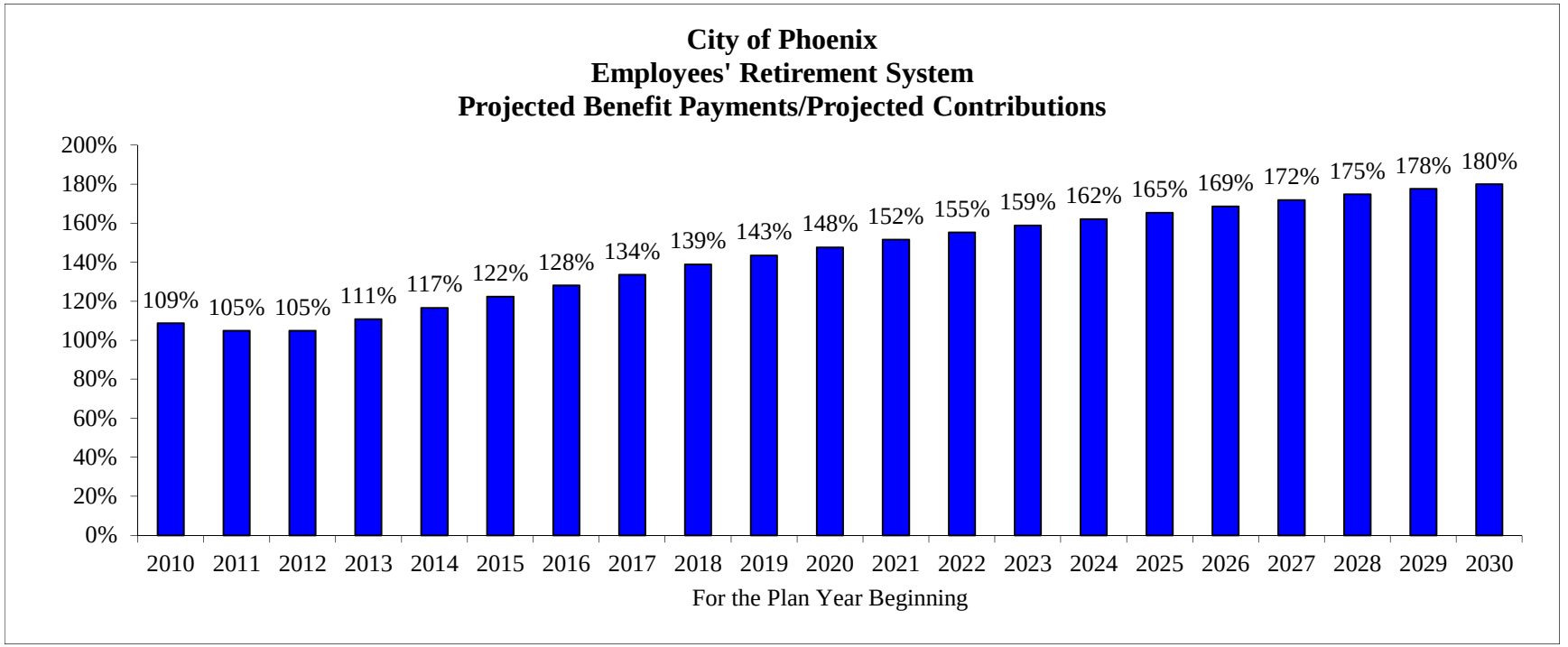
The Plan's assumed projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years.



Deterministic Analysis (continued)

Benefit Payments/Contributions

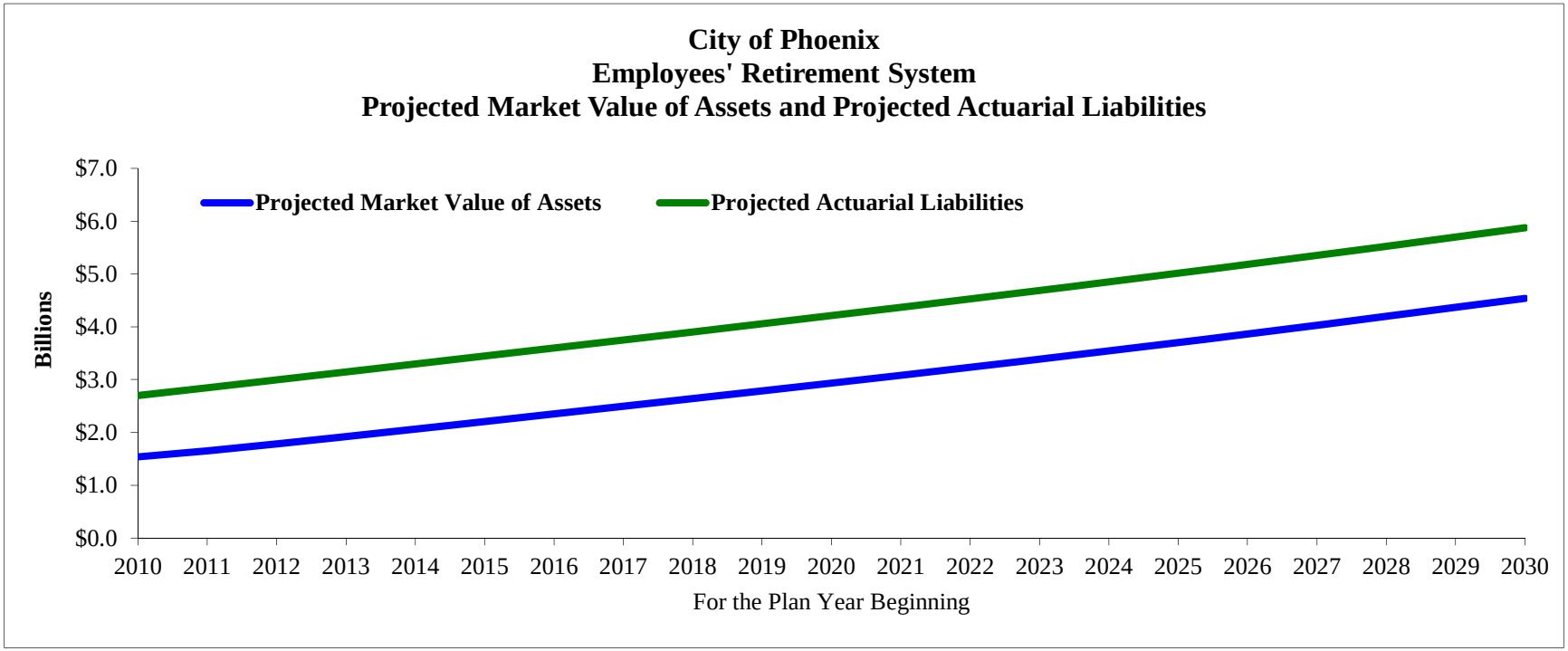
The Plan's assumed projected benefit payments divided by projected contributions are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years.



Deterministic Analysis (continued)

Actuarial Accrued Liabilities and Market Value of Assets

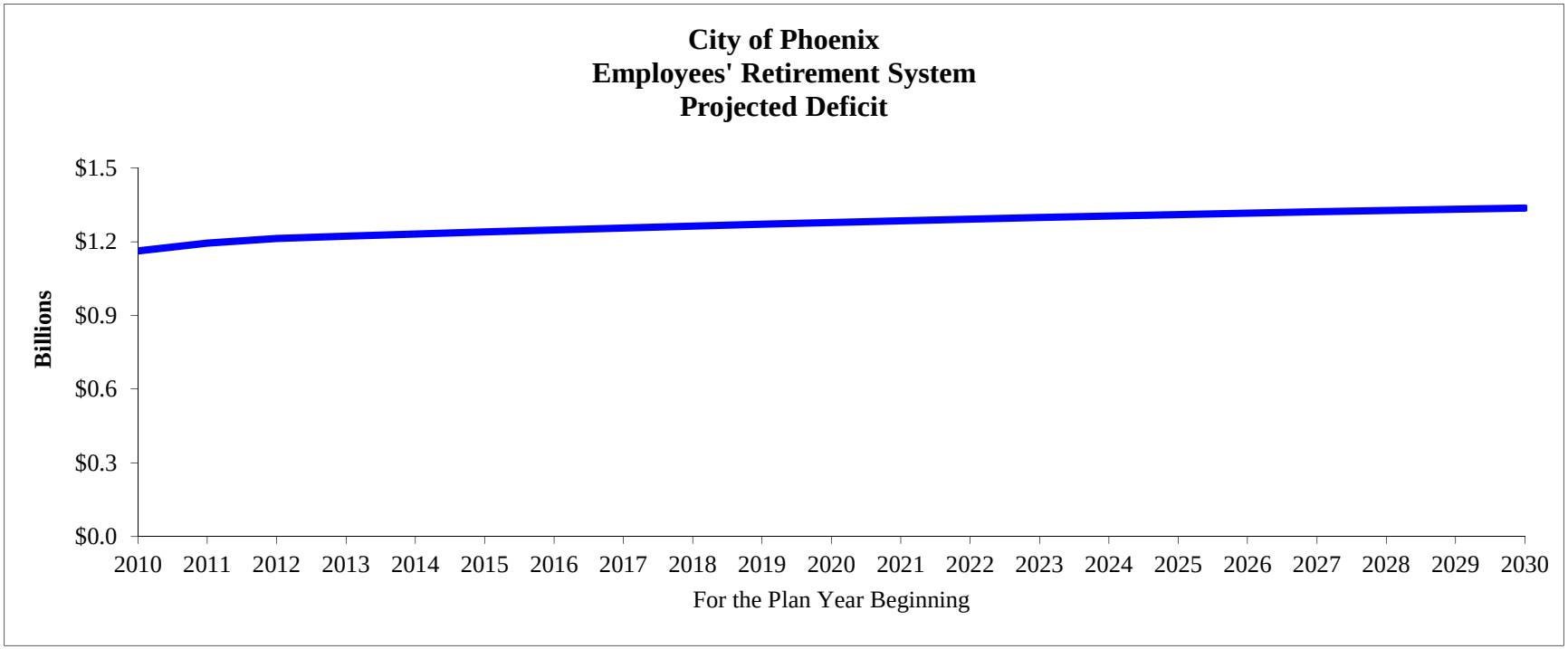
The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to remain roughly constant through the end of the projection period. The actuarial funded ratio (based on actuarial value of assets) is expected to increase from about 69% currently to approximately 77% 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)

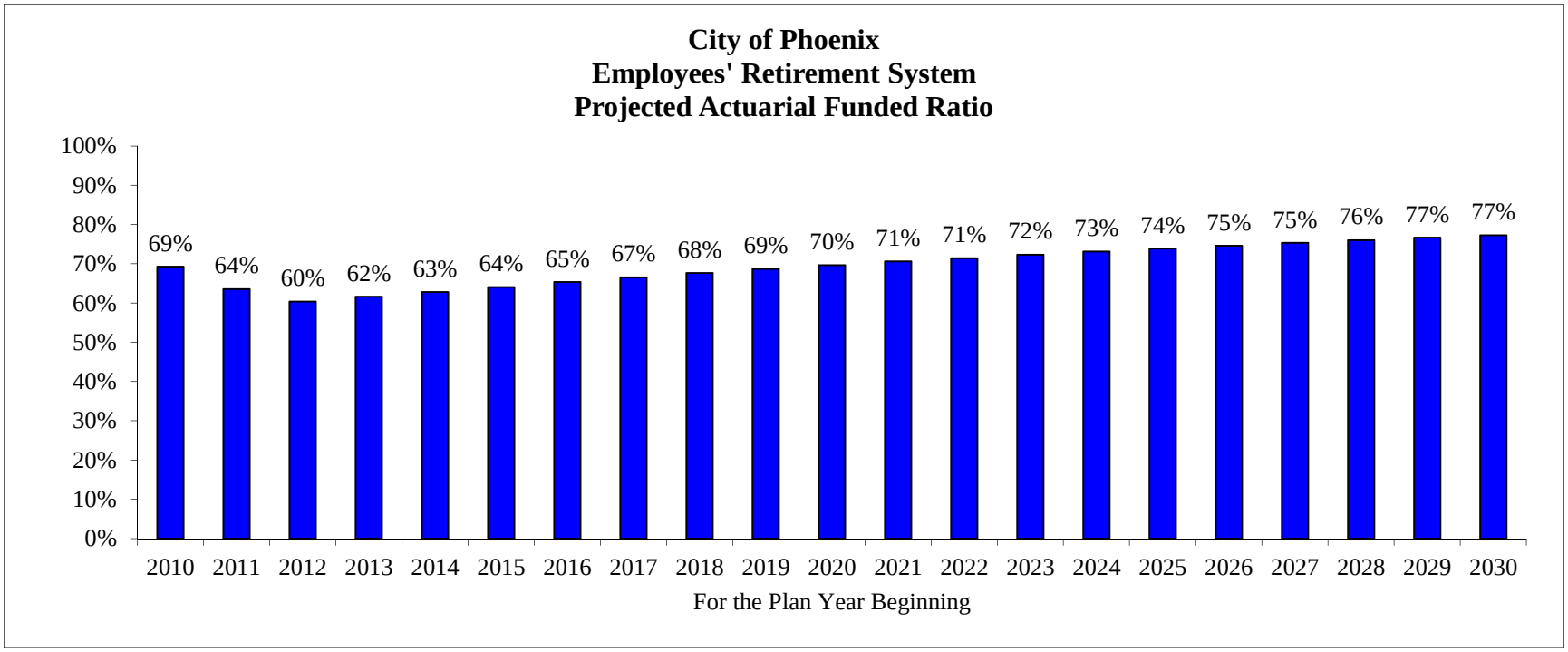
The Plan's projected deficit of assets is shown in the chart below. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to remain roughly constant through the end of the projection period.



Deterministic Analysis (continued)

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

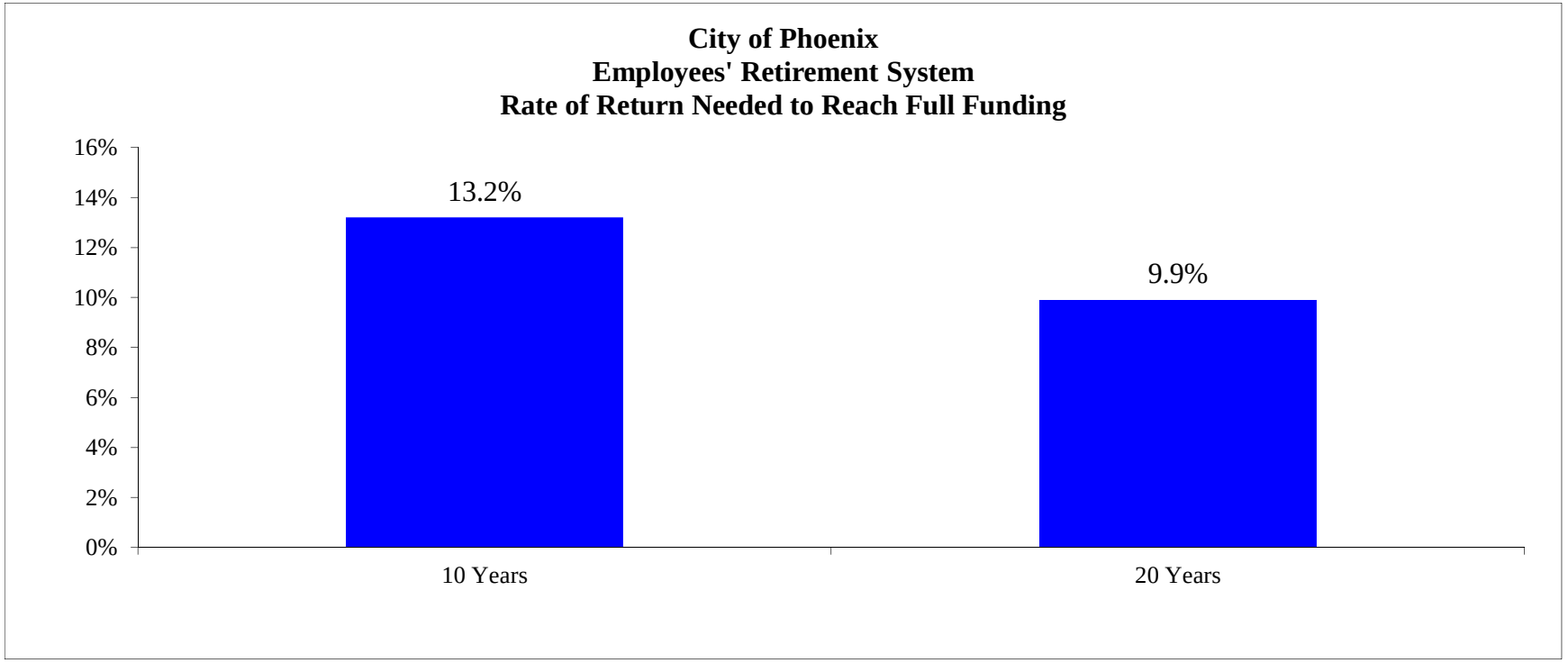
The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 77% funded. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely 8.0% each year without exception for all projection years.



Deterministic Scenario Analysis

Full Funding Implied Returns

As of June 30, 2010 the Plan's unfunded actuarial accrued liability (UAAL) had an open amortization period of 20 years. Assuming the current contribution policy remains unchanged and all actuarial assumptions are met, the Plan will never reach full funding with an open 20 year amortization period. The rate of return 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 77% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2030 assuming the Plan experiences an annualized investment return of 50 basis points lower (7.5%) than the actuarially assumed rate of return (8.0%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

	Value in 2030			
	8.00% Return	**7.50% Return**	**Change**	
Projected Payout Ratio	9.4%	10.1%	0.75%	▲
Projected Employer Contributions (millions)	$178.4	$198.1	$19.7	▲
Projected Contributions (Weighted Average % of Salary)	20.2%	21.9%	1.70%	▲
Projected Benefit Payments/Projected Total Contributions	180%	166%	-14%	▼
Projected Actuarial Accrued Liabilities (billions)	$5.9	$5.9	$0.0	–
Projected Market Value of Assets (billions)	$4.5	$4.2	($0.3)	▼
Projected Deficit (billions)	$1.3	$1.7	$0.4	▲
Projected Funded Ratio	77%	72%	-5%	▼
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	$3.1	$3.3	$0.2	▲

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 77% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2030 assuming the Plan experiences employer contribution rates that are $15 million higher than the calculated ARC each year. 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	9.4%	8.7%	-0.68%	▼
Projected Employer Contributions (millions)	$178.4	$170.2	($8.2)	▼
Projected Contributions (Weighted Average % of Salary)	20.2%	19.5%	-0.70%	▼
Projected Benefit Payments/Projected Total Contributions	180%	186%	6%	▲
Projected Actuarial Accrued Liabilities (billions)	$5.9	$5.9	$0.0	▬
Projected Market Value of Assets (billions)	$4.5	$4.9	$0.4	▲
Projected Deficit (billions)	$1.3	$1.0	($0.3)	▼
Projected Funded Ratio	77%	83%	6%	▲
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	$3.1	$3.2	$0.1	▲

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.

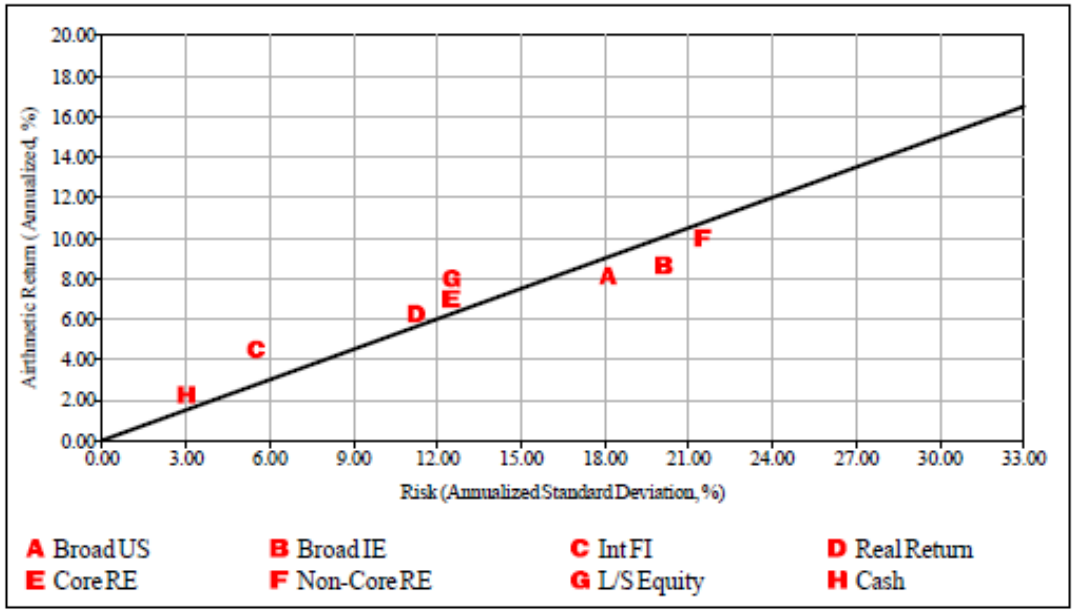
Using the expected values and variances of the returns and inflation, along with their correlations, 2000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted 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 18.10%, meaning that two-thirds of the time we expect its return to lie between –9.95% (= 8.15 – 18.10) and 26.25% (= 8.15 + 18.10). 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 -28.05% or rise above 44.35%. 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	18.10
Broad International Equity	8.65	20.10
Int. Duration Fixed Income	4.50	5.50
Real Return	6.25	11.25
Core Real Estate	7.00	12.50
Non-Core Real Estate	10.00	21.50
Long/Short Equity	8.00	12.50
Cash Equivalents	2.25	3.00



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	Int. Duration Fixed Income	Real Return	Core Real Estate	Non-Core Real Estate	Long/Short Equity	Cash Equivalents
Broad US Equity	1.00	0.75	0.21	0.63	0.31	0.25	0.76	0.03
Broad International Equity	0.75	1.00	0.11	0.74	0.36	0.24	0.66	-0.07
Int. Duration Fixed Income	0.21	0.11	1.00	0.25	-0.04	-0.04	0.12	0.25
Real Return	0.63	0.74	0.25	1.00	0.47	0.30	0.59	-0.08
Core Real Estate	0.31	0.36	-0.04	0.47	1.00	0.90	0.24	0.25
Non-Core Real Estate	0.25	0.24	-0.04	0.30	0.90	1.00	0.22	0.15
Long/Short Equity	0.76	0.66	0.12	0.59	0.24	0.22	1.00	0.01
Cash Equivalents	0.03	-0.07	0.25	-0.08	0.25	0.15	0.01	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 1/31/2011) and Target Allocation 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.

