LaToya Cantrell, President

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www.swbno.org

July 11, 2018

The Pension Committee met on Wednesday, July 11, 2018 in the Board Room, 625 St. Joseph Street, New Orleans, LA. The meeting convened at 9:30 A.M.

Present:

Mr. Christopher Bergeron
Ms. Eileen Gleason
Mr. Ralph Johnson
Mr. Marvin Russell
Mr. Lewis Sterling III
Mr. John Wilson

Also in attendance: Ms. Jade Brown-Russell, Acting Executive Director of the Employees' Retirement System (ERS) and Sewerage and Water Board (S&WB); and the following S&WB staff – Mr. James Thompson, Office of Special Counsel; Ms. Sharon Judkins, Deputy Director of Administration; Ms. Veronica Washington, Employee Relations; Ms. Sonji Skipper, Personnel; Dr. Tim Viezer, Chief Investment Officer; and Ms. Candice Newell, Board Relations Manager.

ACTION ITEMS:

1. Approval of June 13, 2018 Pension Committee minutes.

EXECUTIVE SESSION:

2. Pursuant to LA R.S. 42:17.A.1., to consider an employee disability application.

PRESENTATION ITEMS:

3. None

In the absence of the Chairman, Mr. Marvin Russell moved to nominate Mr. John Wilson to act as Chairman for the meeting. Mr. Chris Bergeron seconded the motion and the motion carried.

Acting Chairman Wilson then asked for a motion to move into executive session to consider a disability retirement application. Ms. Eileen Gleason moved to enter into executive session and Mr. Russell seconded the motion. The motion carried and the Committee entered executive session. The Committee re-entered regular session by a motion by Ms. Gleason, this was seconded by Mr. Sterling, and carried by vote. Chairman Wilson called for a motion and Ms. Gleason made a motion to approve the matter discussed in executive session. Mr. Russell seconded and the motion carried.

Mr. Wilson asked if there were any questions about the information item concerning Employee Trustee elections. Mr. Bergeron noted that there was low employee participation in past elections and asked whether there might be more effective ways to engage participation than mailing ballots to employees' home addresses

and requiring the submission of ballots at the St. Joseph Street office, recognizing that not all employees work at that location. Ms. Sharon Judkins agreed that alternative balloting methods could be considered.

Ms. Gleason noted that the past meeting minutes required approval. Mr. Russell moved to approve the minutes and Ms. Gleason seconded, and the motion carried.

INFORMATION ITEMS:

Information item 5 was received.

ANY OTHER MATTERS:

The following questions and requests were raised for follow-up:

1. Mr. Bergeron requested a review of alternative balloting methods in order to increase employee participation in the election of Employee Trustees.

ADJOURNMENT:

There being no further business to come before the Pension Committee, Acting Chairman Wilson called for a motion and Mr. Bergeron made a motion to adjourn. Mr. Sterling seconded and the motion carried. The meeting adjourned at approximately 10:00 A.M.

Respectfully submitted,

_____

John Wilson, Pension Committee Acting Chair

R-121-2018

RECOMMENDATION TO ADOPT A NEW ASSET ALLOCATION MIX

WHEREAS, Board of Trustees of the Employees' Retirement System of the Sewerage and Water Board of New Orleans hired Callan LLC to conduct an asset-liability study; and

WHEREAS, Callan provided an introduction to the study at the Pension Committee on April 11, 2018, and presented the study results at the Board of Trustees meeting on July 11, 2018; and

WHEREAS, it is the opinion of the Pension Committee and the Board of Trustees that the study and the discussion of its results were conducted with prudence, care, skill and competence; and

WHEREAS, the Pension Committee, considering Callan's recommendations, selected Mix ____ with the following asset class allocations: Broad US Equity ____%, Global Ex US Equity ____%, Real Estate ____%, Hedge Funds ____%, Domestic Fixed Income ____%, and Cash Equivalents ____%.

NOW, THEREFORE, BE IT RESOLVED by Board of Trustees of the Employees' Retirement System of the Sewerage and Water Board of New Orleans that the Chief Investment Officer be authorized to amend the Investment Policy Statement to reflect the chosen asset allocation, implement said asset allocation as soon as practicable in consultation with the Board of Trustees' investment consultant, negotiate and execute any documents necessary to effect the transitioning of assets, and to certify this resolution..

I, Timothy W. Viezer, Chief Investment Officer,
of the Sewerage and Water Board of New Orleans,
do hereby
certify that the above and foregoing is a true and
correct copy of a Resolution adopted at the Meeting of the
Board of Trustees of the Employees' Retirement System
of Sewerage and Water Board of New Orleans, duly called and held,
according to law, on **August 15, 2018.**

_____

_____, **Chief Investment Officer**
OF THE SEWERAGE AND WATER BOARD OF NEW ORLEANS

Sewerage & Water Board of New Orleans

Chief Investment Officer's Presentation to the Pension Committee

August 8, 2018

August Meeting Agenda

- Action Item: Approval of July Minutes
- Action Item: Asset Allocation Mix
- Update on Funding Policy
- Presentation by Theodore Sanders III on the Louisiana Asset Management Pool, Inc. (LAMP)

ERS Mission Statement

- *Prudently manage an actuarially sound pension fund*
- *solely in the interest of participants and beneficiaries*
- *in a cost-effective manner.*

Discussion

PROPOSED FUNDING POLICY

Revised Funding Proposal

- We are recalculating the actuarial valuation using a 20-year closed amortization.
- The outline of the draft process is:
  - The Board of Trustees approve a funding policy stating the principles and core elements (actuarial cost method, asset smoothing, and amortization).
  - The actuary calculates the "actuarially determined contribution" rate.
  - Pension Committee approved the actuarial valuation and ADC.
  - The Chief Financial Officer and Finance and Administration Committee use the ADC and minimum contribution rate within the S&WB budget process.
  - If the ADC rate is not used, the CFO will explain the reasons for this departure to the Board of Trustees, who if they agree, will grant a 6-month waiver (renewable for a total of 12 months).
  - The Pension Committee will review contributions quarterly to ensure compliance.
- A draft Funding Policy will be presented to the Pension Committee in September. The Policy will require approval by the Chief Financial Officer, Board of Trustees and Board of Directors.

Updates

OLD BUSINESS

Follow Up From Previous Meetings

- The approval of policies that affect both S&WB and ERS and the provision of in-kind resources should involve both the Board of Directors and Board of Trustees.
- Trustee Peychaud asked S&WB staff to continue to work together and to bring another discussion draft that incorporated the Pension Committee's desired changes into the S&WB Professional Services Procurement Policy #95 (May 8, 2018). Trustee Peychaud reaffirmed that Ms. Valerie Rivers, Deputy Director of Logistics, would review the discussion draft that incorporated the Pension Committee's desired changes into the S&WB Professional Services Procurement Policy #95 and report back to the Pension Committee with her thoughts and suggestions.
- Review the Reciprocity Agreement with NOMERS. (June 13. 2018)
- Assignment of custody contract. Trustee Bergeron asked for the reason that large increase total benefit payments in 2017. Trustee Peychaud asked that Human Resources also investigate the increase. (June 13. 2018)
- Ms. Brown-Russell supports an experience study to investigate changes in S&WB's actual demographic experience relative to actuarial assumptions. (June 13. 2018)
- Mr. Conefry will conduct a more thorough analysis of the impact upon the pension plan of a larger percentage of the workforce being higher paid. Trustee Peychaud asked that Mr. Joseph collaborate with Mr. Conefry on the study. (June 13. 2018)
- Trustee Bergeron requested a review of alternative balloting methods in order to increase employee participation in the election of Employee Trustees. (July 11, 2018)

NEW BUSINESS?