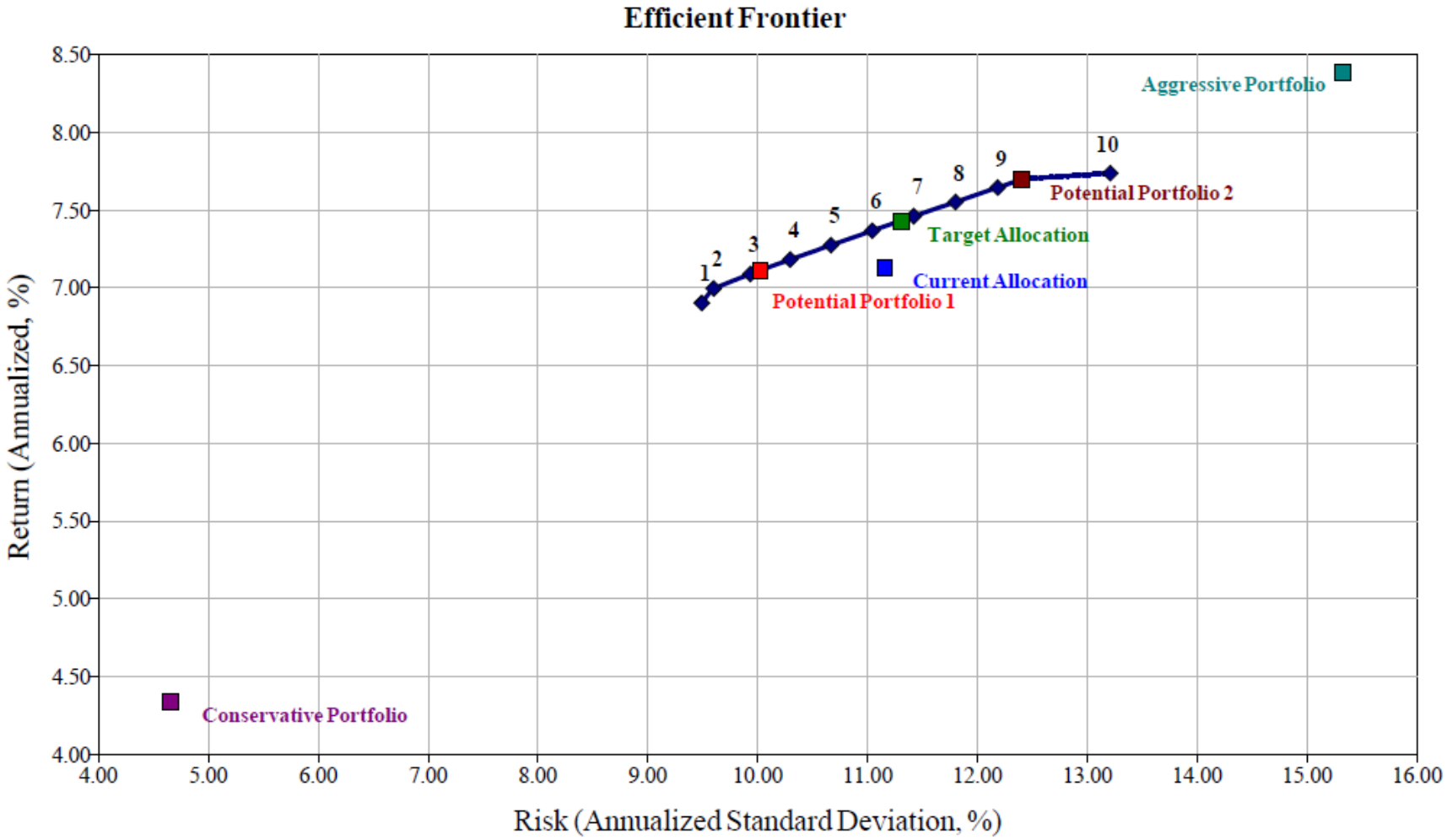
	Min	Max	1	2	3	4	5	6	7	8	9	10	Current Allocation	Target Allocation	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Aggressive Portfolio
Broad US Equity	20	55	20	20	20	21	22	23	24	26	27	33	27	25	0	20	28	38
Broad International Equity	15	40	15	15	19	21	22	23	24	26	27	33	22	21	0	20	27	37
Int. Duration Fixed Income	15	30	30	30	30	28	26	23	21	19	16	15	23	19	75	30	15	0
Real Return	5	10	10	10	6	5	5	5	5	5	5	5	8	10	10	5	5	0
Core Real Estate	7	10	10	7	7	7	7	7	7	7	7	7	7	7	0	7	7	7
Non-Core Real Estate	0	9	5	8	8	8	8	8	8	8	8	8	2	8	0	8	8	8
Long/Short Equity	0	10	10	10	10	10	10	10	10	10	10	0	10	10	0	10	10	10
Cash Equivalents	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15	0	0	0
Total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			40	43	47	50	52	55	57	59	62	73	51	54	0	48	63	83
Capital Preservation			30	30	30	28	26	23	21	19	16	15	24	19	90	30	15	0
Alpha			10	10	10	10	10	10	10	10	10	0	10	10	0	10	10	10
Inflation			20	17	13	12	12	12	12	12	12	12	15	17	10	12	12	7
Expected Return			**6.90**	**7.00**	**7.09**	**7.18**	**7.27**	**7.37**	**7.46**	**7.55**	**7.64**	**7.74**	7.13	7.42	4.34	7.11	7.70	8.39
Risk (Standard Deviation)			**9.49**	**9.60**	**9.93**	**10.29**	**10.67**	**11.04**	**11.42**	**11.80**	**12.18**	**13.21**	11.16	11.30	4.65	10.02	12.40	15.33
Return (Compound)			6.48	6.57	6.63	6.69	6.74	6.81	6.86	6.91	6.96	6.94	6.55	6.83	4.24	6.64	6.99	7.32
Return/Risk Ratio			0.73	0.73	0.71	0.70	0.68	0.67	0.65	0.64	0.63	0.59	0.64	0.66	0.93	0.71	0.62	0.55
RVK Expected Eq Beta (LC US Eq = 1)			0.48	0.48	0.50	0.52	0.54	0.56	0.58	0.60	0.62	0.67	0.58	0.57	0.09	0.50	0.63	0.79
RVK Liquidity Metric (T-Bills = 100)			69	69	70	71	71	71	71	71	72	78	76	69	83	71	72	75

Relative Constraints: Broad International Equity cannot exceed Broad US Equity. Total Real Estate cannot exceed 15% of Total Portfolio.

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

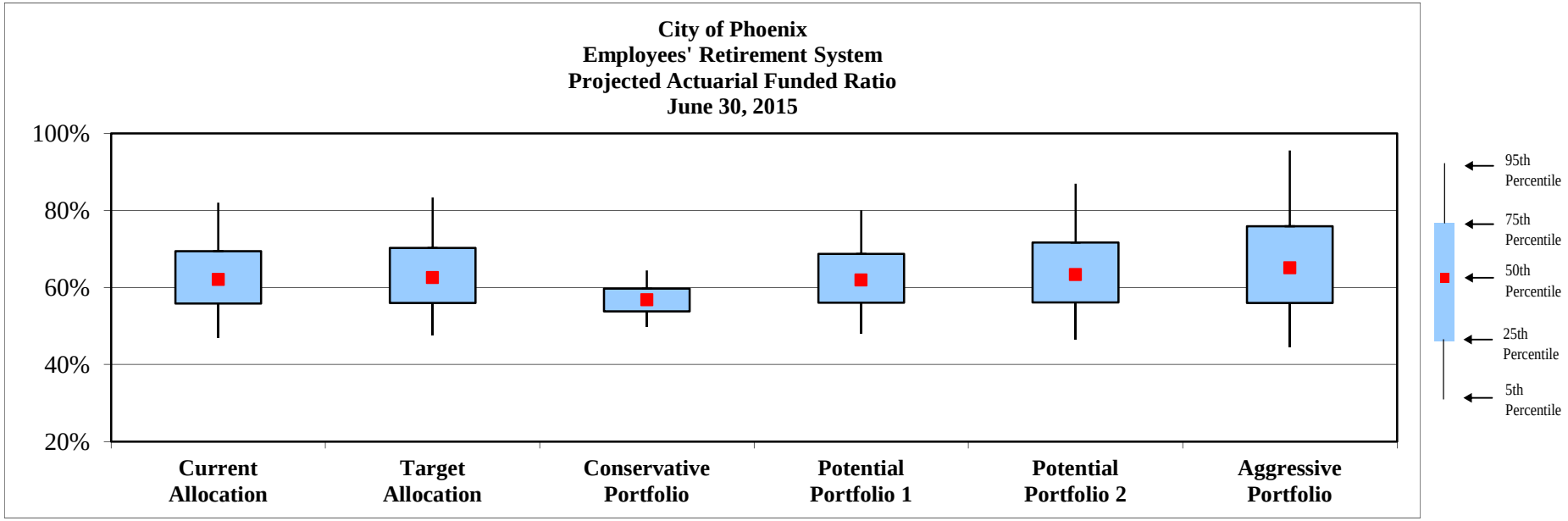
Outlined below are the Current Allocation and Target Allocation (as of 1/31/2011) and four other mixes to be examined in this stochastic analysis. The expected return and expected risk, as measured by standard deviation, for each is also shown.

Asset Class	Current Allocation	Target Allocation	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Aggressive Portfolio
Broad US Equity	27%	25%	0%	20%	28%	38%
Broad International Equity	22%	21%	0%	20%	27%	37%
Int. Duration Fixed Income	23%	19%	75%	30%	15%	0%
Real Return	8%	10%	10%	5%	5%	0%
Core Real Estate	7%	7%	0%	7%	7%	7%
Non-Core Real Estate	2%	8%	0%	8%	8%	8%
Long/Short Equity	10%	10%	0%	10%	10%	10%
Cash Equivalents	1%	0%	15%	0%	0%	0%
Expected Return	**7.13%**	**7.42%**	**4.34%**	**7.11%**	**7.70%**	**8.39%**
Expected Risk	**11.16%**	**11.30%**	**4.65%**	**10.02%**	**12.40%**	**15.33%**

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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



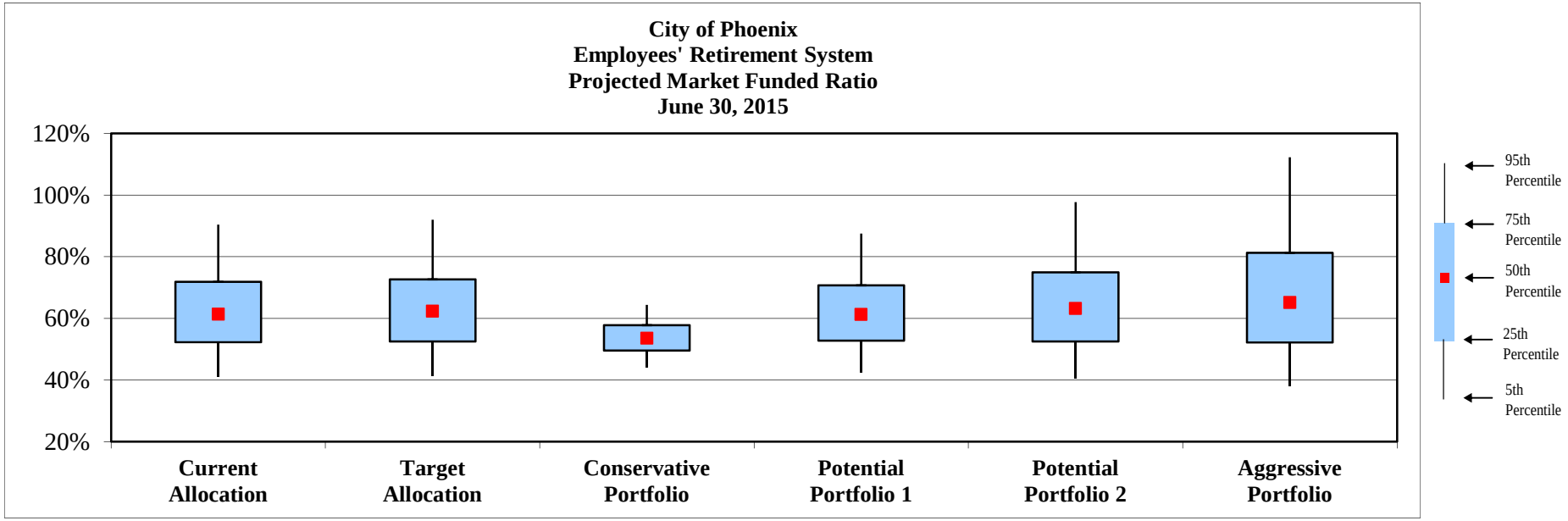
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$1,793.9	47.0%	$1,784.8	47.5%	$1,701.0	49.7%	$1,765.4	48.1%	$1,805.5	46.6%	$1,881.3	44.5%
25th Percentile	$1,507.7	55.8%	$1,498.7	56.0%	$1,577.3	53.8%	$1,495.8	56.1%	$1,496.0	56.1%	$1,507.6	56.0%
50th Percentile	$1,298.9	62.1%	$1,286.2	62.6%	$1,482.7	56.8%	$1,305.9	61.9%	$1,265.1	63.4%	$1,207.8	65.1%
75th Percentile	$1,067.6	69.4%	$1,036.3	70.2%	$1,382.6	59.7%	$1,081.0	68.7%	$980.6	71.7%	$834.1	75.9%
95th Percentile	$629.1	82.0%	$574.8	83.4%	$1,240.6	64.5%	$695.0	80.0%	$457.4	86.9%	$151.6	95.6%

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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



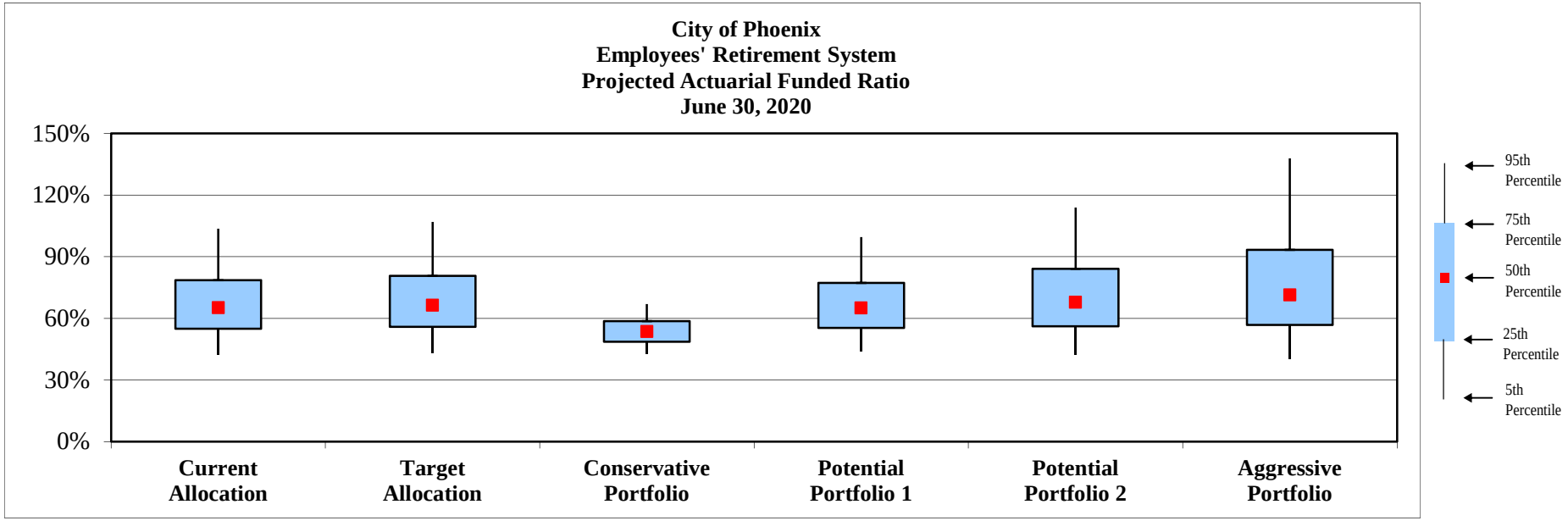
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$1,982.8	41.0%	$1,979.1	41.3%	$1,861.9	44.0%	$1,940.7	42.3%	$2,007.4	40.6%	$2,088.9	37.9%
25th Percentile	$1,621.4	52.3%	$1,603.6	52.5%	$1,706.6	49.5%	$1,598.5	52.7%	$1,602.8	52.5%	$1,620.9	52.1%
50th Percentile	$1,323.6	61.3%	$1,294.2	62.3%	$1,598.6	53.5%	$1,331.7	61.3%	$1,266.5	63.2%	$1,190.7	65.2%
75th Percentile	$984.1	71.9%	$947.3	72.6%	$1,464.0	57.8%	$1,016.2	70.7%	$868.4	74.9%	$657.4	81.2%
95th Percentile	$334.4	90.4%	$286.1	92.0%	$1,265.0	64.4%	$441.7	87.5%	$84.6	97.7%	($427.0)	112.3%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



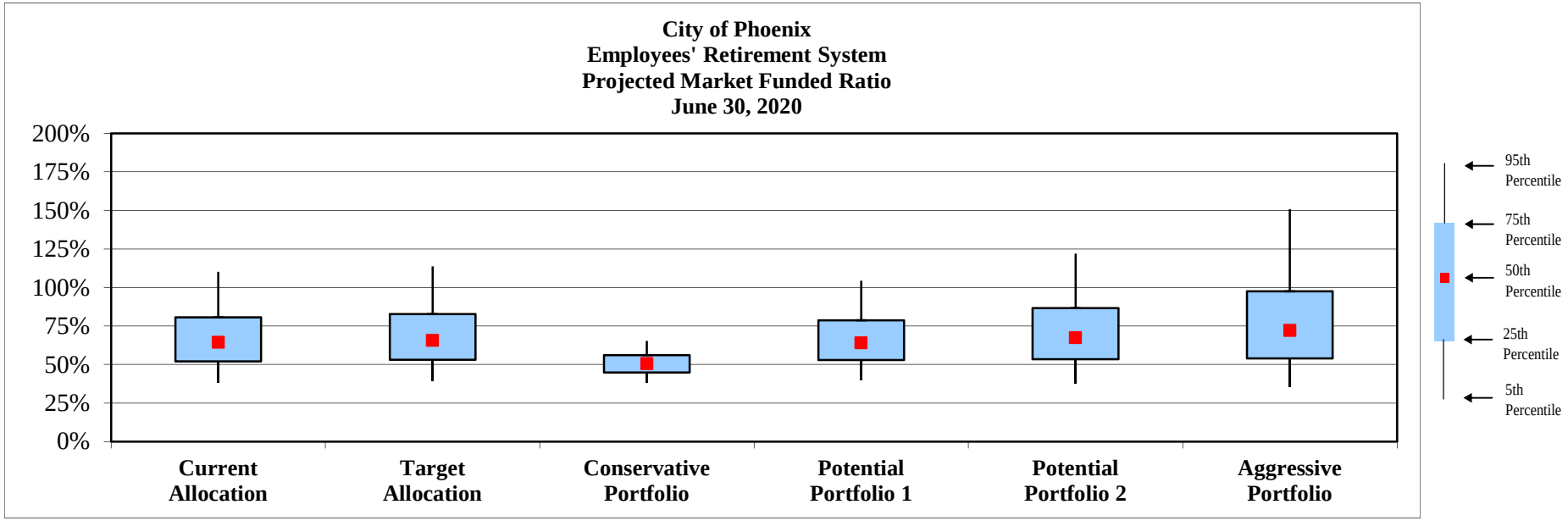
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,333.7	42.4%	$2,305.8	42.9%	$2,304.8	42.4%	$2,285.5	43.9%	$2,348.7	42.2%	$2,440.9	40.1%
25th Percentile	$1,864.6	54.9%	$1,836.0	55.9%	$2,106.8	48.6%	$1,836.5	55.3%	$1,823.7	56.2%	$1,795.8	56.8%
50th Percentile	$1,458.0	65.2%	$1,409.1	66.4%	$1,947.3	53.5%	$1,463.8	65.1%	$1,349.2	67.8%	$1,183.7	71.4%
75th Percentile	$898.1	78.6%	$815.3	80.7%	$1,762.1	58.7%	$961.2	77.3%	$685.6	84.1%	$283.2	93.4%
95th Percentile	($151.0)	103.6%	($291.3)	106.9%	$1,456.3	67.0%	$24.3	99.5%	($636.1)	113.9%	($1,636.4)	137.9%

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.

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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



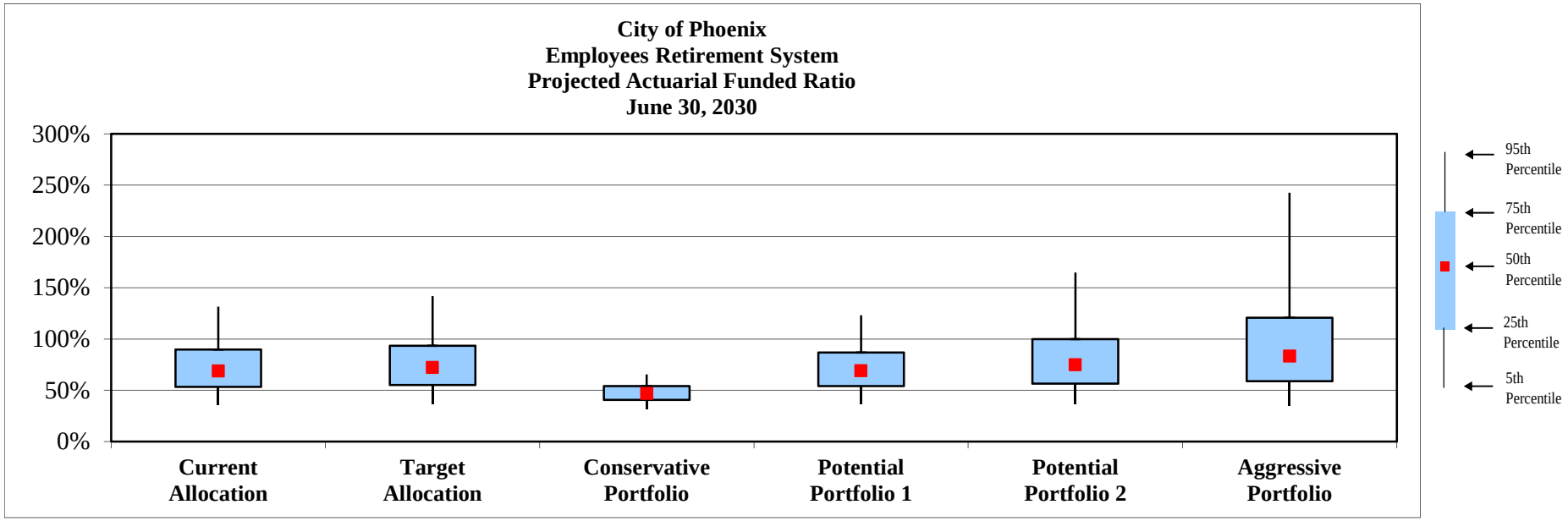
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,511.3	38.3%	$2,474.3	39.0%	$2,449.8	38.3%	$2,447.3	40.0%	$2,519.0	38.0%	$2,616.3	35.7%
25th Percentile	$1,969.5	52.0%	$1,913.2	53.1%	$2,238.0	44.9%	$1,923.6	52.8%	$1,923.0	53.4%	$1,907.0	54.0%
50th Percentile	$1,490.1	64.4%	$1,440.6	65.6%	$2,074.2	50.5%	$1,510.2	64.0%	$1,370.7	67.5%	$1,178.5	72.1%
75th Percentile	$835.5	80.7%	$741.2	82.7%	$1,881.5	56.1%	$918.0	78.8%	$570.7	86.6%	$104.0	97.6%
95th Percentile	($442.8)	110.2%	($604.9)	113.7%	$1,566.5	65.4%	($200.3)	104.4%	($980.2)	122.0%	($2,250.5)	150.8%

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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



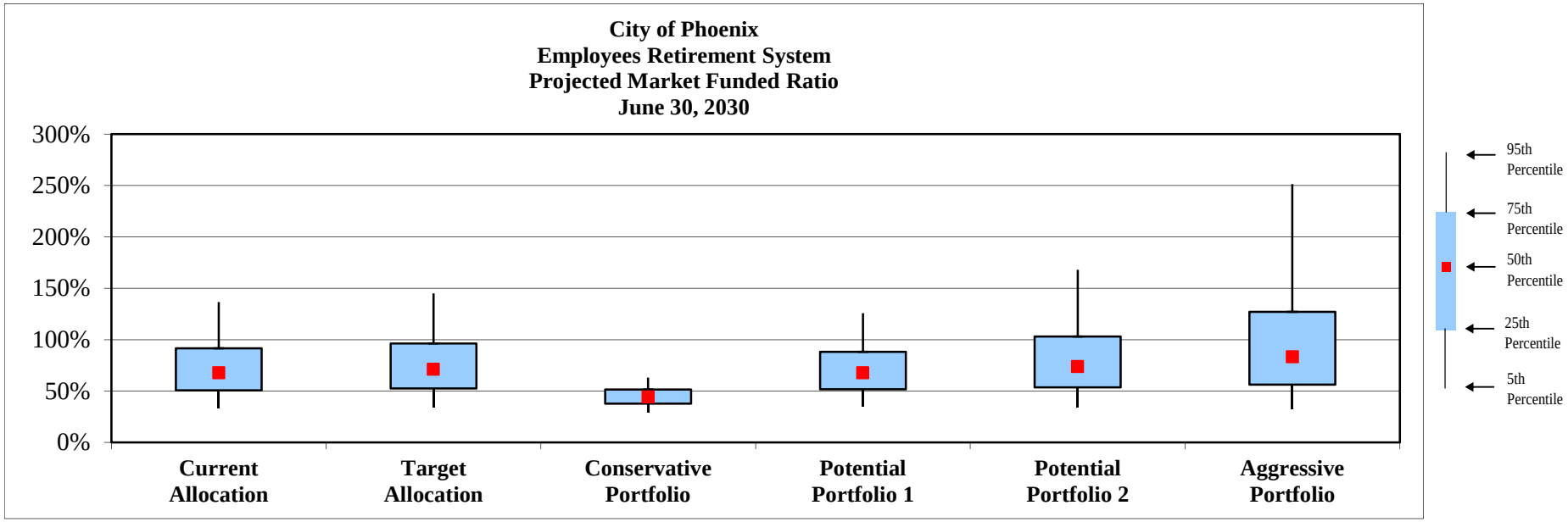
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$3,519.5	35.4%	$3,460.9	36.7%	$3,733.1	31.2%	$3,428.6	36.6%	$3,487.5	36.6%	$3,578.3	35.1%
25th Percentile	$2,615.1	53.2%	$2,525.8	55.0%	$3,337.7	40.5%	$2,584.4	53.9%	$2,469.7	56.4%	$2,348.1	58.7%
50th Percentile	$1,844.5	68.8%	$1,640.9	72.0%	$3,089.5	46.8%	$1,828.5	68.8%	$1,484.3	74.7%	$995.7	83.1%
75th Percentile	$640.2	89.5%	$418.7	93.3%	$2,800.3	54.1%	$782.1	86.8%	$3.2	100.0%	($1,249.3)	120.8%
95th Percentile	($1,985.0)	131.6%	($2,608.9)	141.9%	$2,274.8	65.4%	($1,436.6)	123.0%	($4,040.2)	164.8%	($8,695.5)	242.7%

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.

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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$3,670.6	32.8%	$3,577.4	34.1%	$3,876.5	28.7%	$3,527.5	34.4%	$3,626.9	33.9%	$3,725.4	32.2%
25th Percentile	$2,767.4	50.5%	$2,656.1	52.5%	$3,486.2	37.6%	$2,728.4	51.5%	$2,612.1	53.5%	$2,492.4	56.2%
50th Percentile	$1,897.1	67.6%	$1,699.6	71.0%	$3,243.8	44.2%	$1,906.9	67.6%	$1,499.3	73.7%	$932.9	83.2%
75th Percentile	$550.8	91.3%	$244.9	96.1%	$2,961.1	51.4%	$727.5	87.9%	($186.1)	103.0%	($1,622.0)	127.1%
95th Percentile	($2,287.1)	136.4%	($2,782.1)	144.9%	$2,471.7	62.9%	($1,720.6)	125.7%	($4,290.7)	168.0%	($9,433.0)	251.2%

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

The table below shows the probability (at the conclusion of the forecast period) that the Plan will be fully funded (market value of assets meets or exceed liabilities) and the probability the Plan's asset will be less than 50% of liabilities for each of the six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

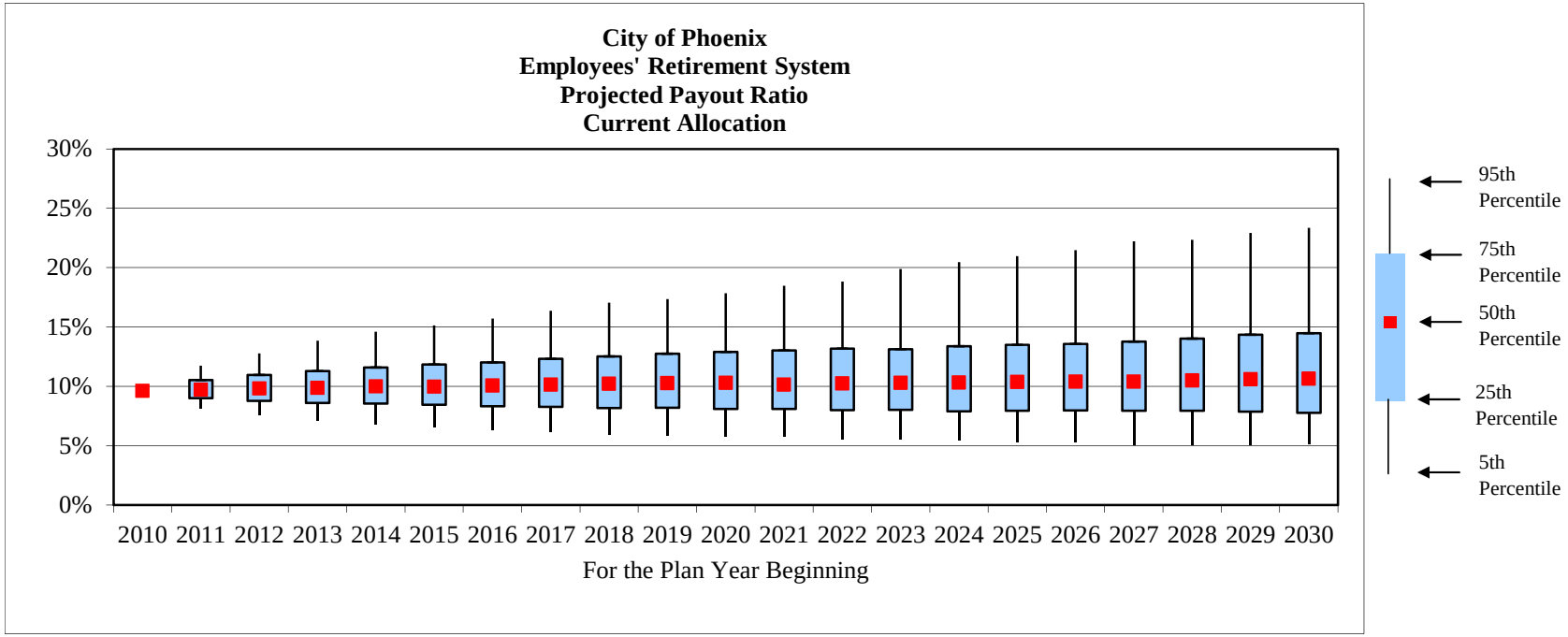
	Probability of Full Funding in 2030	**Probability of less than 50% Funding in 2030**
Current Allocation	19%	24%
Target Allocation	22%	21%
Conservative Portfolio	0%	71%
Potential Portfolio 1	15%	23%
Potential Portfolio 2	27%	20%
Aggressive Portfolio	39%	19%

Stochastic Analysis (continued)

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

The graph below displays the range of possible 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 9.6% and 10.6%. The worst-case scenario could reach 23% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.8%	9.9%	10.0%	10.0%	10.1%	10.1%	10.2%	10.3%	10.3%	10.1%	10.2%	10.3%	10.3%	10.4%	10.4%	10.4%	10.5%	10.6%	10.6%

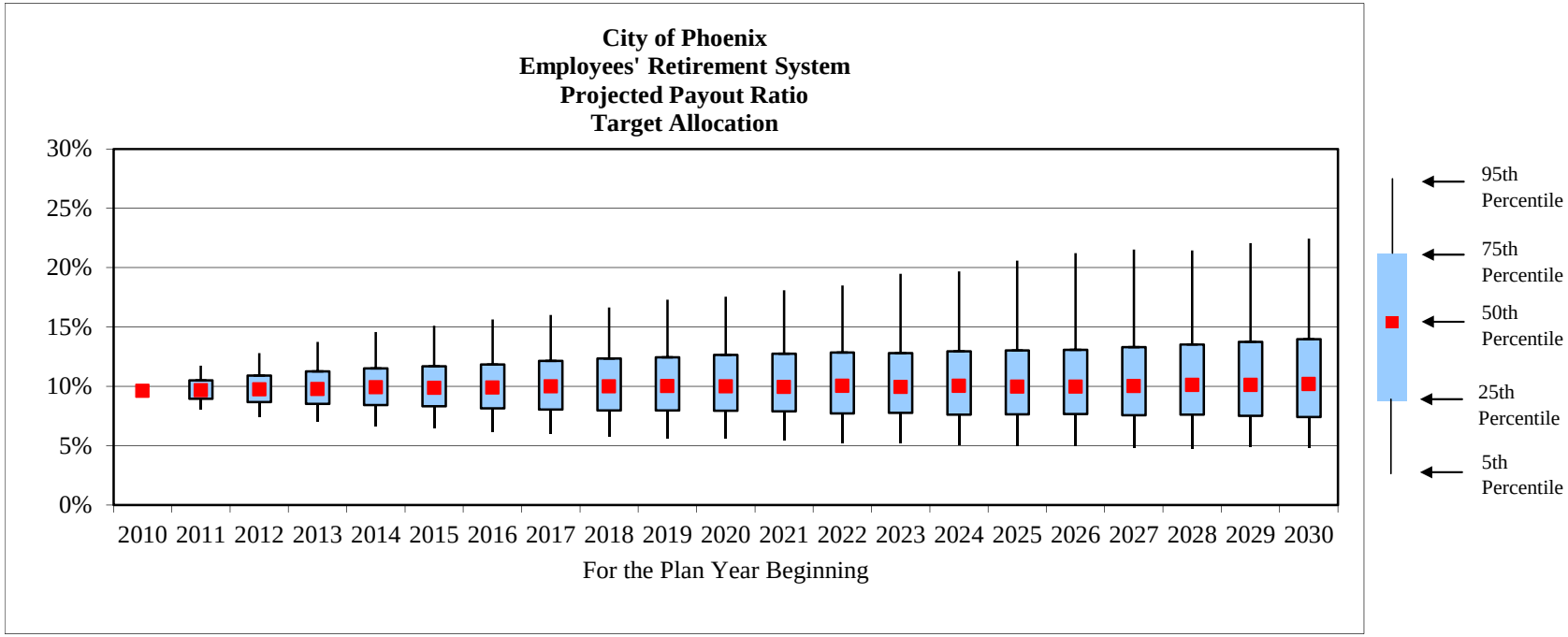
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

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

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the Target 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 9.6% and 10.2%. The worst-case scenario could reach 22% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.7%	9.8%	9.9%	9.9%	9.9%	10.0%	10.0%	10.0%	10.0%	9.9%	10.0%	9.9%	10.0%	10.0%	10.0%	10.0%	10.1%	10.1%	10.2%

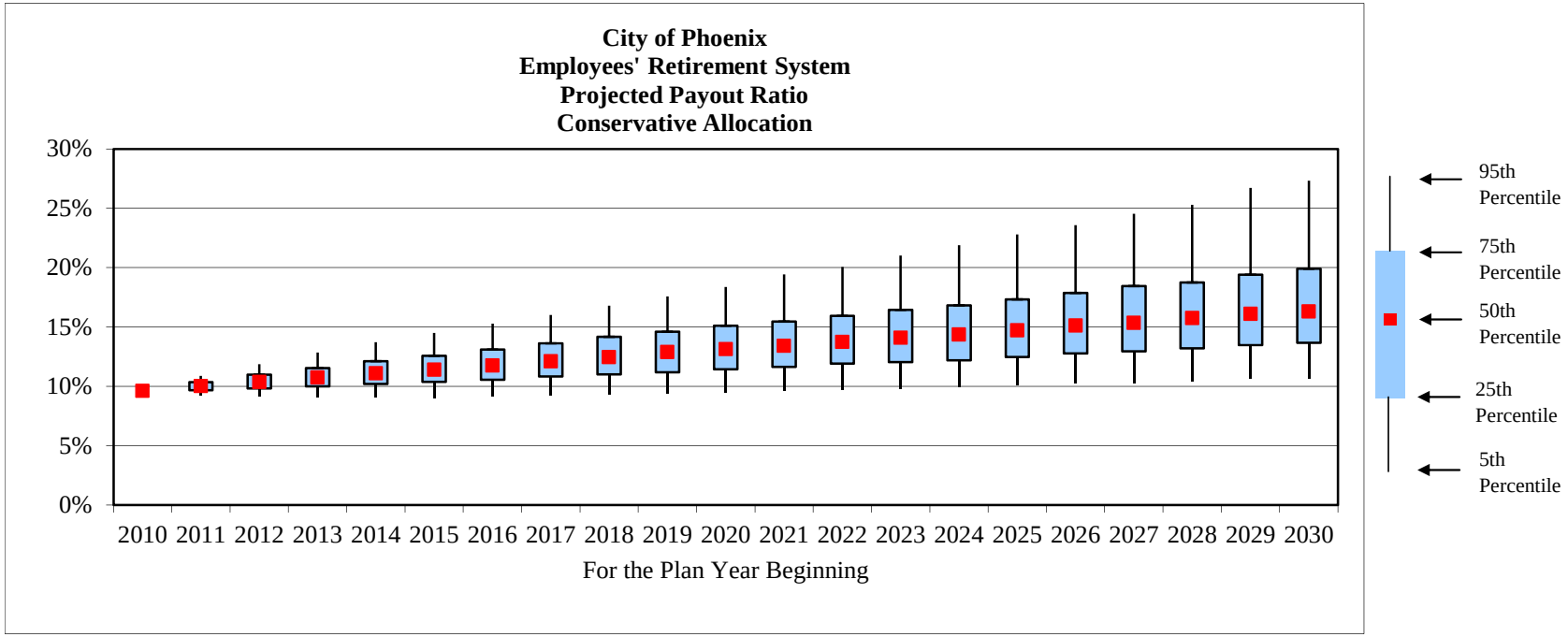
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

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

The graph below displays the range of possible 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 9.6% and 16.3%. The worst-case scenario could reach 27% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	10.0%	10.4%	10.8%	11.1%	11.4%	11.8%	12.1%	12.5%	12.9%	13.1%	13.4%	13.7%	14.1%	14.4%	14.7%	15.1%	15.4%	15.8%	16.1%	16.3%