PAAMCO Prisma Leadership Transition

- PAAMCO Prisma Holdings announced the formation of an Executive Committee that will manage the day-to-day business of the combined firm, effective August 1, 2018. The appointees are Anne-Gaelle Carlton, Mayer Cherem, Vince Cuticello, Von Hughes, Paul Roberts, with Eric Wolfe serving as Chairperson of the committee.
- Current Co-CEOs, Girish Reddy and Jane Buchan, will step down and assume new positions as Advisors, assisting the Executive Committee on any matters.

Source: Sean Lee, Callan Insights, July 17, 2018.

Louisiana Public Retirement 2018 Seminar

- The **Louisiana Public Retirement 2018 Seminar** – New Orleans Marriott
  - Pre-Conference Workshop is on Sunday, September 16th
  - Conference Monday, September 17th and Tuesday, September 18th
  - Will help satisfy your suggested trustee continuing education
  - Registration forms are due to the Chief Investment Officer by August 17th

September Meeting Agenda

- Action Item: Amended Investment Policy Statement
- Action Item: Funding Policy
- Action Item: ERS Procurement Policy
- FFC-RJ Quarterly Review of Performance

Appendix A
CFA Institute's Code of Conduct for Members of a Pension Scheme Governing Body

1. Act in good faith and in the best interest of the scheme participants and beneficiaries.
2. Act with prudence and reasonable care.
3. Act with skill, competence, and diligence.
4. Maintain independence and objectivity by, among other actions, avoiding conflicts of interest, refraining from self-dealing, and refusing any gift that could reasonably be expected to affect their loyalty.
5. Abide by all applicable laws, rules, and regulations, including the terms of the scheme documents.
6. Deal fairly, objectively, and impartially with all participants and beneficiaries.
7. Take actions that are consistent with the established mission of the scheme and the policies that support that mission.
8. Review on a regular basis the efficiency and effectiveness of the scheme's success in meeting its goals, including assessing the performance and actions of scheme service providers, such as investment managers, consultants, and actuaries.
9. Maintain confidentiality of scheme, participant, and beneficiary information.
10. Communicate with participants, beneficiaries, and supervisory authorities in a timely, accurate, and transparent manner.

Appendix B
Committee & Board Decisions

I. **FOUNDATIONAL DECISIONS** (October 2017 – December 2017)

A. Clarify governance focus

- ✓ Amend the current IPS to reflect 2015 decisions.
- ✓ Adopt an ERS Mission Statement
- ✓ Adopt the CFA Code of Conduct for Members of a Pension Governing Body
- ✓ Adopt a resolution to strongly encourage BOT to adhere to LA RS 11:185 Trustee Education requirements starting September 2018.

B. Decisions needed to complete Asset-Liability Study By June 2018

5. Amend and prioritize investment objectives
- ✓ Hire Asset-Liability Consultant

C. Decisions needed to issue RFP for General Investment Consultant

7. Adopt Investment Philosophy
8. Agree upon an investment manager search process (based upon philosophy & policies)
9. Agree upon investment consultant duties and governance matrix

Appendix B
Committee & Board Decisions

II. **MAJOR DECISIONS** (May 2018 – September 2018)*

D. Preparation

10. Governance Matrix:
    a. Who decides (and how) benefits?
    b. Who decides (and how) employer contributions?
    c. Who decides (and how) employee contributions?
    d. Who decides (and how) investment policy?
11. Hire General Investment Consultant
12. Adopt Statement of Risk Capacity and Risk Appetite

E. The BIG THREE Decision-Making

13. Benefit Policy
14. Contribution Policy
    a. Employee
    b. Employer
15. Investment Policy – Asset Allocation

Appendix B
Committee & Board Decisions

III. **FORMALIZE CUMULATIVE DECISIONS** (September 2018 – December 2018)*

F. Update Documents

16. Amend Investment Policy Statement

17. Amend Bylaws

18. Amend Rules and Regulations

IV. **IMPLEMENT ASSET ALLOCATION** (September 2018 – March 2019)*

G. Portfolio Construction

H. Investment Managers

*Dates are tentative and subject to revision.

Appendix C
PRMIA Principles of Good Governance*

- Key Competencies
- Resources and Processes
- Ongoing Education and Development
- Compensation Architecture
- Independence of Key Parties
- Risk Appetite
- External Validation
- Clear Accountability
- Disclosure and Transparency
- Trust, honesty and fairness of key people

*Professional Risk Managers' International Association, 2009

Sewerage & Water Board of New Orleans

Re-Building the City's Water Systems for the 21st Century

Louisiana
Asset
Management
Pool, Inc.

Presented to:

Sewerage and Water Board of New Orleans – Pension Committee

By : Theodore C. Sanders III

August 8, 2018

What is LAMP?

- LAMP = Louisiana Asset Management Pool is a local government investment pool
- Created in 1994 at the initiative of the Louisiana State Treasurer's Office with political subdivisions and local governments of the state of Louisiana
- Operates under Louisiana law as a cooperative endeavor to enable its members to pool together available funds for investments
- Combines the efficiency of private enterprise with the protection of public policy
- Offers the same level of investment management otherwise available only to larger investors

Eligible Participants in LAMP

- *Assessors*
- Clerks of Courts
- Convention & Visitors Bureau
- District Courts
- District Judges
- District Attorneys
- Fire Districts
- Hospitals
- Libraries
- Municipalities
- Police Jury Associations
- Parish Governments
- Levee Districts
- Port Commissions
- Recreation Districts
- Retirement Systems
- Schools
- School Boards
- Universities
- Sheriff's Offices/ Detention Centers
- Utilities
- Other Political Subdivisions

LAMP Profile

- The Fund is operated by a non-profit corporation, LAMP, Inc.
- The Louisiana State Treasurer John Schroder serves as the President of the Fund
- LAMP is governed by a 15-member Board elected each year by the members. A presidents advisory board is appointed by LAMP, Inc president
- Day-to-day operations are performed by the Chief Executive Officer and a Chief Administrative Officer
- LAMP has experienced a growth in the number of participants since inception.