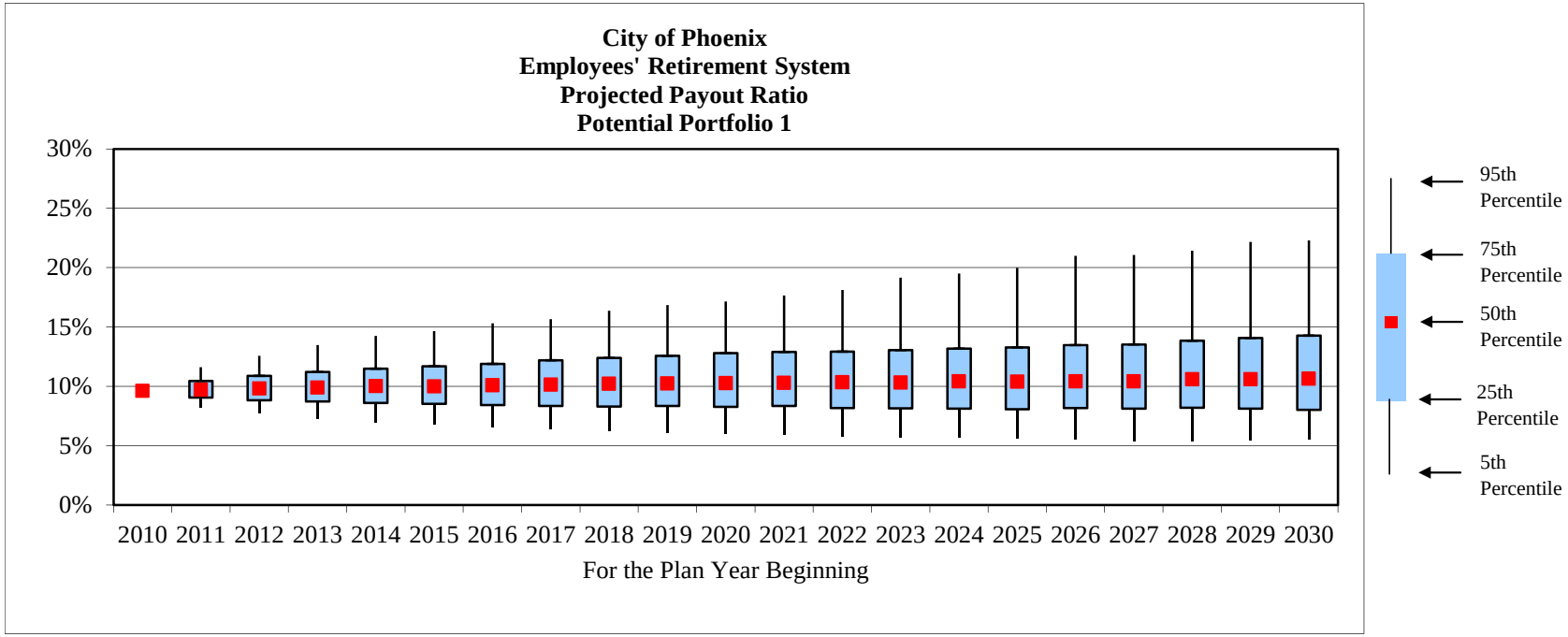
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

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

The graph below displays the range of possible 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 9.6% and 10.7%. The worst-case scenario could reach 22% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.8%	9.9%	10.0%	10.0%	10.1%	10.2%	10.2%	10.2%	10.3%	10.3%	10.3%	10.3%	10.4%	10.4%	10.4%	10.4%	10.6%	10.6%	10.7%

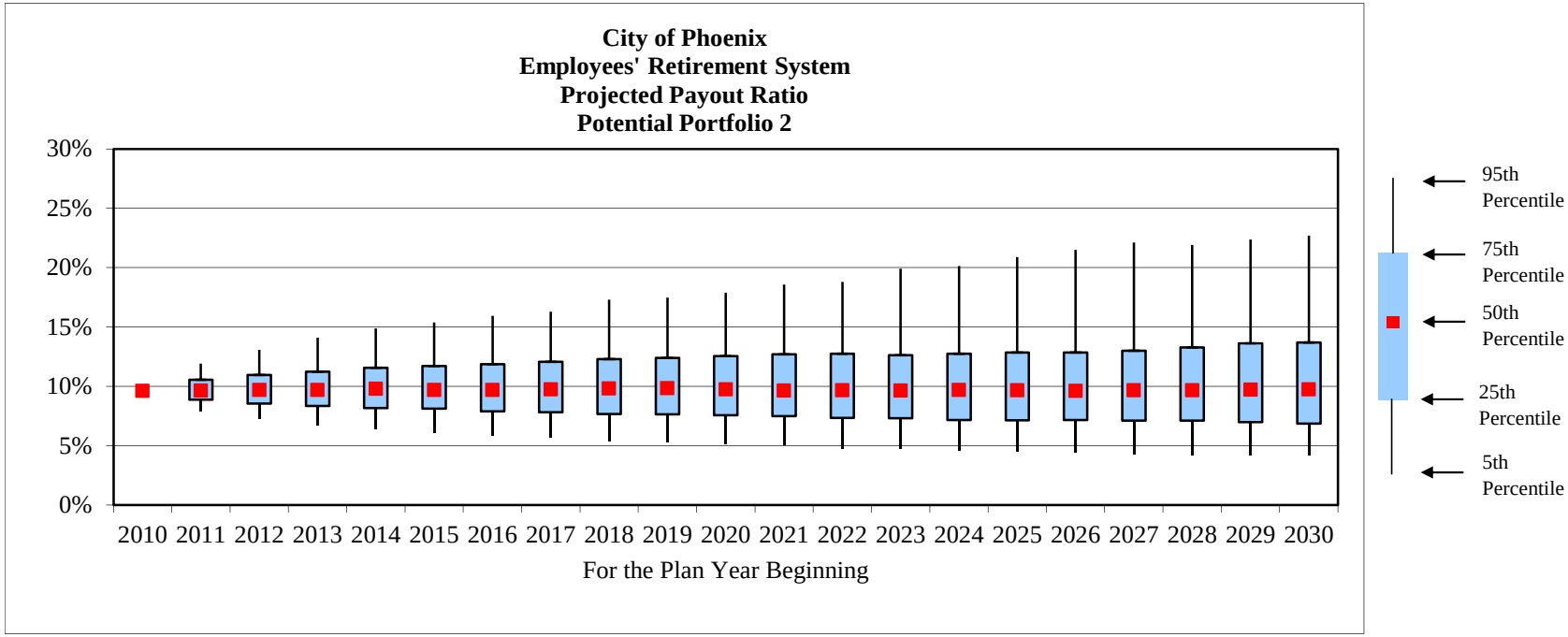
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

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

The graph below displays the range of possible 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 9.6% and 9.8%. The worst-case scenario could reach 23% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.7%	9.7%	9.8%	9.7%	9.7%	9.7%	9.8%	9.8%	9.7%	9.6%	9.7%	9.6%	9.7%	9.7%	9.6%	9.7%	9.7%	9.7%	9.8%

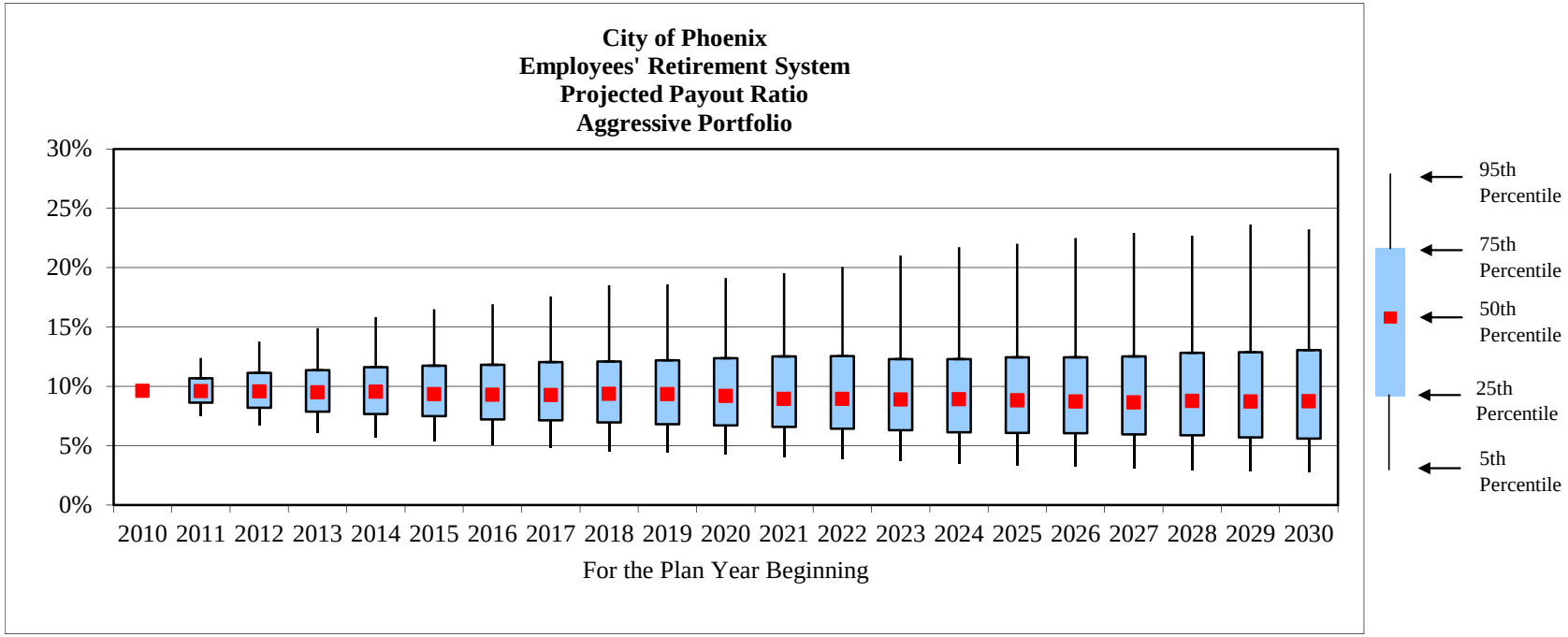
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Stochastic Analysis (continued)

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

The graph below displays the range of possible 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 8.6% and 9.6%. The worst-case scenario could reach 24% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.6%	9.5%	9.6%	9.3%	9.3%	9.3%	9.4%	9.3%	9.2%	9.0%	8.9%	8.9%	8.9%	8.8%	8.7%	8.6%	8.8%	8.7%	8.8%

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.

Stochastic Analysis (continued)

Employer Contributions (as a percentage of pay)

The table below shows the range of required employer contributions (as a percentage of pay) assuming the six different asset mixes highlighted on the prior pages.

	Required Employer Contribution for Plan Year Beginning 2030				
	5th	**25th**	**Median**	**75th**	**95th**
Current Allocation	30.5%	23.4%	17.9%	11.2%	0.0%
Target Allocation	30.2%	22.9%	16.9%	9.9%	0.0%
Conservative Portfolio	33.1%	28.2%	25.1%	22.3%	18.3%
Potential Portfolio 1	30.1%	23.2%	17.9%	12.0%	0.6%
Potential Portfolio 2	30.1%	22.4%	16.0%	7.7%	0.0%
Aggressive Portfolio	30.5%	21.4%	13.3%	1.0%	0.0%

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 six different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios at the end of the projection period.

	Actuarial Funded Ratio in Year 20			Market Funded Ratio in Year 20			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20 Median	2010-2030 Peak	2010-2030 Trough
Current Allocation	68.8%	35.4%	131.6%	67.6%	32.8%	136.4%	10.6%	10.6%	9.6%
Target Allocation	72.0%	36.7%	141.9%	71.0%	34.1%	144.9%	10.2%	10.2%	9.6%
Conservative Portfolio	46.8%	31.2%	65.4%	44.2%	28.7%	62.9%	16.3%	16.3%	9.6%
Potential Portfolio 1	68.8%	36.6%	123.0%	67.6%	34.4%	125.7%	10.7%	10.7%	9.6%
Potential Portfolio 2	74.7%	36.6%	164.8%	73.7%	33.9%	168.0%	9.8%	9.8%	9.6%
Aggressive Portfolio	83.1%	35.1%	242.7%	83.2%	32.2%	251.2%	8.8%	9.6%	8.6%

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:

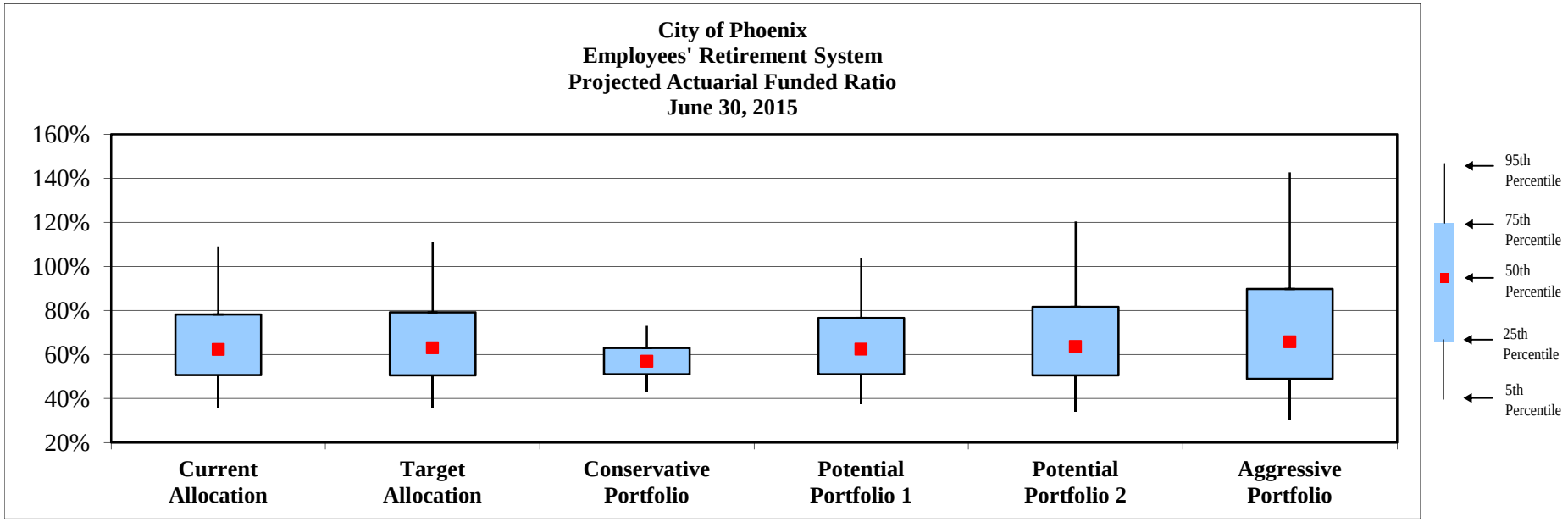
Asset Class	Arithmetic Return Assumption	Standard Deviation Assumption	Standard Deviation Assumption Doubled
Broad US Equity	8.15	18.10	36.20
Broad International Equity	8.65	20.10	40.20
Int. Duration Fixed Income	4.50	5.50	11.00
Real Return	6.25	11.25	22.50
Core Real Estate	7.00	12.50	25.00
Non-Core Real Estate	10.00	21.50	43.00
Long/Short Equity	8.00	12.50	25.00
Cash Equivalents	2.25	3.00	6.00

RVK supports the 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



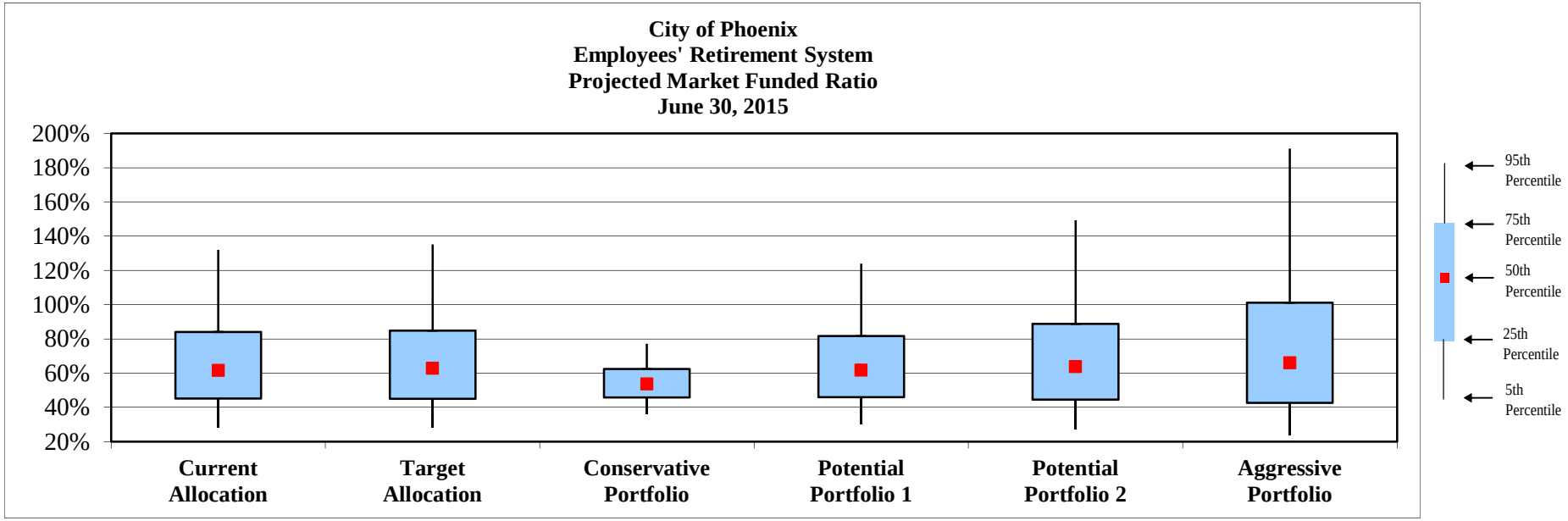
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,189.8	35.6%	$2,167.4	35.9%	$1,907.7	43.4%	$2,132.6	37.5%	$2,229.7	34.3%	$2,348.3	30.2%
25th Percentile	$1,680.8	50.6%	$1,679.8	50.5%	$1,670.8	50.9%	$1,663.7	51.0%	$1,695.0	50.5%	$1,755.0	48.9%
50th Percentile	$1,292.6	62.3%	$1,279.7	62.9%	$1,483.4	56.9%	$1,303.1	62.3%	$1,257.4	63.6%	$1,188.6	65.7%
75th Percentile	$786.3	78.2%	$737.5	79.1%	$1,281.8	62.9%	$824.3	76.6%	$652.3	81.6%	$356.4	89.7%
95th Percentile	($312.7)	109.1%	($394.1)	111.3%	$975.2	73.0%	($140.4)	103.8%	($697.1)	120.4%	($1,540.5)	142.7%

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); **5 Years**

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



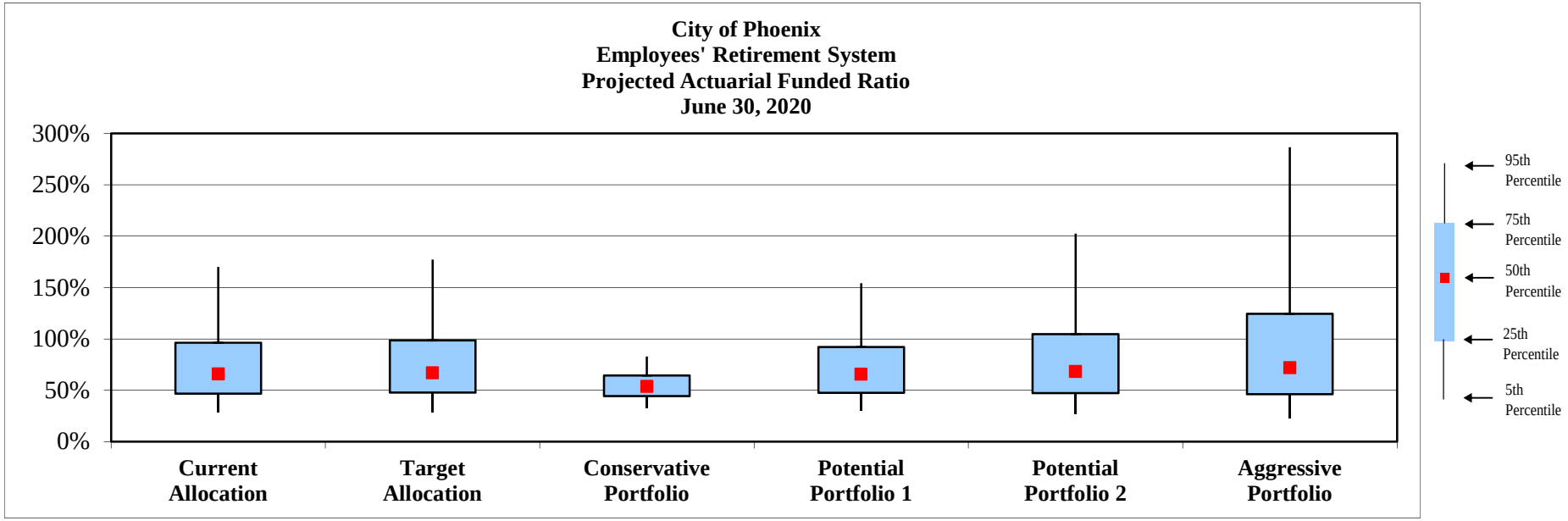
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,414.3	28.2%	$2,394.1	28.0%	$2,090.4	36.1%	$2,348.8	30.0%	$2,445.2	26.9%	$2,566.2	23.4%
25th Percentile	$1,853.1	45.2%	$1,837.0	45.0%	$1,814.1	45.8%	$1,813.3	45.9%	$1,860.1	44.5%	$1,929.1	42.5%
50th Percentile	$1,313.1	61.6%	$1,284.4	62.7%	$1,605.3	53.6%	$1,324.6	61.6%	$1,252.9	63.6%	$1,170.5	66.0%
75th Percentile	$559.6	84.1%	$535.8	84.8%	$1,327.0	62.4%	$652.6	81.7%	$385.5	88.9%	($43.2)	101.1%
95th Percentile	($1,167.8)	132.0%	($1,305.8)	135.1%	$833.7	77.1%	($874.1)	123.9%	($1,789.7)	149.2%	($3,254.1)	191.2%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