LAMP's Objectives

Preservation of Principal "Safety"

- Primary goal of the Fund is to maintain a stable net asset value of $1
- Statement of Investment Guidelines, invested in the manner consistent with Rule 2a-7 of the Investment Company Act of 1940
- Comply with Louisiana law concerning permissible investments set forth in La. R. S. 33:2955
- LAMP has consistently earned a rating of AAAm from Standard & Poor's, the highest rating available to LAMP

Daily Liquidity

- Same-day access to funds under management by phone, fax or online through *CLIENT CONNECTION* with no transaction fees
- Portfolio diversification, maturity and duration parameters are established to provide for liquidity needs

Competitive Rate of Return

- By pooling funds, LAMP's participants enjoy a level of professional money management available only to large institutional investors, generally resulting in higher yields and lower management fees
- Overall portfolio performance is enhanced as a result in cash flows from one participant to anther allowing longer maturities than would be in the case if invested alone

LAMP's Benefits

Advantages of Pooled Funds

» As a cooperative venture, LAMP provides participants benefits difficult to achieve individually, it actively but conservatively manage credit exposure to insure the portfolio is of the highest quality

Professional Money Management

» LAMP is large enough to attract the very best investment managers

» As a result, LAMP generates attractive yield and low expense ratio

Administrative Efficiency

» Efficient Operation keeps staff and overhead to a minimum while maintaining responsive service

» 24/7 access to account information, performance and yields via the Internet or *LAMPLINE* at 1.800.272.8162

Responsive Reporting

» Participants enjoy the benefits of the *LAMP My Access* for immediate, fully secured access to their accounts

» My Access provides up-to-date account information and a variety of reports to LAMP participants

Investment Approach

Statement of Investment Guideline

» LAMP investment objectives and guidelines are detailed and comply with legal restrictions on investing funds for its participants

Investment Instruments

» LAMP investments are limited to securities and other obligations permissible under state law for political subdivision

» LAMP are also restricted to securities issued, guaranteed or otherwise backed by the U S Government, as well as collateralized repurchase agreements, government only Money markets rated AAA by Standard and Poor's and commercial paper of domestic U S corporation rated A-1 or A-1 + by Standard & Poor's

Investment Restrictions

» Many aspects of LAMP's investment policies are similar to those established by the Louisiana state statue for local governments and political subdivions

Safety and Due Diligence

Rated AAAm by Standard & Poor's since 1995

Rating is based on S&P's analysis of the Fund's:

- Credit quality
- Investment policies
- Market price exposure
- Management

AAAm rating indicates:

- Safety of invested principal is excellent
- Extremely strong capacity to maintain principal value and limit exposure to loss
- Superior ability to maintain a $1 per unit net asset value at all times

Annual investment review of assets and performance against benchmarks

Weekly compliance review by UBS Paine Webber

LAMP Fund Profile as of July 26, 2018

Average Monthly Net Assets:	**$1.9 Billion**
Weighted Average Maturity:	**46 days**
Average Monthly Yield:	**2.02%**
Total Number of Participants and Accounts :	**705 4000**

How to Join LAMP

- Obtain a LAMP Information Guide
- Review the Depositing Member's Information Statement
- Sample Footnotes for LAMP investors available on request
- Complete and sign the LAMP account application and agreement form
- Fax application to LAMP office
- Account numbers are assigned upon review of application, and investments can be made the same day

LAMP Conclusion

High Quality Focus

» Standard & Poor's AAAm Rating since inception

» Client service

No Surprises

» Financial and Compliance audit performed annually by the Louisiana Legislative Auditor

Proven Investment Process

» Annual investment review of assets and performance against benchmarks

» Top 90th percentile of peer group

Risk Controls

» Weekly compliance review by UBS consultants

The Louisiana Asset Management Pool (LAMP) represents a genuine success story of which everyone in our state can be proud. LAMP demonstrates clearly that cooperation among public officials brings significant benefits to all.

LAMP is available to any local public entity in the state of Louisiana, large or small, municipal or parish, under elected or appointed management. It provides the superior level of money management that only much larger institutions could otherwise afford, while maintaining the very highest level of safety of principal and the convenience of daily liquidity.

Callan

July 18, 2018

Sewerage & Water Board of New Orleans

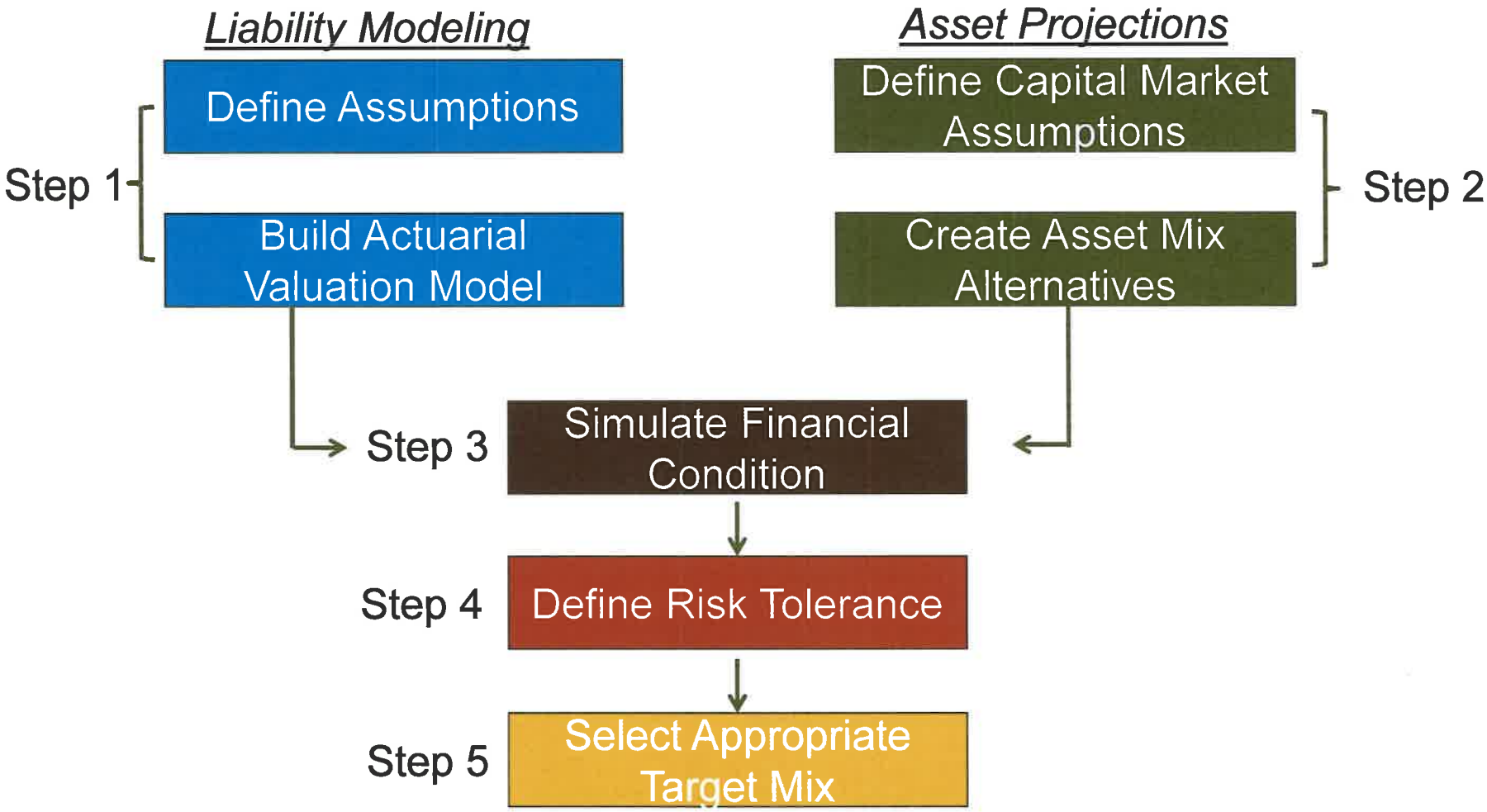
Asset Allocation and Liability Study: Results

Weston Lewis, CFA, CAIA
Atlanta Plan Sponsor Consulting

Cody Chapman, CFA, CAIA
Atlanta Plan Sponsor Consulting

Karen Harris, CFA, ASA
Capital Markets Research Group

Overview of the Asset-Liability Process



Callan's Asset Allocation and Liability Process

Description

Step 1: Liability Modeling

- Examine the characteristics of the pension plan liabilities that influence the investment strategy the most.

Step 2: Asset Projections

- Develop 10-year forward looking capital market expectations for return and risk.
- Create alternative asset mixes to test in the study using an asset-liability framework.

Step 3: Simulate Financial Condition

- Examine a range of capital market outcomes for each asset mix on the pension plan.
- Focus on the impact to pension surplus and contribution risk.

Step 4: Define Risk Tolerance

- Examine the return and risk trade-offs between the alternative asset mixes.
- Examine downside risk of each alternative asset mix.

Step 5: Select Appropriate Target Mix

- Define your primary goals and objectives for the pension plan investments and select an optimal asset mix.

GLOSSARY OF TERMS INCLUDED IN THE APPENDIX

Step 1 - Defining the Liability Assumptions

- January 1, 2018 data and valuation report, as provided by actuary Conefry & Company, LLC.
- Model excludes the current Drop Account Balances ($11.6M) because they are invested in cash.
- Investment risk associated with the asset allocation decisions is reflected in the size of Unfunded Liability as well as the Employer Contribution.
  - Contribution amounts shown use the 15-year closed amortization.

	With Drop	Exclude Drop
Present Value Future Benefits (PVFB)	$ 342.5M	$ 330.9M
less Present Value of Future Normal Costs	26.6	26.6
Actuarial Liability (AL)	315.9	304.3
Market Value of Assets (MVA)	$ 235.3M	$ 223.7M
Actuarial Value of Assets (AVA)	241.4	229.8
Surplus/(Unfunded Liability) = AVA-AL	$ (74.5)M	$ (74.5)M
Funded Ratio = AVA/AL	76.4%	75.5%
Normal Cost	$ 4.7M (11.25% pay)	11.25% pay
plus Amortization Payment (15 year Closed)	+7.9 (18.97% pay)	+18.97% pay
less Employee Contribution	-2.1 (5.00% pay)	-5.00% pay
Employer Contribution	$10.5M (25.22% pay)	25.22% pay

Step 1 - Defining the Liability Assumptions (Continued)

Funding Policy

- Funding Policy :
  - Entry Age Normal level % of pay used to determine normal cost
  - Asset smoothing reflects a full 7 years of gains / losses

  - Total Contribution equal to Normal Cost plus a "closed" 15-year Amortization payment for each year's actuarial gains and losses.
  - Total Contribution equal to the Normal cost plus an "open" 30-year amortization payment, which takes the entire unfunded liability at each valuation date and re-amortizes over a new 30 year period.

  - Employer Contribution equals the Total Contribution less the Employee Contribution, expressed as a % of Payroll.
  - Employee Contributions modeled as 5% of pay for this study in accordance with the 2018 actuarial report:
    - *Despite "Actual" contributions from employees currently at 6% of pay, or 1% higher.*
    - *The model therefore assumes the Total Contribution would remain the same as the actuarial projections, and the "actual" employer contribution rates could be 1% lower than the rates shown in this study.*

Step 1 - Defining the Liability Assumptions (Continued)

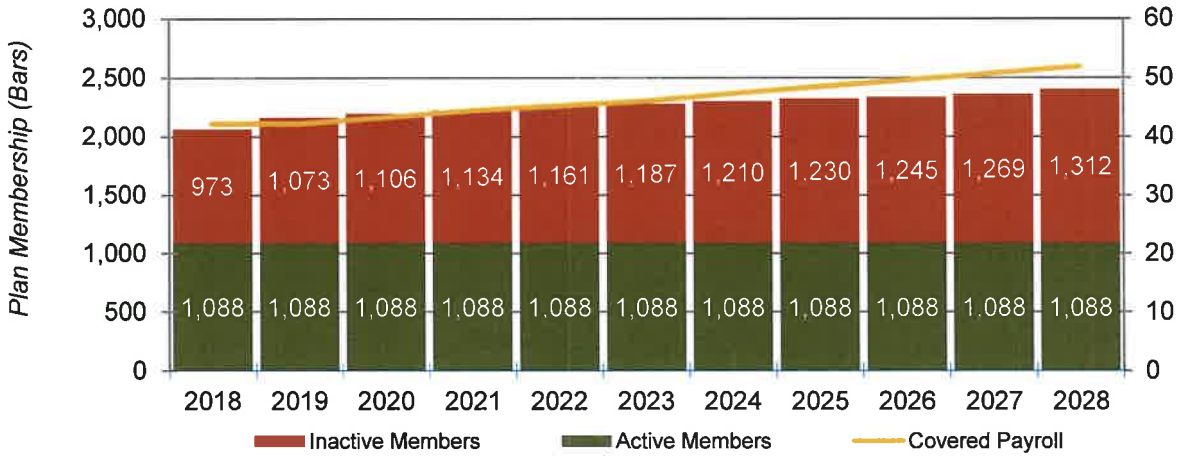
Workforce Projections

- Modeled and tested several future workforce projections:
  - 1. Level population of 1088 active employees.
    - *Which means maintaining the current workforce, and replacing those who leave with a new hire. The new hire is eligible to join the plan.*
  - 2. Increasing to 1500 active employees over 5 years.
  - 3. Assume everyone who can retire in the next 5 years will, with *level* population of 1088 active.
  - 4. Closing the plan to new hires.
- Other considerations in the liability model:
  - 5. Lowering the actuarial discount rate from 7% to 6% in 2019.
  - 6. Katrina-like scenario where employee and employer contributions stop.
  - 7. Scenario analysis such as another 2008-like market decline or 2001 tech bubble in the next 5 years.