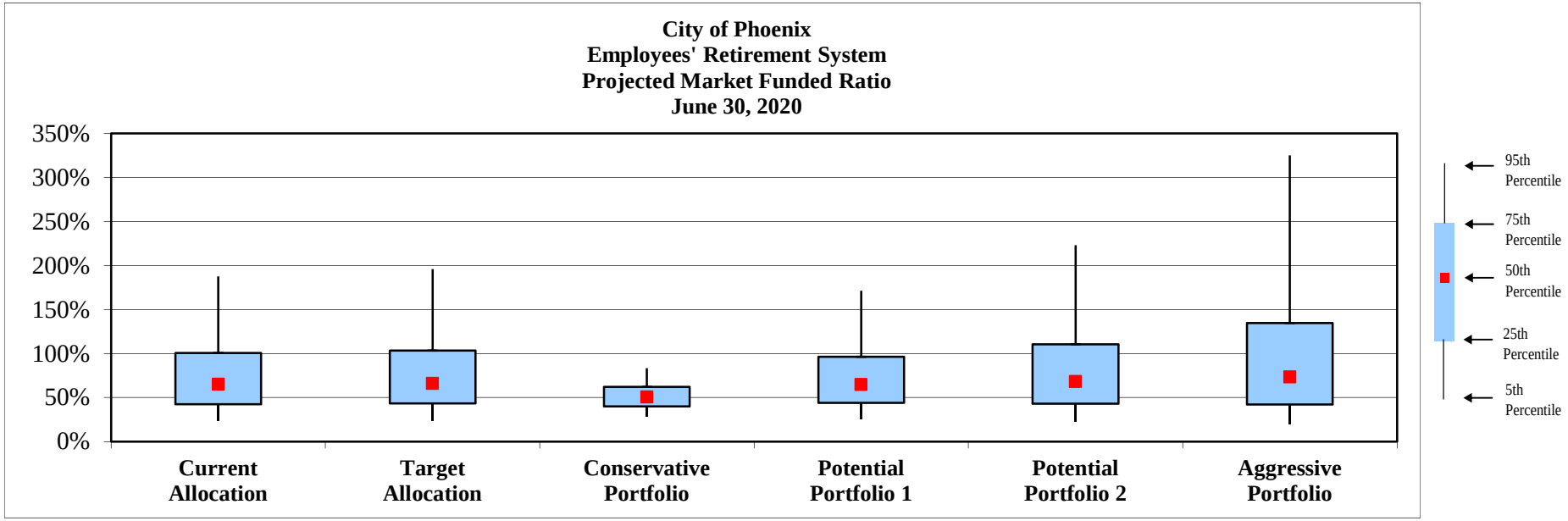
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,887.6	28.4%	$2,872.2	28.6%	$2,629.6	32.8%	$2,820.3	30.1%	$2,939.8	26.8%	$3,114.7	22.9%
25th Percentile	$2,162.1	46.6%	$2,147.7	47.7%	$2,249.0	44.2%	$2,121.6	47.5%	$2,159.5	47.2%	$2,204.2	46.1%
50th Percentile	$1,452.0	65.7%	$1,415.9	66.8%	$1,946.2	53.6%	$1,454.7	65.4%	$1,342.6	68.1%	$1,151.9	71.8%
75th Percentile	$178.5	96.1%	$66.6	98.6%	$1,565.8	64.3%	$351.5	92.0%	($212.9)	104.5%	($1,047.8)	124.3%
95th Percentile	($3,319.8)	170.0%	($3,571.4)	177.2%	$798.5	82.9%	($2,548.5)	154.2%	($4,776.8)	202.5%	($8,413.0)	286.6%

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); **10 Years**

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



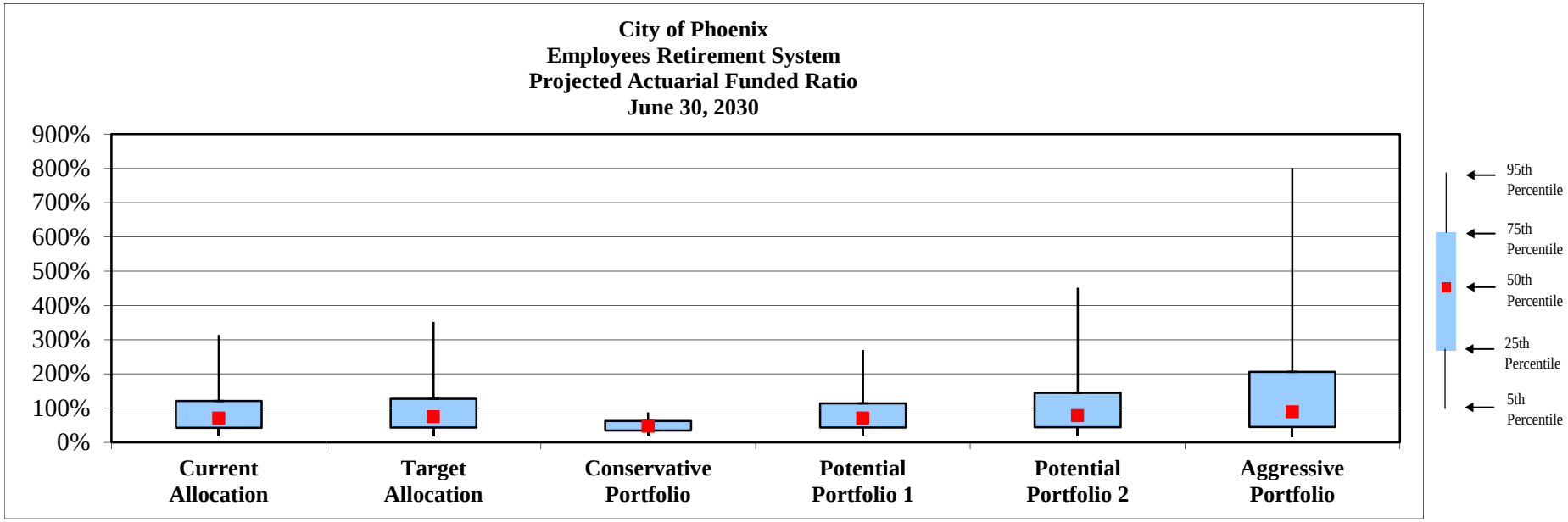
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$3,092.6	23.8%	$3,067.6	24.0%	$2,776.2	28.3%	$3,011.3	25.3%	$3,168.1	22.6%	$3,298.2	19.2%
25th Percentile	$2,330.9	42.5%	$2,274.8	43.2%	$2,373.2	39.8%	$2,249.0	43.8%	$2,297.0	43.1%	$2,353.5	42.0%
50th Percentile	$1,465.7	64.9%	$1,450.7	65.9%	$2,074.2	50.4%	$1,507.7	64.6%	$1,358.2	68.1%	$1,127.0	73.3%
75th Percentile	($22.6)	100.4%	($154.0)	103.2%	$1,667.0	62.2%	$154.7	96.3%	($473.2)	110.4%	($1,495.6)	134.6%
95th Percentile	($4,082.2)	187.6%	($4,557.3)	195.9%	$809.4	83.2%	($3,330.3)	171.3%	($5,962.8)	223.1%	($10,634.6)	325.0%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



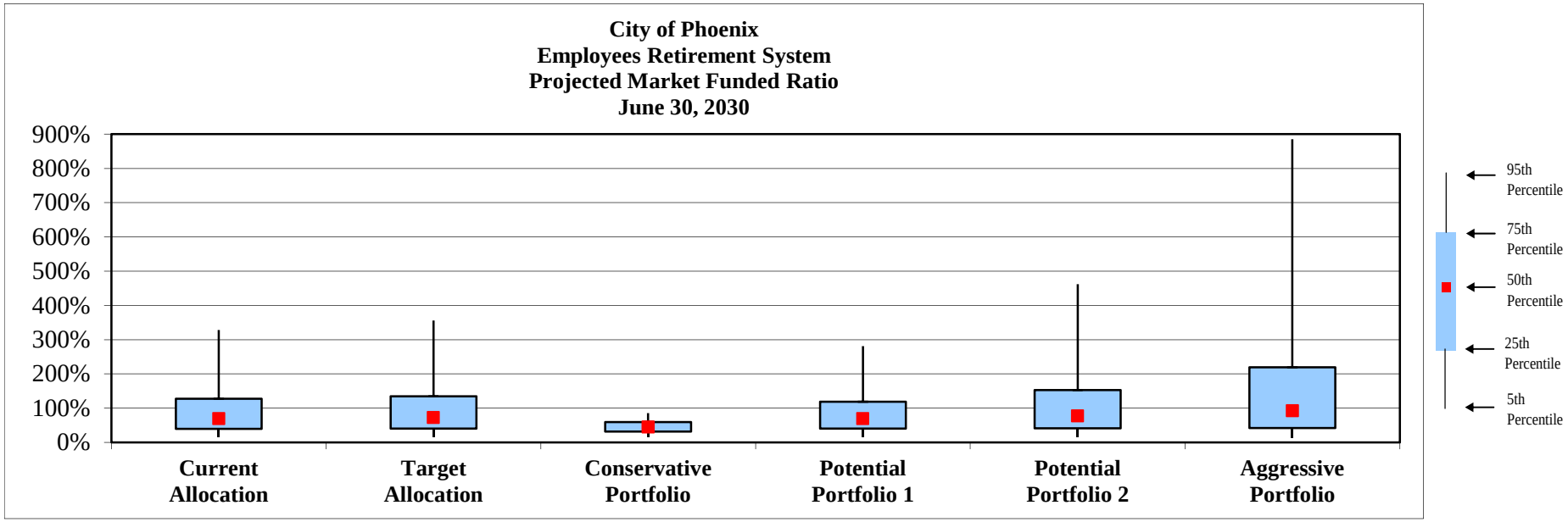
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$4,437.7	18.1%	$4,347.2	18.1%	$4,463.4	17.7%	$4,329.3	19.1%	$4,444.2	17.3%	$4,629.1	15.4%
25th Percentile	$3,045.1	42.3%	$2,976.0	43.4%	$3,523.3	34.5%	$2,987.6	43.6%	$2,962.7	44.4%	$2,997.2	45.0%
50th Percentile	$1,748.3	70.7%	$1,505.6	74.3%	$3,041.8	47.1%	$1,743.9	70.4%	$1,325.9	78.0%	$641.7	88.9%
75th Percentile	($1,337.4)	120.9%	($1,877.7)	126.8%	$2,445.6	61.9%	($870.8)	113.6%	($2,895.2)	144.6%	($6,526.5)	205.8%
95th Percentile	($15,075.8)	314.2%	($18,244.5)	351.7%	$989.9	87.4%	($12,311.6)	269.3%	($24,104.6)	451.5%	($48,187.8)	801.7%

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



	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$4,672.4	15.0%	$4,626.5	16.0%	$4,578.5	15.6%	$4,578.5	16.6%	$4,718.9	14.9%	$4,876.2	13.8%
25th Percentile	$3,210.3	39.2%	$3,151.4	40.1%	$3,663.1	31.7%	$3,143.0	39.8%	$3,140.3	41.0%	$3,104.5	41.5%
50th Percentile	$1,826.2	69.1%	$1,578.6	72.3%	$3,184.0	44.4%	$1,846.7	69.3%	$1,322.8	77.1%	$486.8	91.8%
75th Percentile	($1,833.0)	127.2%	($2,334.4)	134.5%	$2,616.7	58.9%	($1,199.0)	118.3%	($3,597.9)	152.8%	($7,640.0)	219.1%
95th Percentile	($15,984.0)	328.5%	($18,890.5)	356.1%	$1,140.6	85.6%	($12,879.3)	280.5%	($25,658.8)	461.5%	($52,767.7)	885.5%

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

The table below shows the probability (at the conclusion of the forecast period) that the Plan will be fully funded (market value of assets meets or exceed liabilities) and the probability the Plan's asset will be less than 50% of liabilities for each of the six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

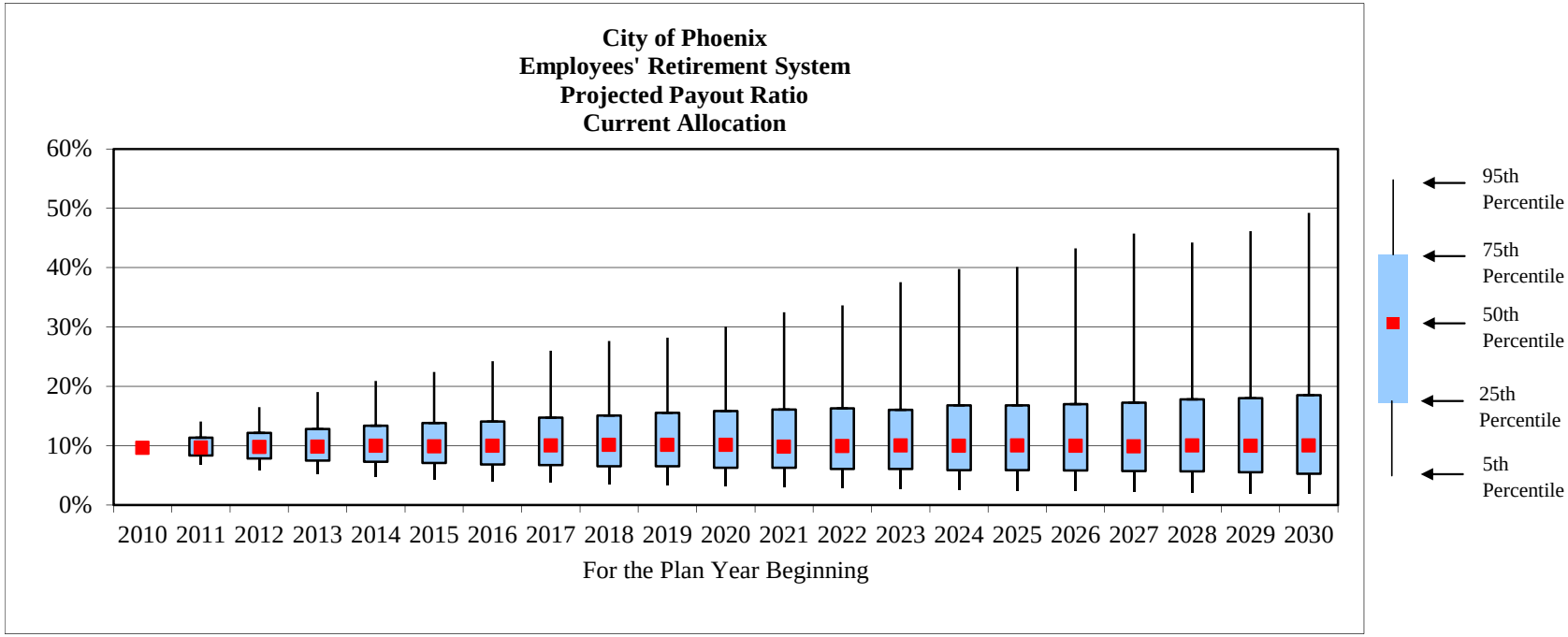
	Probability of Full Funding in 2030	**Probability of less than 50% Funding in 2030**
Current Allocation	34%	36%
Target Allocation	36%	34%
Conservative Portfolio	2%	60%
Potential Portfolio 1	32%	35%
Potential Portfolio 2	40%	33%
Aggressive Portfolio	47%	31%

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 range of possible 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 9.6% and 10.2%. The worst-case scenario could reach 49% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.8%	9.8%	10.0%	9.9%	10.0%	10.0%	10.1%	10.2%	10.2%	9.9%	9.9%	10.0%	10.0%	10.0%	10.0%	9.9%	10.1%	10.0%	10.0%

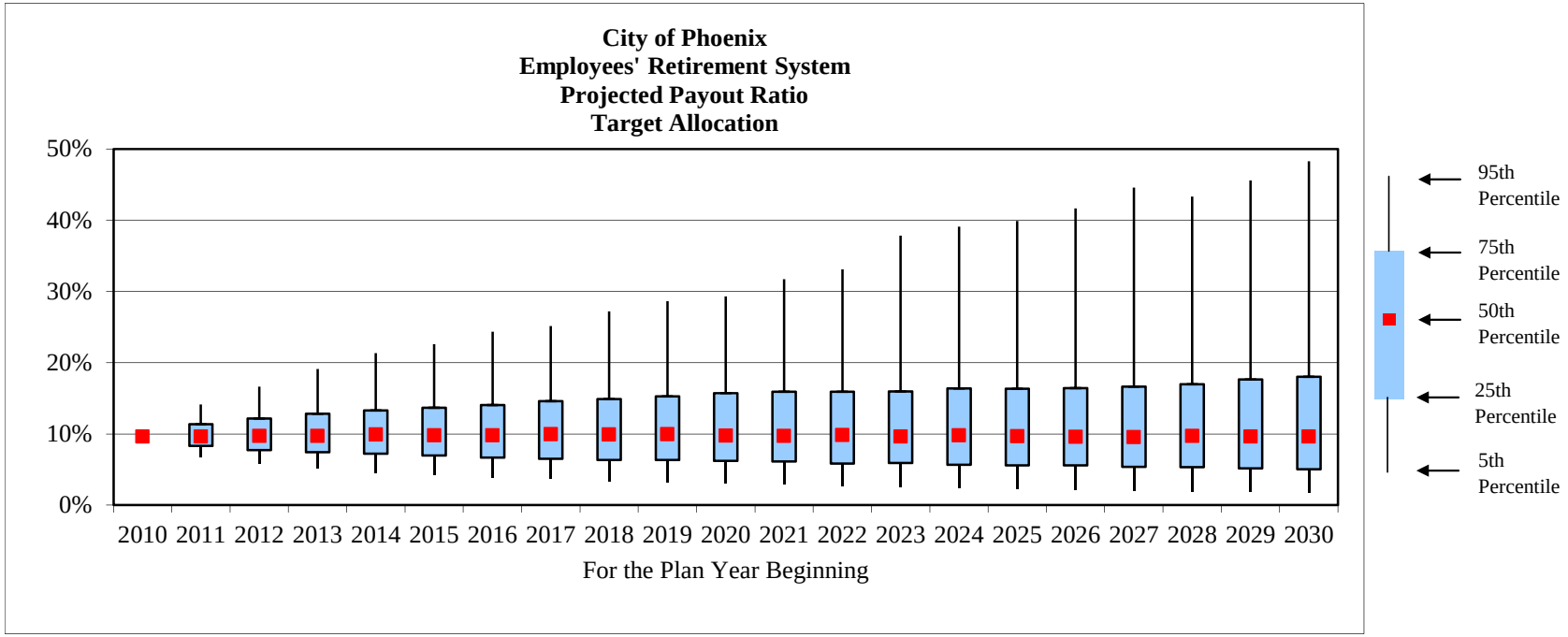
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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

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

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the Target 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 9.6% and 9.9%. The worst-case scenario could reach 48% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.7%	9.7%	9.9%	9.8%	9.8%	9.9%	9.9%	9.9%	9.7%	9.7%	9.8%	9.6%	9.8%	9.7%	9.6%	9.6%	9.7%	9.6%	9.6%