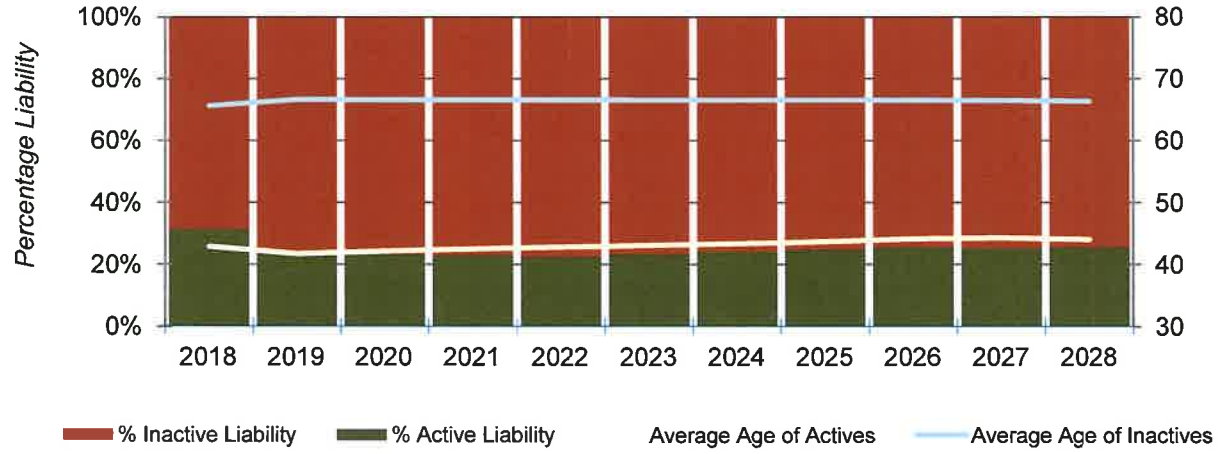
Step 1 - Building the Actuarial Valuation Model

1. Level Population Characteristics

Plan Membership



Plan Maturity

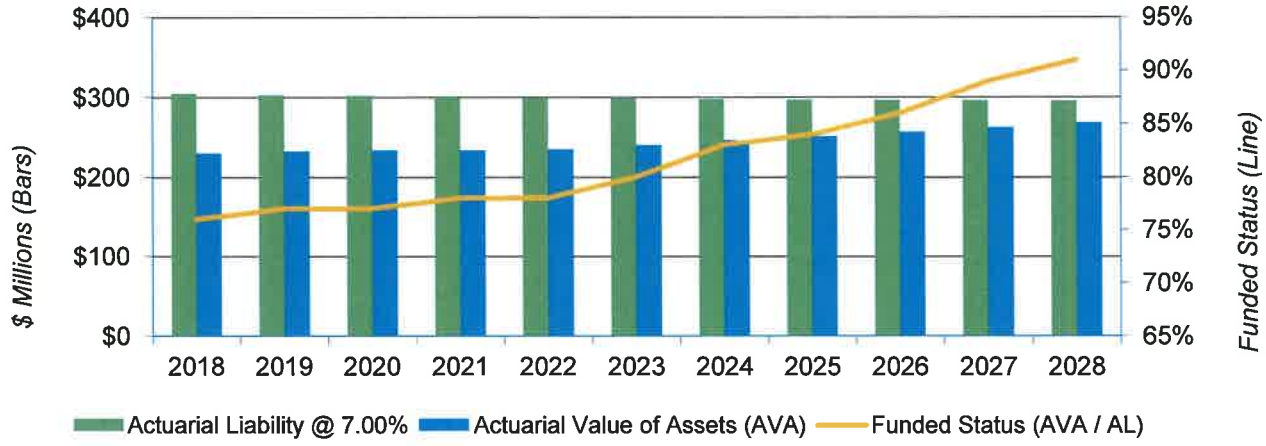


- Begin with a ***deterministic projection***, one scenario whereby the actuarial assumptions will be met (i.e. future experience will equal actuarial assumptions):
  - 7% investment return (i.e. discount rate)
  - 2% COLA
  - GAM 71 mortality
  - *One exception:*
    - *payroll projections assume 3% "actual" salary increase (versus 5% actuarial assumption)*
    - *lower payroll implies actuarial gains each year - consistent with the last 2 valuation reports.*
- Inactive includes retirees, beneficiaries, and deferred-terminated vested.
- Plan maturity indicates that active and inactive liabilities are fairly constant over next 10 years, with a large portion associated with inactive.
- Lower salary experience impacts the active portion of the liability.

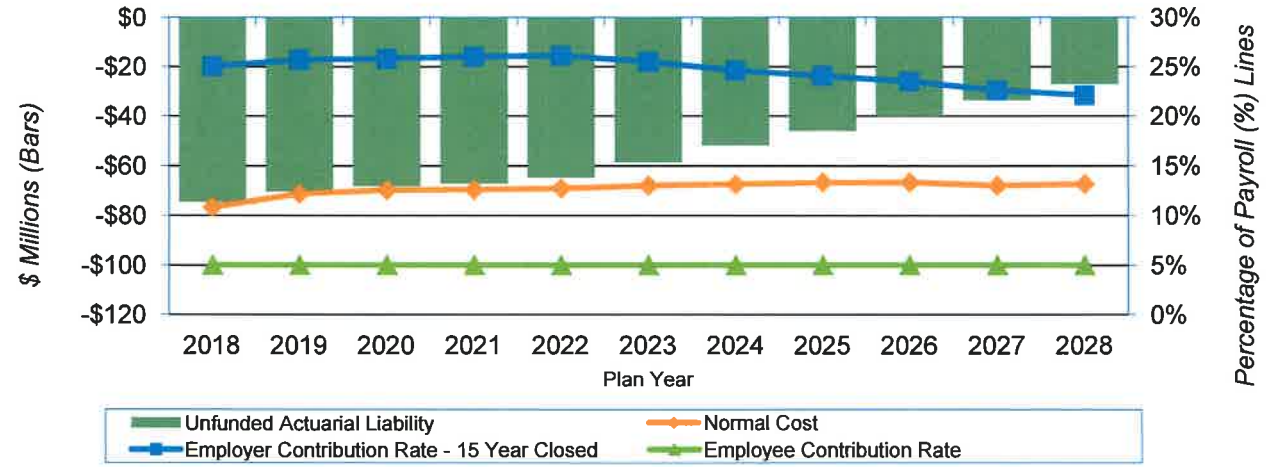
Step 1 - Building the Actuarial Valuation Model

1. Level Population Funding Progress – 15 Year Closed Amortization

AL Funded Status



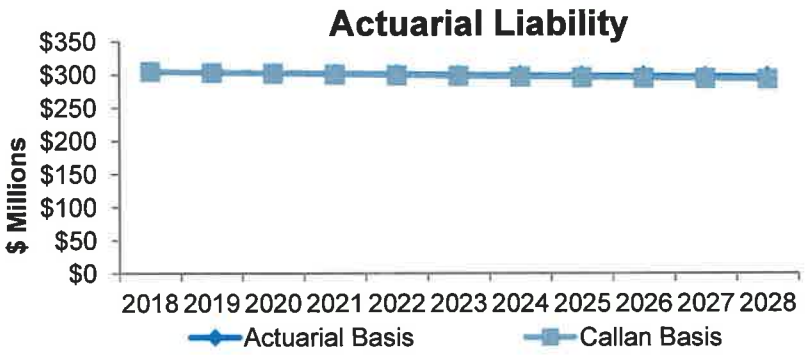
Contribution Rates

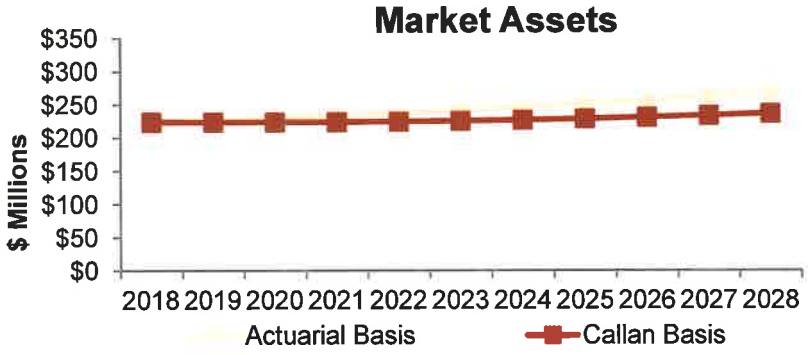


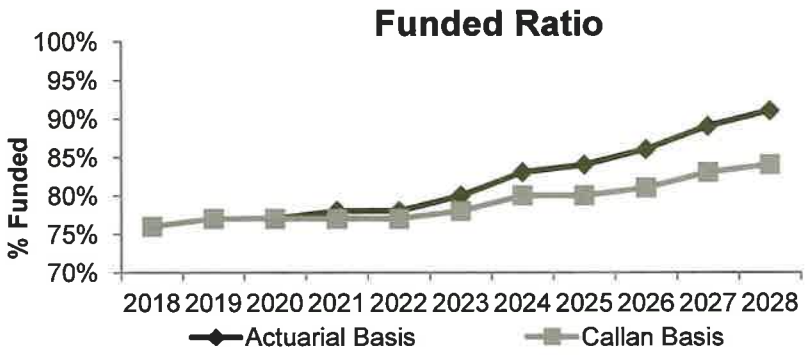
- Funded status and contribution projections reflect 7.00% return in each future year:
  - Stochastic modeling is necessary because a constant return assumption in each year is unlikely.
- Assets are expected to grow as the unfunded liability is paid down, but actuarial liabilities appear to have peaked.
- Total Normal Cost rate rises marginally in the next year but stays level thereafter.
- Under a closed 15-year amortization, the Employer Contribution rate will decline as actuarial gains from lower salary are amortized.

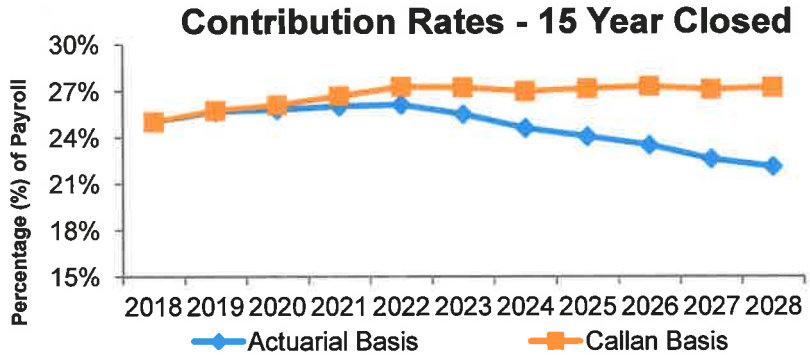
Step 1 - Building the Actuarial Valuation Model

1. Level Population – Closed 15 Year Amortization: Compare Assumptions







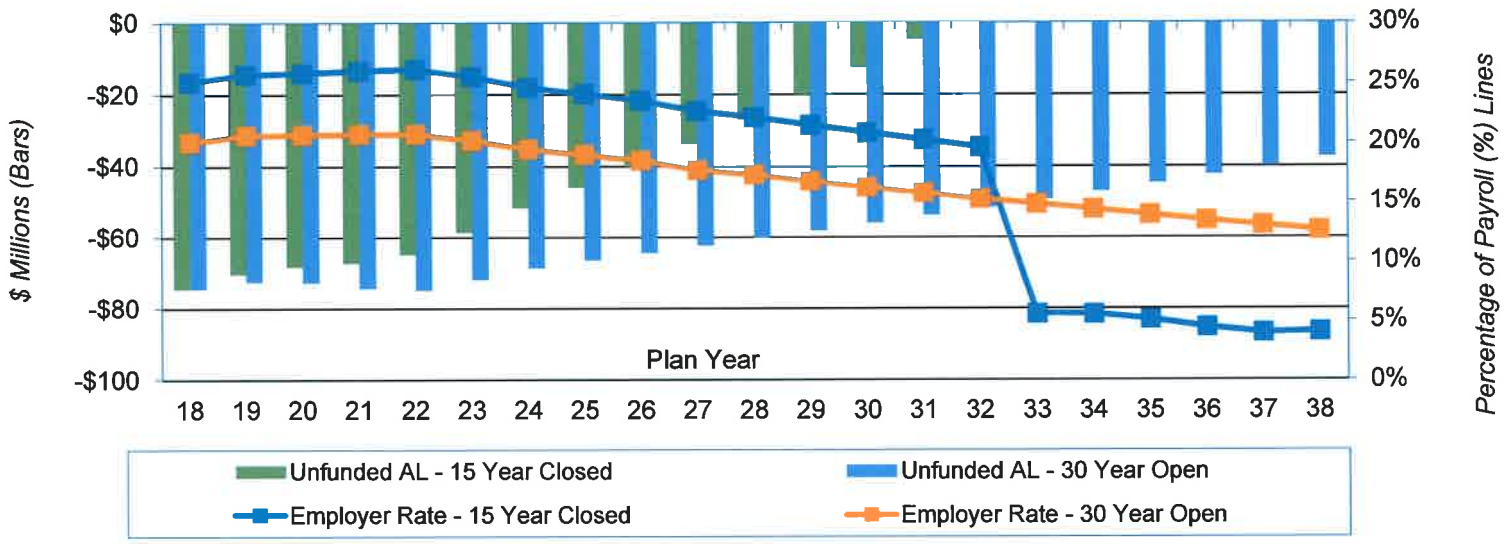


- Callan Basis projections are lower relative to the actuarial projections:
  - Callan returns for the next 10 Years = 5.65%, Actuarial assumption = 7.00%.
  - Return differences are due to Callan's 10Yr forecast horizon relative to the actuary's longer horizon of 40- 50 years.
- At the end of 10 years, Callan projects that liabilities will be roughly equal, but assets will be 8% lower and funded status will be 7% lower than the actuarial basis.
- Overall, investment losses will exceed gains from lower salary experience, resulting in net actuarial losses that are amortized into higher contribution rates.

Step 1 - Building the Actuarial Valuation Model

1. Level Population - Closed versus Open Amortization

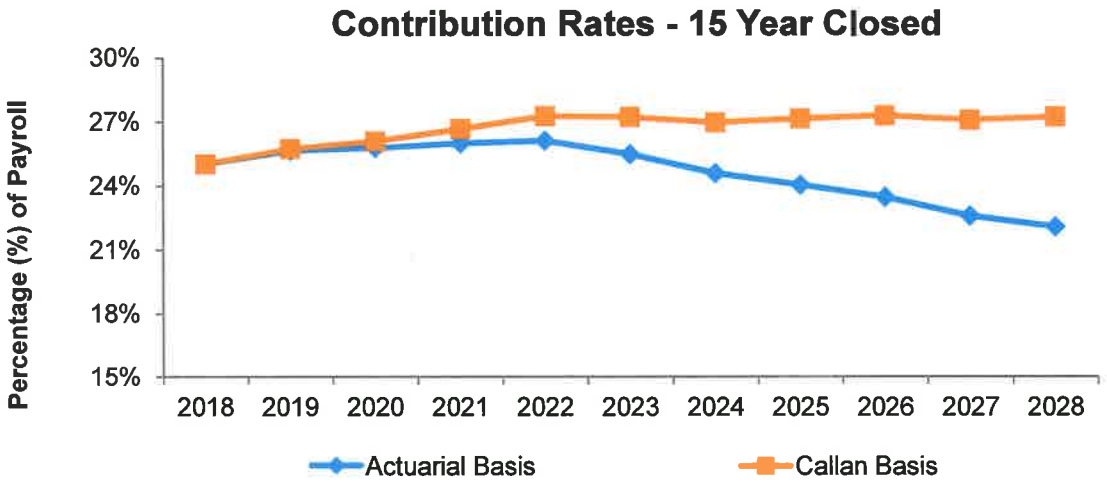
Impact of Open versus Closed Amortization