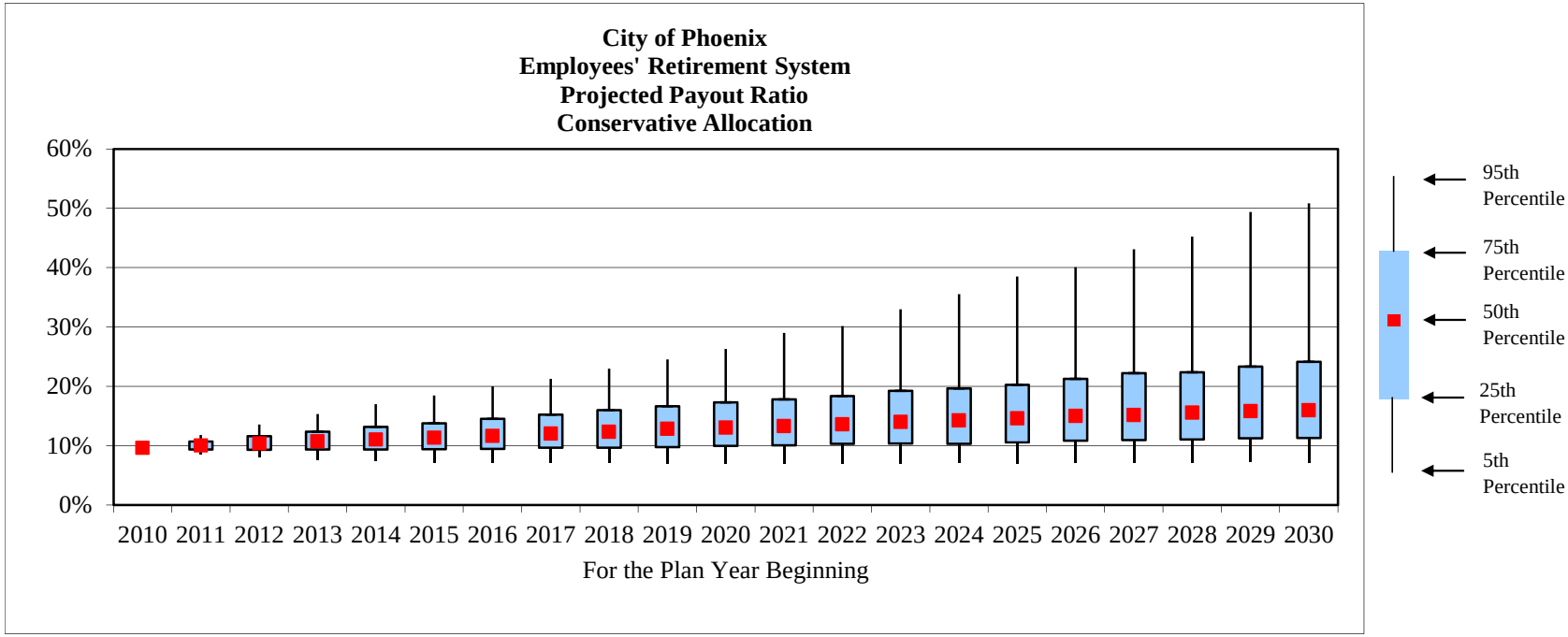
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

Appendix 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 range of possible 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 9.6% and 16.0%. The worst-case scenario could reach 51% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	10.0%	10.4%	10.8%	11.1%	11.3%	11.7%	12.0%	12.3%	12.9%	13.0%	13.3%	13.6%	14.0%	14.3%	14.6%	15.0%	15.2%	15.6%	15.8%	16.0%

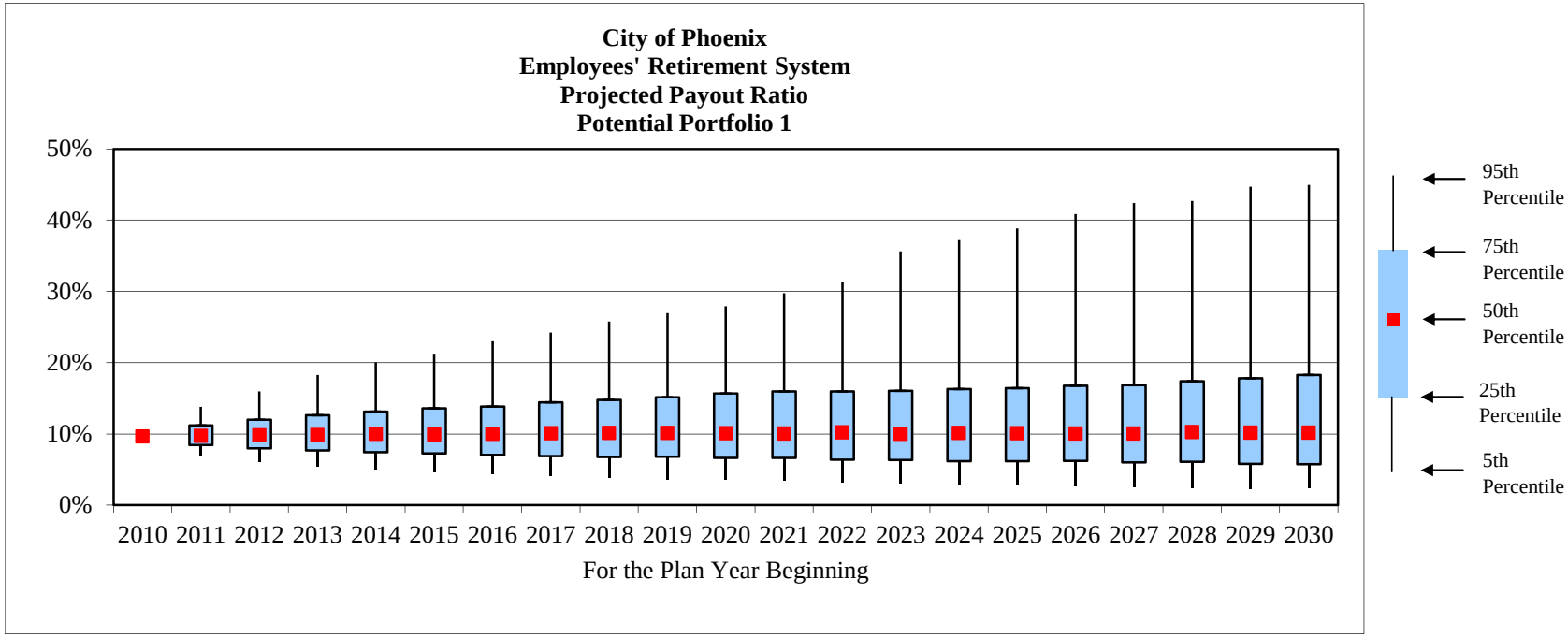
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 9.6% and 10.2%. The worst-case scenario could reach 45% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.8%	9.8%	10.0%	9.9%	10.0%	10.1%	10.1%	10.1%	10.1%	10.1%	10.2%	10.0%	10.1%	10.1%	10.0%	10.0%	10.2%	10.1%	10.2%

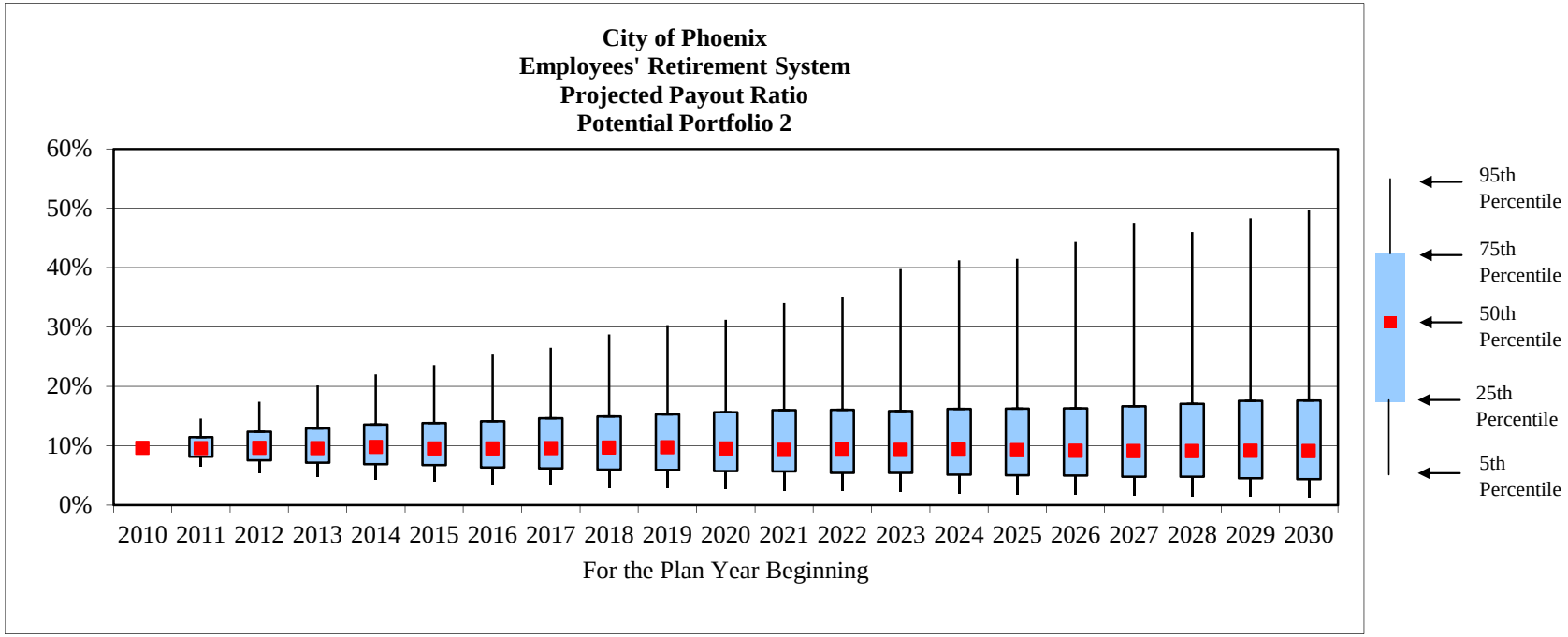
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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

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

The graph below displays the range of possible 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 9.1% and 9.8%. The worst-case scenario could reach 50% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.7%	9.6%	9.8%	9.6%	9.6%	9.6%	9.7%	9.8%	9.5%	9.3%	9.4%	9.3%	9.3%	9.2%	9.1%	9.1%	9.1%	9.1%	9.1%

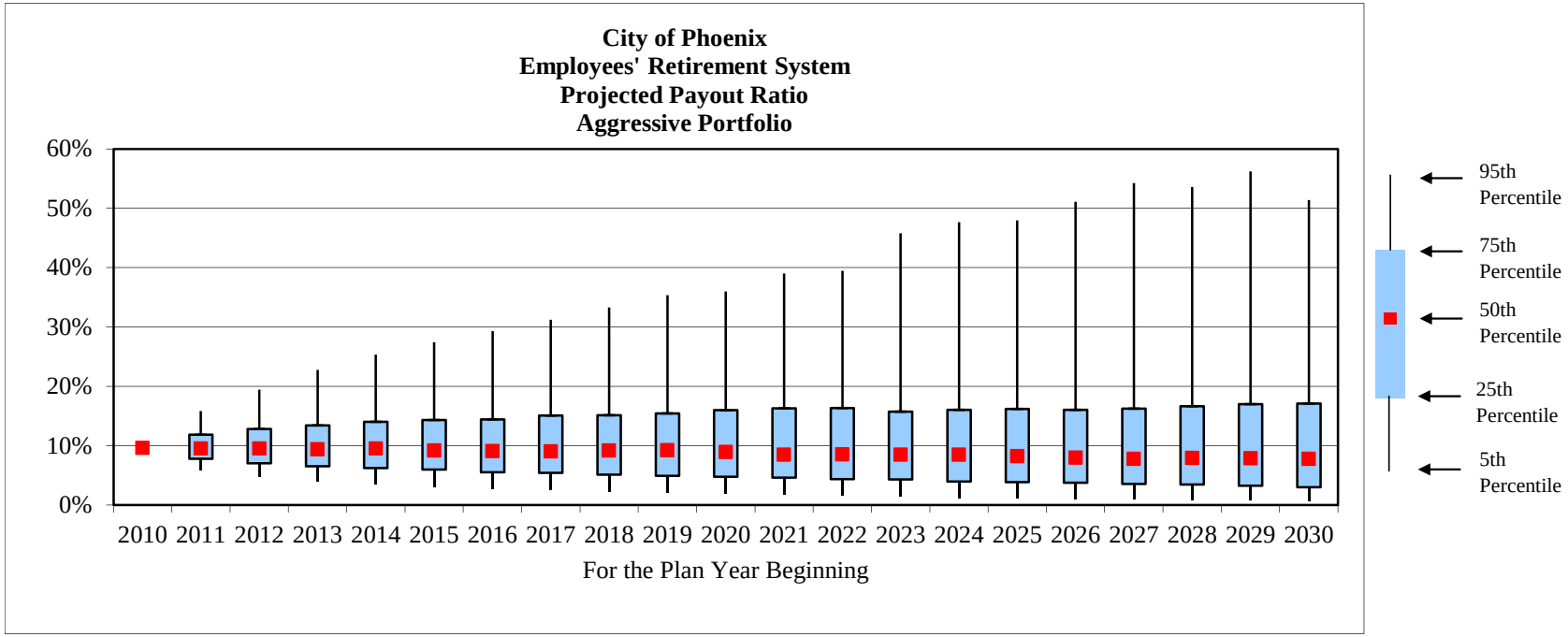
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 7.8% and 9.6%. The worst-case scenario could reach 56% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.5%	9.4%	9.5%	9.2%	9.1%	9.0%	9.2%	9.2%	8.9%	8.5%	8.5%	8.5%	8.5%	8.2%	8.0%	7.8%	7.9%	7.9%	7.8%

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 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

Employer Contributions (as a percentage of pay)

The table below shows the range of required employer contributions (as a percentage of pay) assuming the six different asset mixes highlighted on the prior pages.

	Required Employer Contribution for the Plan Year Beginning 2030				
	5th	25th	Median	75th	95th
Current Allocation	35.9%	26.9%	18.3%	7.0%	0.0%
Target Allocation	35.8%	26.5%	17.3%	5.0%	0.0%
Conservative Portfolio	36.2%	30.0%	25.4%	20.6%	13.8%
Potential Portfolio 1	35.8%	26.8%	18.3%	7.3%	0.0%
Potential Portfolio 2	36.0%	26.1%	16.3%	2.7%	0.0%
Aggressive Portfolio	36.0%	25.2%	13.4%	0.0%	0.0%

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 six different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios at the end of the projection period.

	Actuarial Funded Ratio in Year 20			Market Funded Ratio in Year 20			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20 Median	2010-2030 Peak	2010-2030 Trough
Current Allocation	70.7%	18.1%	314.2%	69.1%	15.0%	328.5%	10.0%	10.2%	9.6%
Target Allocation	74.3%	18.1%	351.7%	72.3%	16.0%	356.1%	9.6%	9.9%	9.6%
Conservative Portfolio	47.1%	17.7%	87.4%	44.4%	15.6%	85.6%	16.0%	16.0%	9.6%
Potential Portfolio 1	70.4%	19.1%	269.3%	69.3%	16.6%	280.5%	10.2%	10.2%	9.6%
Potential Portfolio 2	78.0%	17.3%	451.5%	77.1%	14.9%	461.5%	9.1%	9.8%	9.1%
Aggressive Portfolio	88.9%	15.4%	801.7%	91.8%	13.8%	885.5%	7.8%	9.6%	7.8%

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:

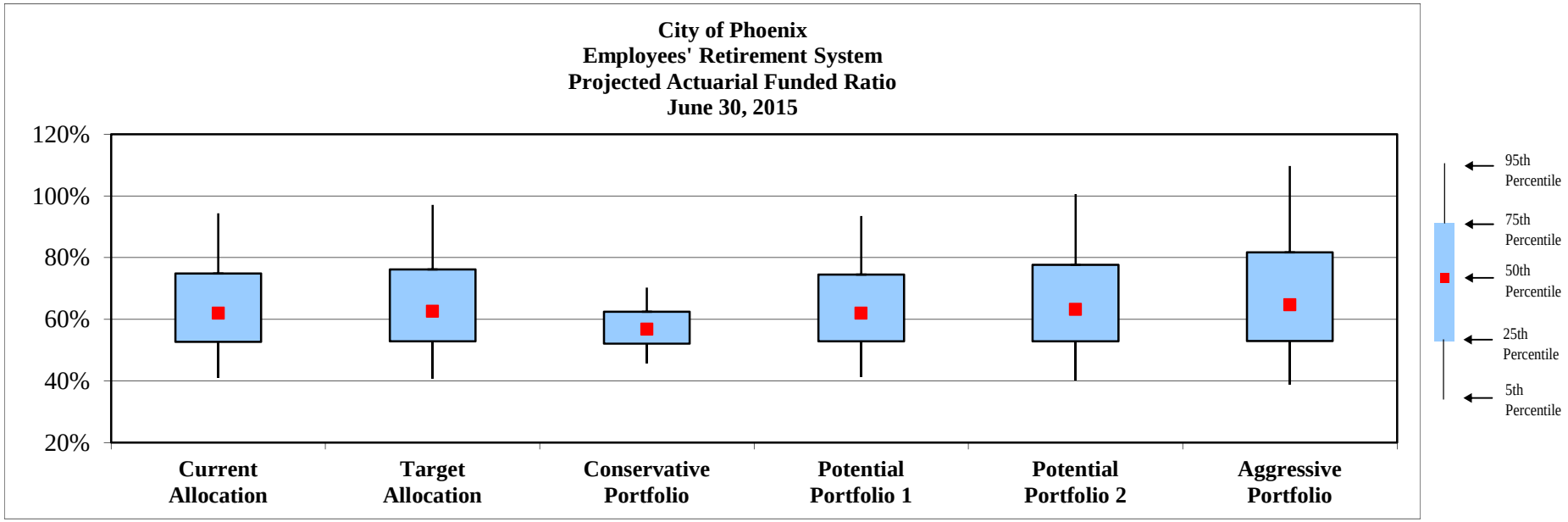
	Broad US Equity	Broad International Equity	Int. Duration Fixed Income	Real Return	Core Real Estate	Non-Core Real Estate	Long/Short Equity	Cash Equivalents
Broad US Equity	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Broad International Equity	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Int. Duration Fixed Income	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Real Return	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Core Real Estate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Non-Core Real Estate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Long/Short Equity	1.00	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	1.00

RVK supports the 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



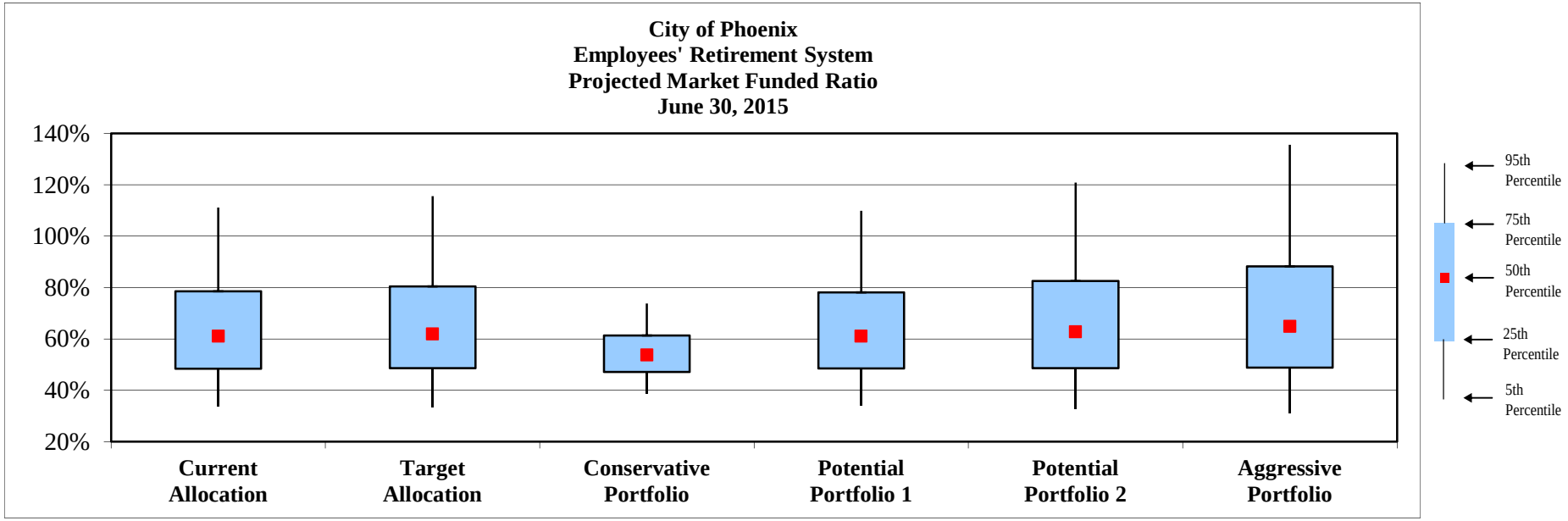
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$1,864.0	41.0%	$1,874.6	40.6%	$1,725.3	45.7%	$1,856.7	41.3%	$1,890.1	40.1%	$1,935.7	38.8%
25th Percentile	$1,567.1	52.7%	$1,559.8	52.8%	$1,592.0	52.1%	$1,563.0	52.8%	$1,561.1	52.9%	$1,562.5	52.9%
50th Percentile	$1,305.0	62.0%	$1,285.1	62.6%	$1,477.7	56.7%	$1,306.7	61.9%	$1,262.3	63.2%	$1,211.7	64.6%
75th Percentile	$901.9	74.8%	$853.4	76.2%	$1,335.6	62.4%	$912.5	74.5%	$796.6	77.7%	$650.6	81.7%
95th Percentile	$212.3	94.4%	$110.5	97.1%	$1,110.7	70.3%	$242.8	93.5%	($22.4)	100.6%	($360.5)	109.7%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