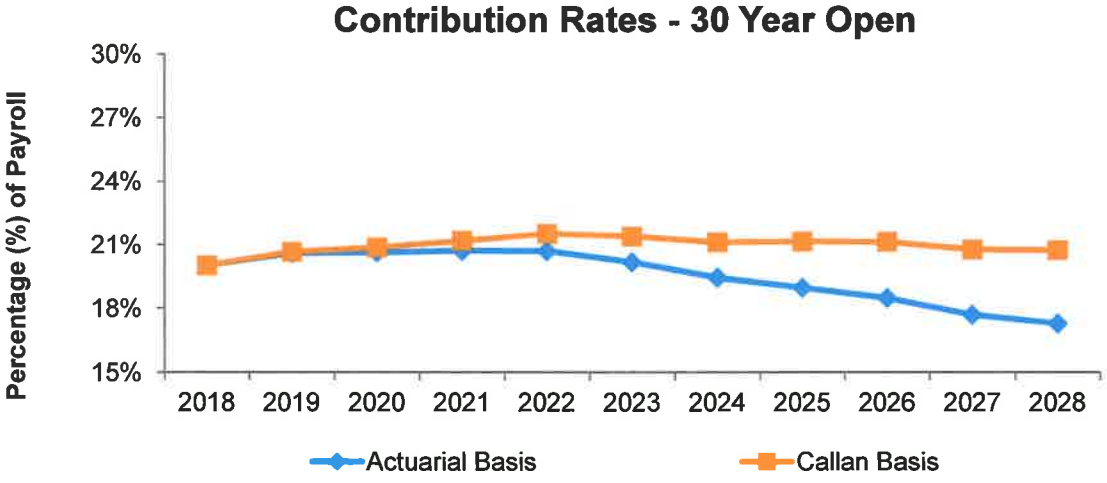


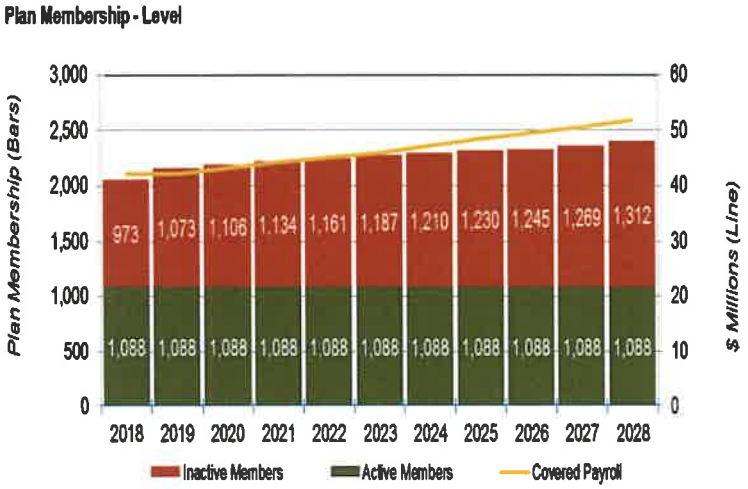
- Projection has been extended from 10 years to 20 years to show the impact of **15-year "closed"** versus **30-year "open"** amortizations.
- A 30-year "open" amortization policy results in less than half of the unfunded liability being paid down after 20 years:
  - Under this policy, the unfunded liability is never fully paid off.
  - Analogy is asking the bank every year to re-calculate your mortgage with a new 30-year lending period. You will never fully pay off the loan.
- An "open" amortization policy also results in an elevated contribution rate for a much longer period of time.

Step 1 - Building the Actuarial Valuation Model

1. Level Population - Closed versus Open Amortization





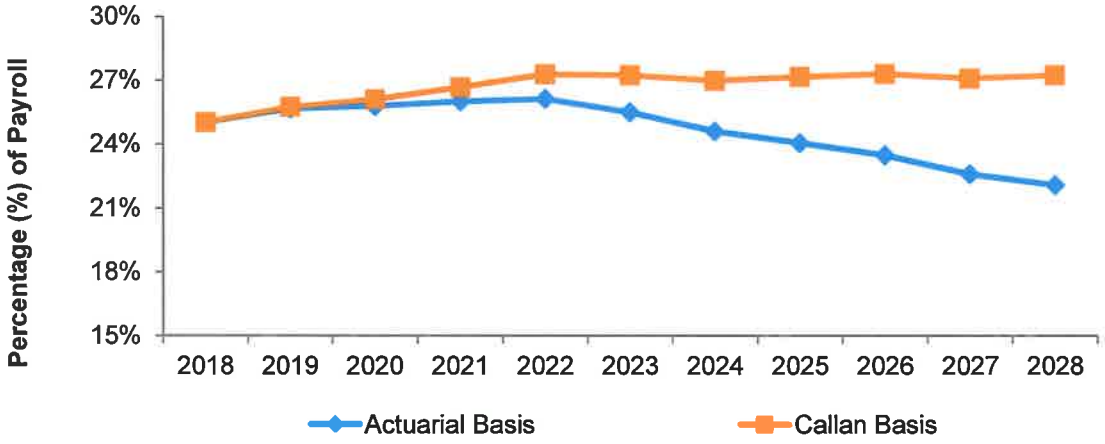


- Using the Callan Basis of lower expected returns, the charts compare the impact of closed versus open amortization on employer contribution rates for the level population.
- Charts indicate a range of employer contribution rate between 21 – 27% of payroll over the next 10 years in the expected case.