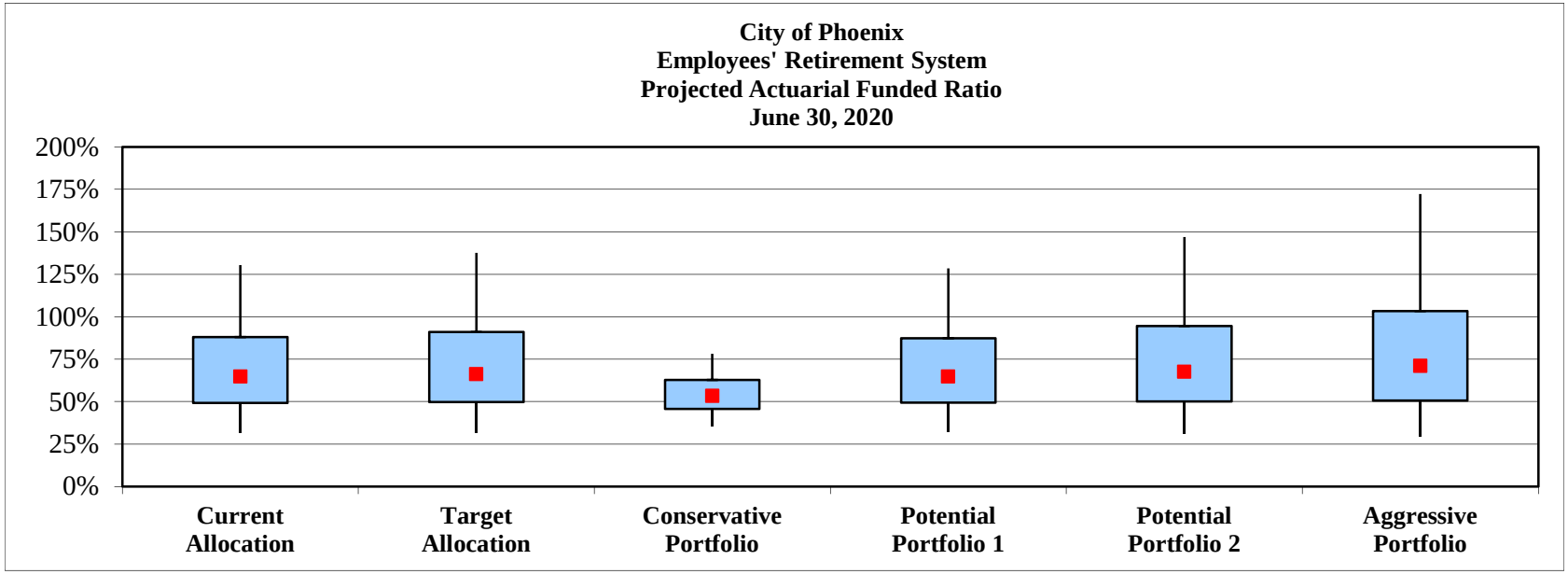
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,102.2	33.6%	$2,111.8	33.3%	$1,942.9	38.5%	$2,091.0	34.0%	$2,130.3	32.7%	$2,172.2	31.3%
25th Percentile	$1,713.4	48.3%	$1,704.6	48.6%	$1,754.6	47.0%	$1,708.0	48.5%	$1,703.6	48.6%	$1,699.4	48.7%
50th Percentile	$1,335.2	61.1%	$1,307.4	61.9%	$1,591.0	53.7%	$1,337.9	61.1%	$1,279.3	62.7%	$1,204.8	64.9%
75th Percentile	$766.5	78.5%	$698.4	80.4%	$1,369.9	61.4%	$782.6	78.1%	$620.7	82.5%	$424.1	88.2%
95th Percentile	($422.5)	111.2%	($584.2)	115.6%	$978.2	73.7%	($371.6)	109.8%	($783.0)	120.8%	($1,329.6)	135.6%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



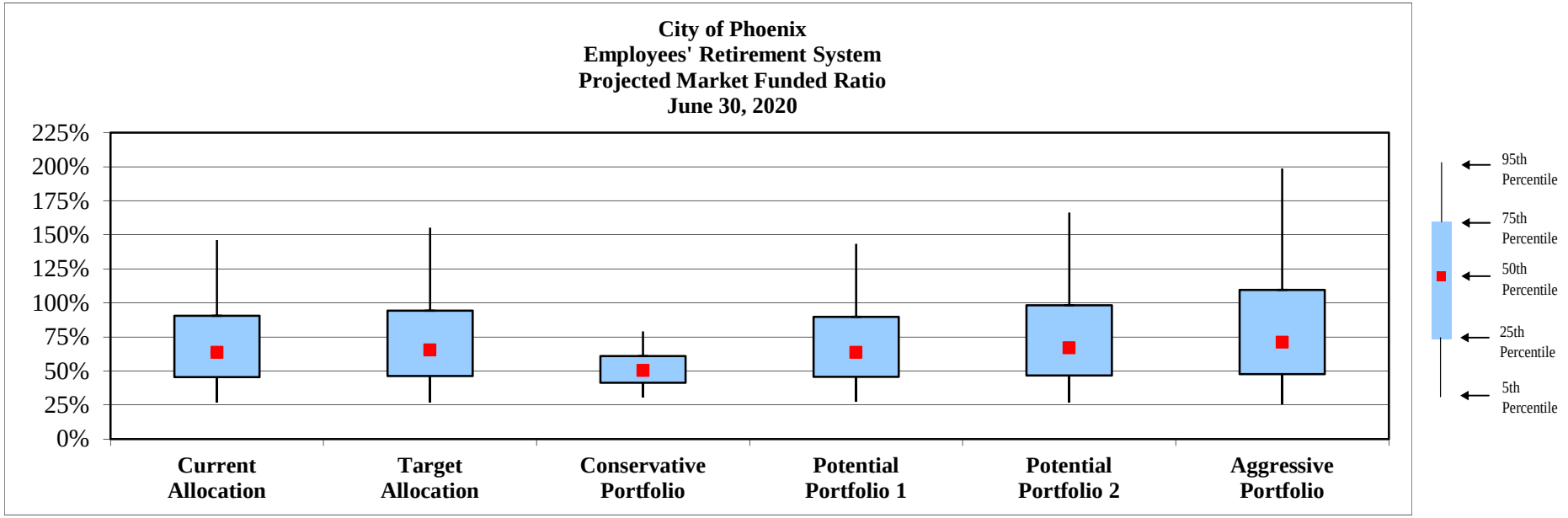
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,477.5	31.7%	$2,483.2	31.4%	$2,358.3	35.4%	$2,466.8	32.1%	$2,505.0	31.0%	$2,556.4	29.6%
25th Percentile	$2,004.3	49.3%	$1,981.9	49.8%	$2,143.2	45.6%	$1,998.7	49.4%	$1,972.6	50.1%	$1,946.9	50.5%
50th Percentile	$1,473.5	64.7%	$1,417.6	66.2%	$1,947.0	53.3%	$1,478.7	64.7%	$1,365.0	67.6%	$1,216.7	71.0%
75th Percentile	$527.3	88.0%	$400.2	91.0%	$1,652.7	62.8%	$554.6	87.4%	$242.3	94.6%	($151.9)	103.4%
95th Percentile	($1,461.6)	130.4%	($1,828.3)	137.6%	$1,057.9	78.2%	($1,364.2)	128.4%	($2,249.4)	147.0%	($3,502.8)	172.2%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



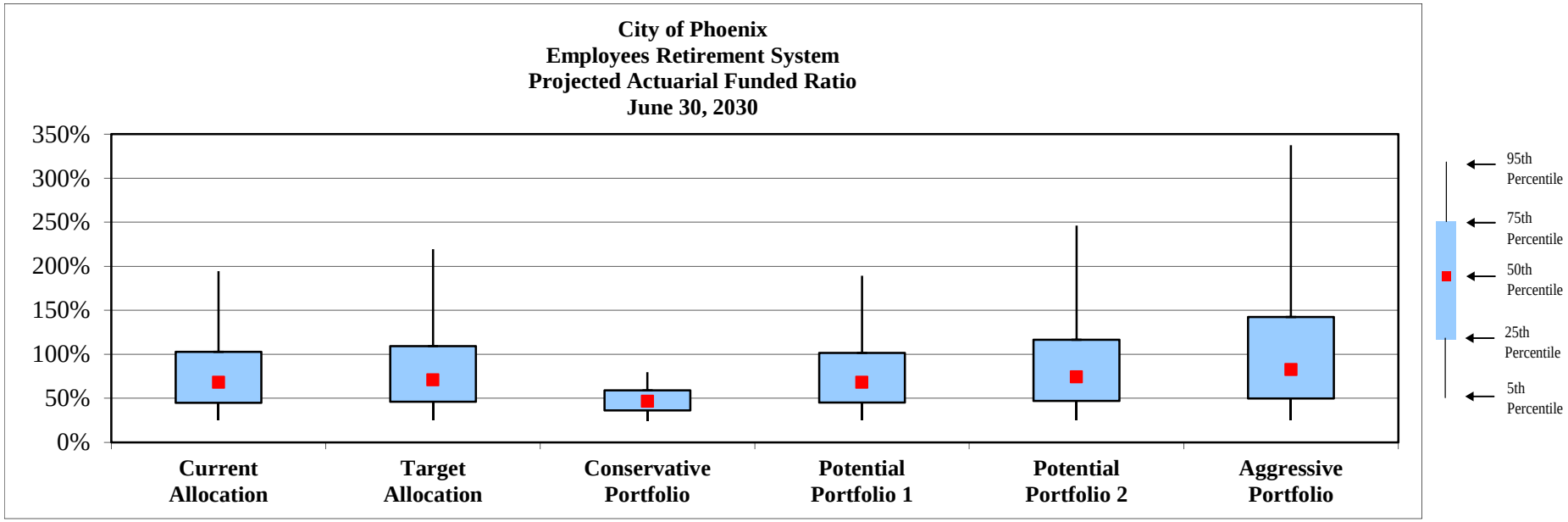
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$2,651.4	27.1%	$2,657.2	27.0%	$2,521.9	30.5%	$2,638.1	27.4%	$2,675.3	26.6%	$2,718.1	25.5%
25th Percentile	$2,146.2	45.5%	$2,124.5	46.2%	$2,310.8	41.3%	$2,137.9	45.7%	$2,110.8	46.6%	$2,076.8	47.7%
50th Percentile	$1,524.7	63.6%	$1,454.8	65.2%	$2,080.1	50.3%	$1,528.0	63.5%	$1,389.6	66.8%	$1,214.4	71.1%
75th Percentile	$425.1	90.5%	$253.8	94.2%	$1,735.4	60.9%	$454.8	89.8%	$75.7	98.3%	($420.2)	109.5%
95th Percentile	($2,227.1)	146.1%	($2,670.6)	155.3%	$1,025.8	79.0%	($2,112.3)	143.4%	($3,200.6)	166.4%	($4,831.6)	198.7%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



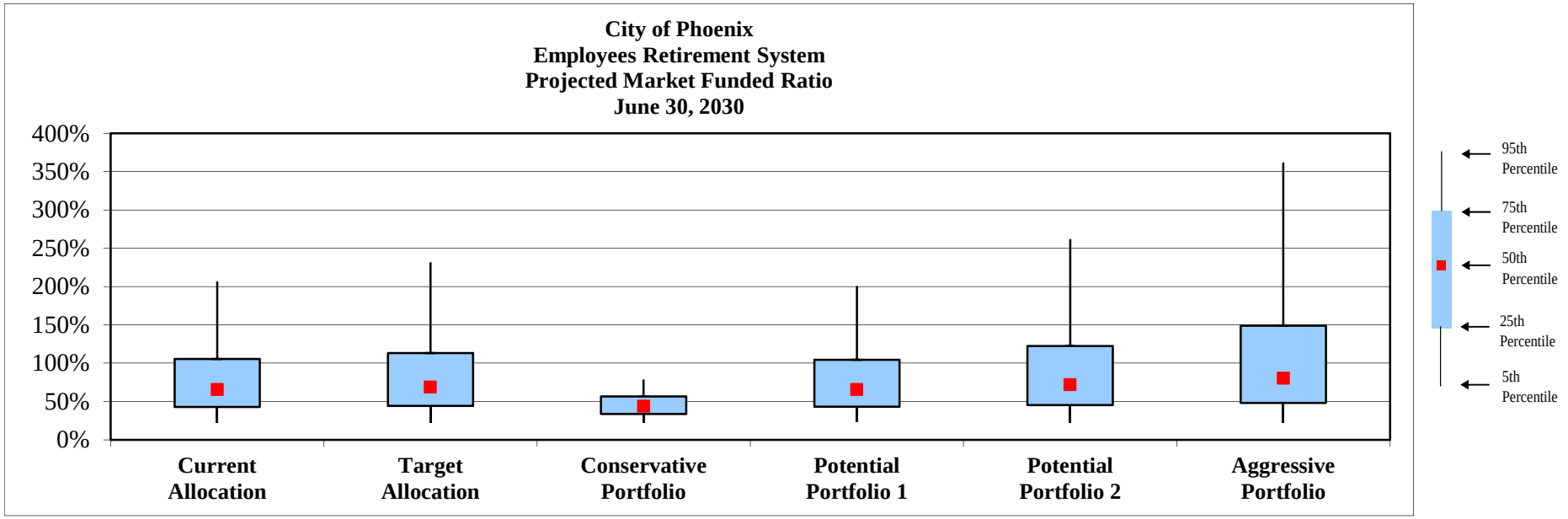
	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$3,476.7	25.1%	$3,466.7	25.3%	$3,519.0	24.6%	$3,463.6	25.4%	$3,471.1	25.3%	$3,479.0	25.0%
25th Percentile	$2,894.2	44.9%	$2,830.9	46.1%	$3,344.6	36.2%	$2,886.5	45.1%	$2,780.6	47.1%	$2,641.6	49.6%
50th Percentile	$1,869.6	68.1%	$1,690.6	71.0%	$3,100.3	46.6%	$1,877.9	67.9%	$1,514.4	74.1%	$1,017.6	82.6%
75th Percentile	($175.9)	102.7%	($595.4)	109.2%	$2,661.6	59.1%	($105.9)	101.6%	($1,076.6)	116.5%	($2,788.5)	142.3%
95th Percentile	($7,170.6)	194.2%	($8,832.1)	219.3%	$1,562.9	79.6%	($6,801.8)	189.3%	($11,139.2)	246.0%	($18,070.1)	337.4%

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 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 six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.



	Current Allocation		Target Allocation		Conservative Portfolio		Potential Portfolio 1		Potential Portfolio 2		Aggressive Portfolio	
	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio	Unfunded Liability (Mil)	Funded Ratio
5th Percentile	$3,602.4	22.3%	$3,593.8	22.4%	$3,602.2	22.0%	$3,587.0	22.7%	$3,597.8	22.3%	$3,611.2	21.8%
25th Percentile	$3,017.3	43.0%	$2,946.5	44.2%	$3,499.6	33.6%	$3,006.9	43.1%	$2,891.7	45.3%	$2,755.5	48.1%
50th Percentile	$2,006.9	65.5%	$1,830.7	68.8%	$3,288.9	43.6%	$2,022.6	65.4%	$1,635.2	71.7%	$1,139.2	80.3%
75th Percentile	($348.6)	105.3%	($890.7)	113.3%	$2,819.6	56.7%	($279.3)	104.2%	($1,457.5)	122.3%	($3,264.7)	149.1%
95th Percentile	($8,117.8)	206.7%	($9,904.4)	231.6%	$1,610.7	78.8%	($7,641.7)	200.8%	($12,171.5)	262.0%	($20,178.4)	362.0%

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 (at the conclusion of the forecast period) that the Plan will be fully funded (market value of assets meets or exceed liabilities) and the probability the Plan's asset will be less than 50% of liabilities for each of the six different asset mixes highlighted on the prior pages. The results below assume the current contribution policy remains unchanged for all projection years.

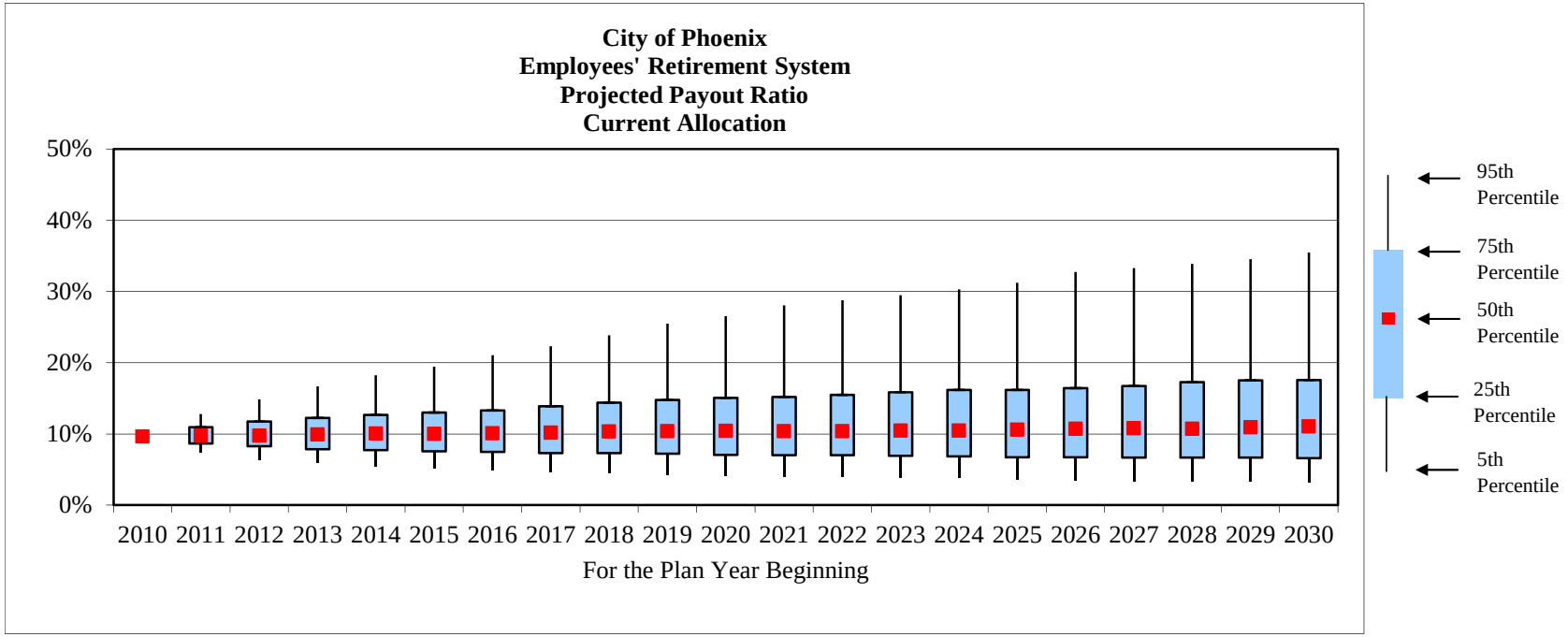
	Probability of Full Funding in 2030	**Probability of 50% Funded in 2030**
Current Allocation	28%	34%
Target Allocation	30%	31%
Conservative Portfolio	0%	64%
Potential Portfolio 1	27%	33%
Potential Portfolio 2	34%	30%
Aggressive Portfolio	40%	27%

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 range of possible 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 9.6% and 11.1%. The worst-case scenario could reach 35% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.8%	9.7%	9.9%	10.0%	10.0%	10.1%	10.2%	10.3%	10.4%	10.4%	10.4%	10.4%	10.5%	10.5%	10.6%	10.7%	10.8%	10.7%	10.9%	11.1%

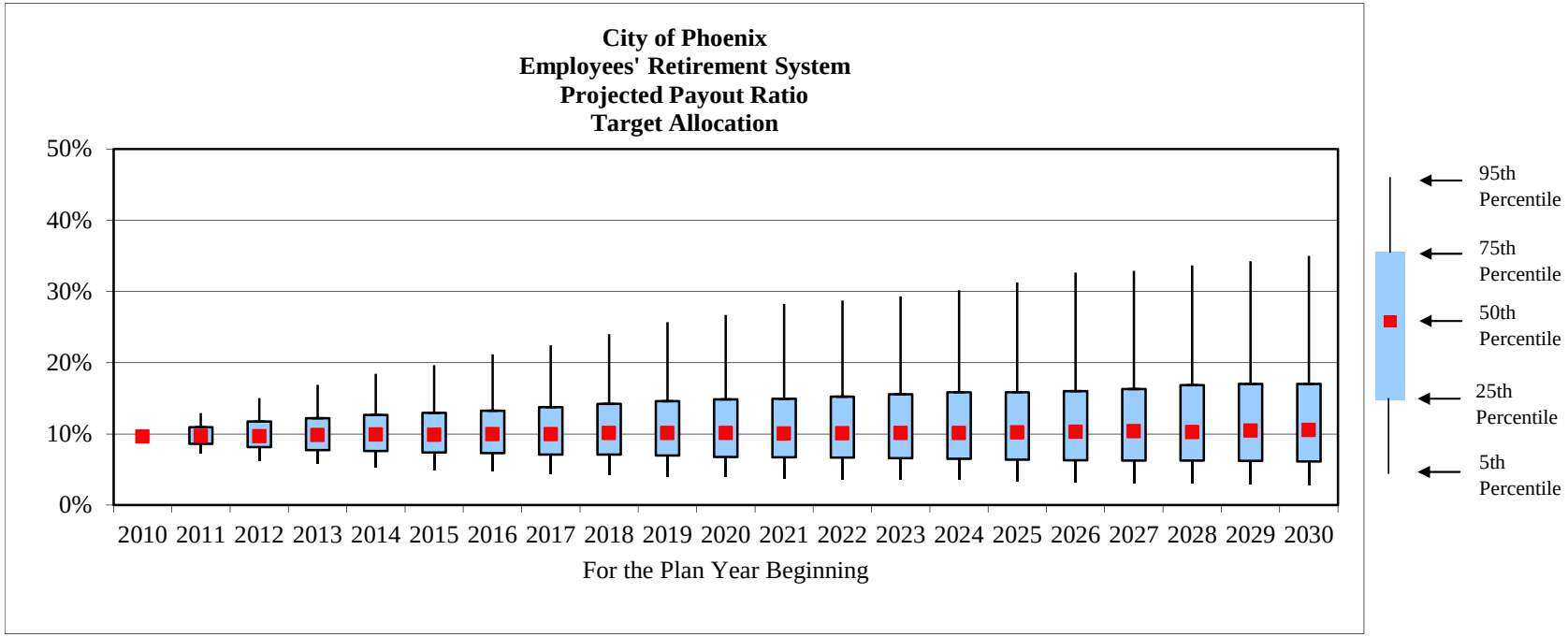
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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

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

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the Target 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 9.6% and 10.6%. The worst-case scenario could reach 35% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.7%	9.8%	9.9%	9.9%	9.9%	10.0%	10.1%	10.1%	10.1%	10.1%	10.1%	10.1%	10.1%	10.2%	10.3%	10.4%	10.2%	10.4%	10.6%

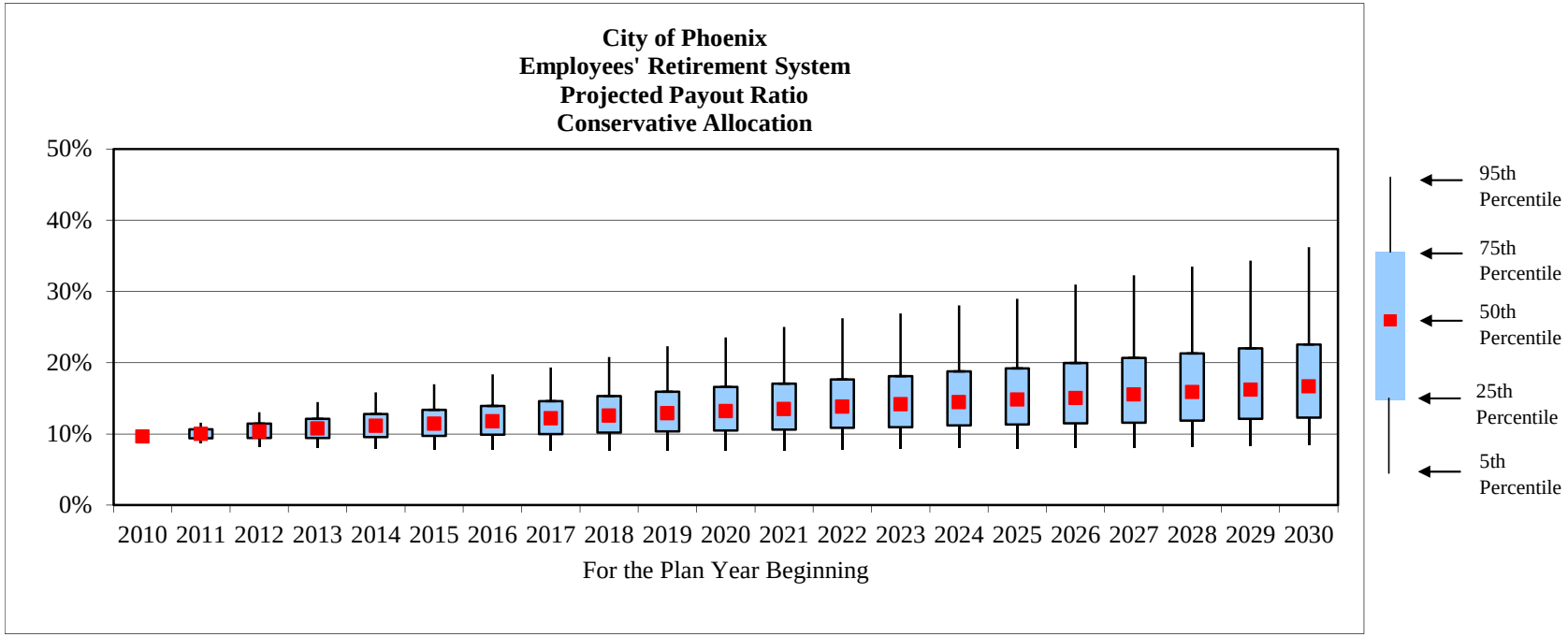
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 9.6% and 16.7%. The worst-case scenario could reach 36% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	10.0%	10.3%	10.7%	11.1%	11.4%	11.8%	12.2%	12.6%	12.9%	13.2%	13.5%	13.8%	14.1%	14.4%	14.8%	15.0%	15.5%	15.9%	16.2%	16.7%

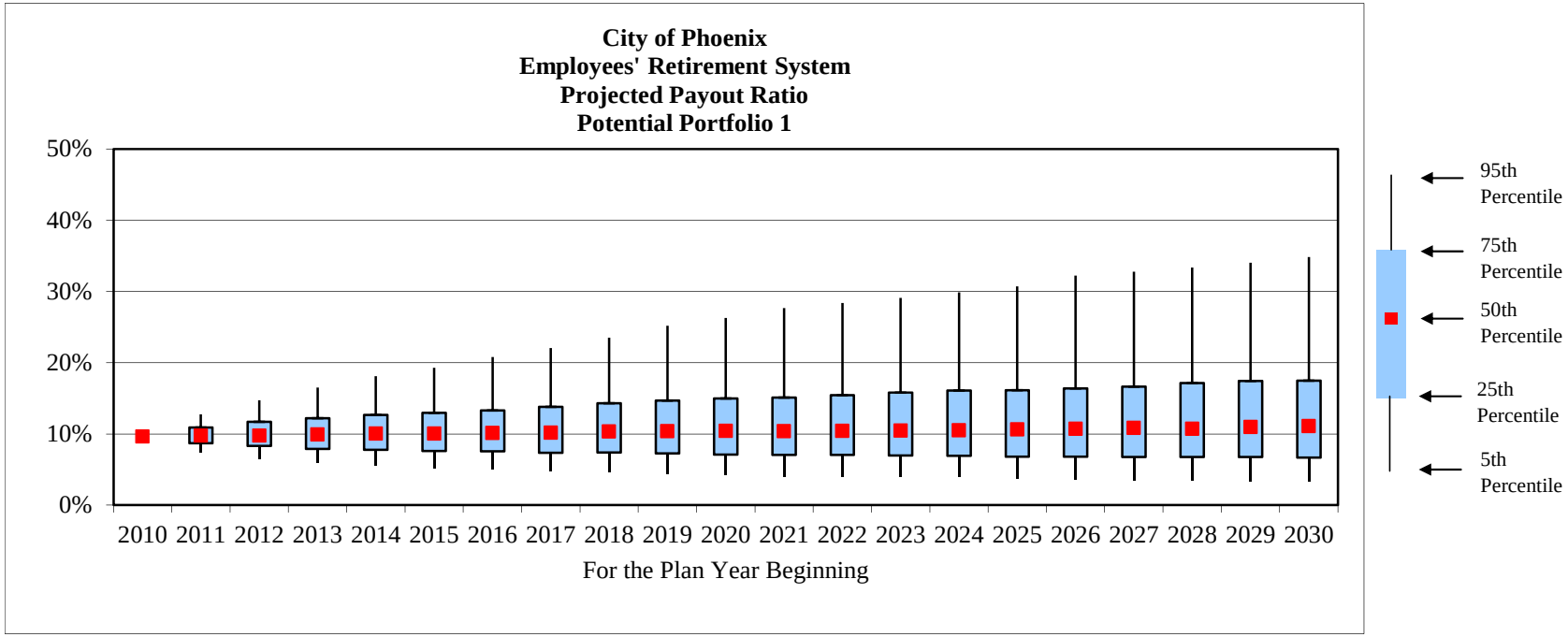
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 9.6% and 11.1%. The worst-case scenario could reach 35% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.8%	9.7%	9.9%	10.0%	10.0%	10.1%	10.2%	10.3%	10.4%	10.4%	10.4%	10.4%	10.5%	10.5%	10.6%	10.7%	10.9%	10.7%	11.0%	11.1%

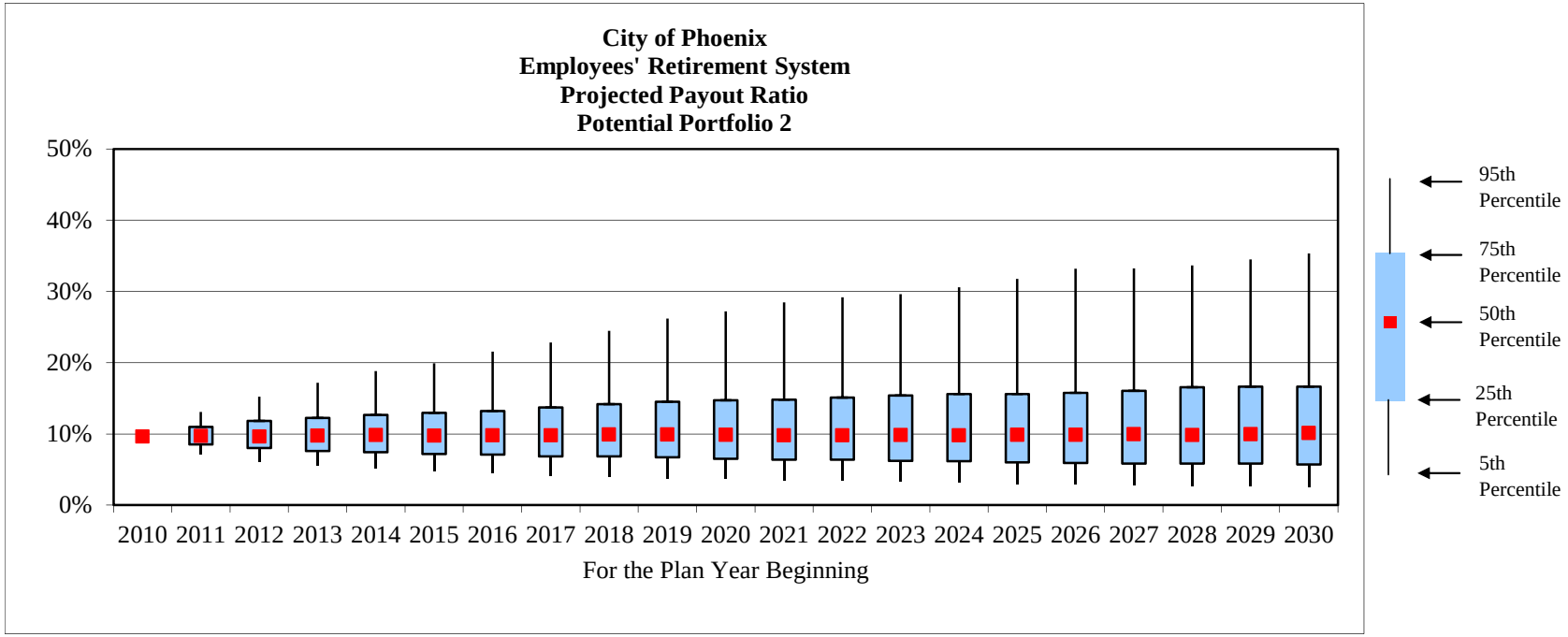
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 9.6% and 10.1%. The worst-case scenario could reach 35% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.7%	9.6%	9.8%	9.8%	9.8%	9.8%	9.8%	9.9%	9.9%	9.9%	9.8%	9.8%	9.8%	9.8%	9.9%	9.9%	9.9%	9.8%	10.0%	10.1%

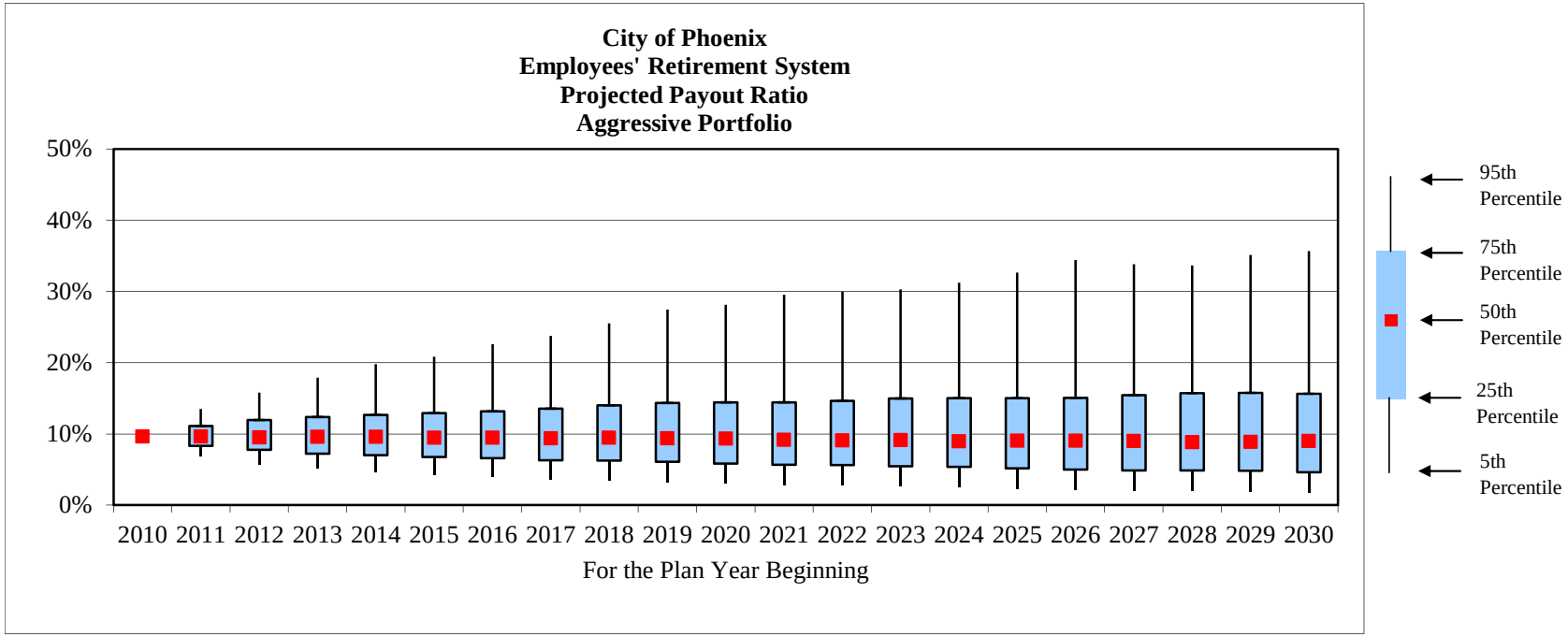
Percentiles indicate the probability of achieving a Payout Ratio higher or lower than the corresponding ratio. For instance, the 50th percentile (median) indicates that 50% of the time the Plan can expect a Payout Ratio lower than the ratio shown, and 50% of the time a higher ratio can be expected.

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 range of possible 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 8.8% and 9.6%. The worst-case scenario could reach 36% or higher.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Median	9.6%	9.6%	9.5%	9.6%	9.6%	9.4%	9.4%	9.4%	9.4%	9.4%	9.3%	9.1%	9.1%	9.1%	9.0%	9.0%	9.0%	9.0%	8.8%	8.9%	9.0%

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)

Employer Contributions (as a percentage of pay)

The table below shows the range of required employer contributions (as a percentage of pay) assuming the six different asset mixes highlighted on the prior pages.

	Required Employer Contribution for the Plan Year Beginning 2030				
	5th	25th	Median	75th	95th
Current Allocation	35.9%	26.9%	18.3%	7.0%	0.0%
Target Allocation	35.8%	26.5%	17.3%	5.0%	0.0%
Conservative Portfolio	36.2%	30.0%	25.4%	20.6%	13.8%
Potential Portfolio 1	35.8%	26.8%	18.3%	7.3%	0.0%
Potential Portfolio 2	36.0%	26.1%	16.3%	2.7%	0.0%
Aggressive Portfolio	36.0%	25.2%	13.4%	0.0%	0.0%

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 six different asset mixes highlighted on the prior pages. The table also displays the median projected payout ratios at the end of the projection period.

	Actuarial Funded Ratio in Year 20			Market Funded Ratio in Year 20			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20 Median	2010-2030 Peak	2010-2030 Trough
Current Allocation	68.1%	25.1%	194.2%	65.5%	22.3%	206.7%	11.1%	11.1%	9.6%
Target Allocation	71.0%	25.3%	219.3%	68.8%	22.4%	231.6%	10.6%	10.6%	9.6%
Conservative Portfolio	46.6%	24.6%	79.6%	43.6%	22.0%	78.8%	16.7%	16.7%	9.6%
Potential Portfolio 1	67.9%	25.4%	189.3%	65.4%	22.7%	200.8%	11.1%	11.1%	9.6%
Potential Portfolio 2	74.1%	25.3%	246.0%	71.7%	22.3%	262.0%	10.1%	10.1%	9.6%
Aggressive Portfolio	82.6%	25.0%	337.4%	80.3%	21.8%	362.0%	9.0%	9.6%	8.8%

Appendix 3: Assumptions and Methods

Actuarial Valuation Assumptions and Methods: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The methods and assumptions used in each projected actuarial valuation are the same used in the valuation as of June 30, 2010, prepared by Rodwan Consulting Company. These methods and assumptions are described below:

Actuarial Cost Method	Individual Entry-Age
Liability Discount Rate	8.00% compounded annually
Expenses	No explicit expense assumption, assumed to be funded by returns in excess of 8.00%.
Future Salary Increases	Future salary increases are outlined in the table on page 11 of the June 30, 2010 Actuarial Valuation for the City of Phoenix Employees' Retirement System and vary by participant age. These rates include a 4.5% base salary inflation rate.
Retirement	Retirement assumptions are outlined on page 14 of the June 30, 2010 Actuarial Valuation for the City of Phoenix Employees' Retirement System
Mortality	Mortality assumptions are outlined on page 12 of the June 30, 2010 Actuarial Valuation for the City of Phoenix Employees' Retirement System
Disability	Rates of disability as outlined on page 12 of the June 30, 2010 Actuarial Valuation for the City of Phoenix Employees' Retirement System
Withdrawal	Rates of withdrawal as outlined on page 13 of the June 30, 2010 Actuarial Valuation for the City of Phoenix Employees' Retirement System
Asset Valuation Method	Four year smoothed market value
Amortization Method	Level percent of payroll, open 20 year period
Cost of Living Adjustments	No Cost of Living Adjustments assumed

Appendix 3: Assumptions and Methods (continued)

Projection Assumptions (used in the deterministic and stochastic asset/liability projections): These projections begin with the Plan's participant population as of June 30, 2010, as provided by Rodwan Consulting Company. The Plan's population is projected forward and assumed to change as a result of employment separation, death, retirement, and new hires as predicted by the assumptions outlined in the June 30, 2010 actuarial valuation provided by Rodwan Consulting Company (and described on the prior page). Employee compensation is projected into the future in accordance with the assumptions described on the prior page. Investment returns are projected into the future in accordance with assumptions described below.

Total Contributions	Equal to the normal cost under the actuarial cost method plus a payment/credit to amortize the unfunded liability Employees contribute 5.00% of pay
New Entrants	The Plan is open to new entrants and assumes a level future active population
Rate of Return on Assets	Deterministic Analysis: 8.00% compounded annually Stochastic Analysis: 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 3.00%
Pension Equalization	The Pension Equalization provision was not modeled
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 June 30, 2010 were provided by Rodwan Consulting Company.