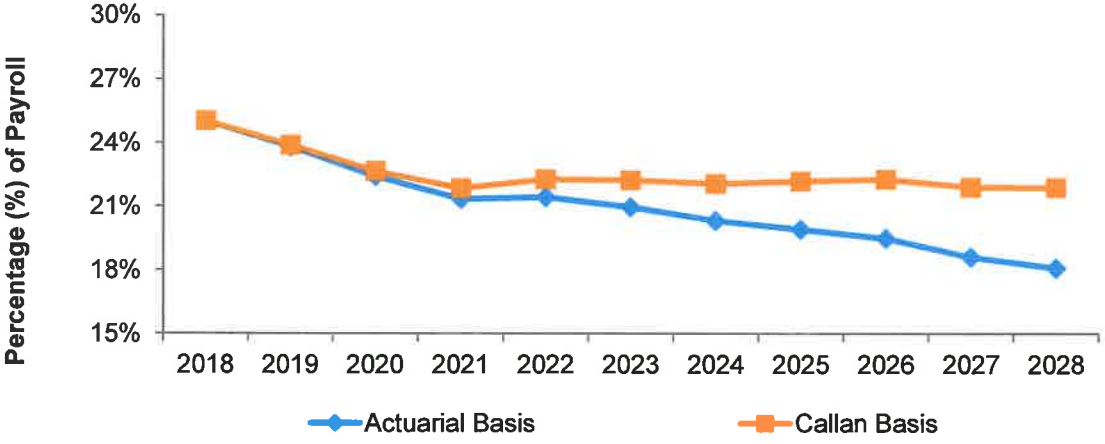
Step 1 - Building the Actuarial Valuation Model

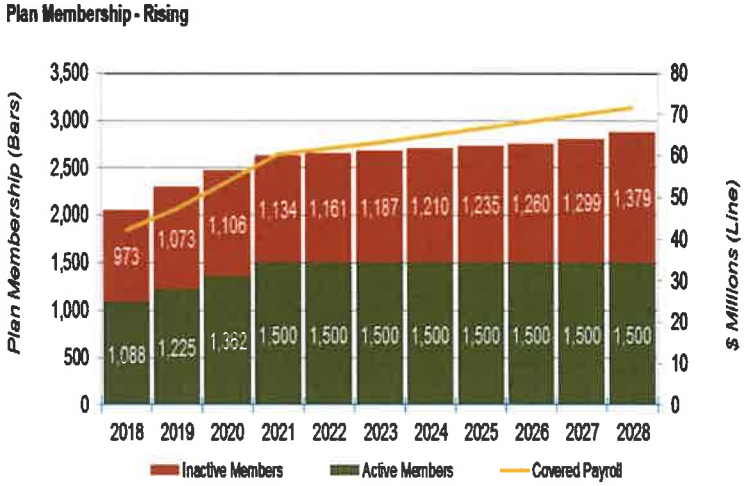
2. Rising Population - Impact on Employer Contribution Rates

1. Level Population Contribution Rates - 15 Year Closed



2. Rising Population Contribution Rates - 15 Year Closed

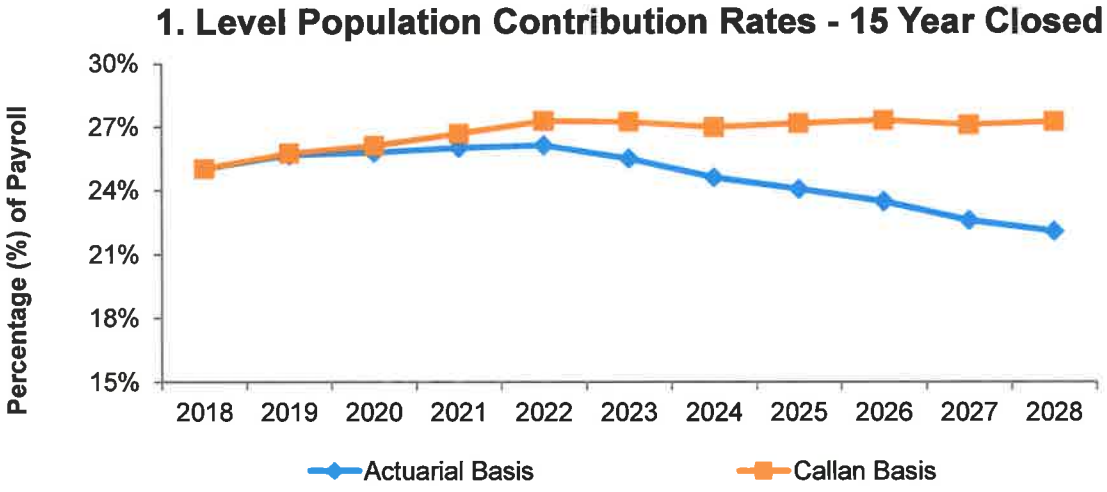


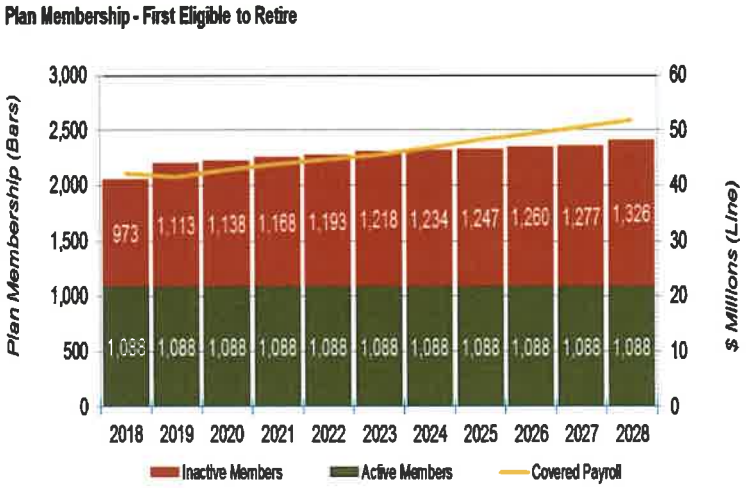


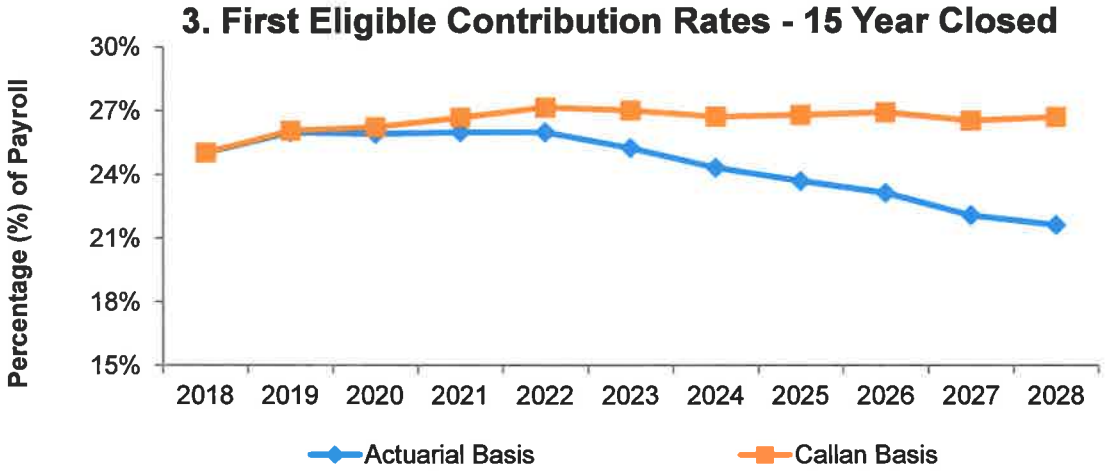
- Increasing the size of the active population results in a lower employer contribution rate:
  - Dollars of payroll increases and shown in the membership table above
  - Unfunded liability as a % of total payroll therefore declines
  - Normal cost as a % of total payroll stays the same.

Step 1 - Building the Actuarial Valuation Model

3. First Eligible for Retire - Impact on Employer Contribution Rates





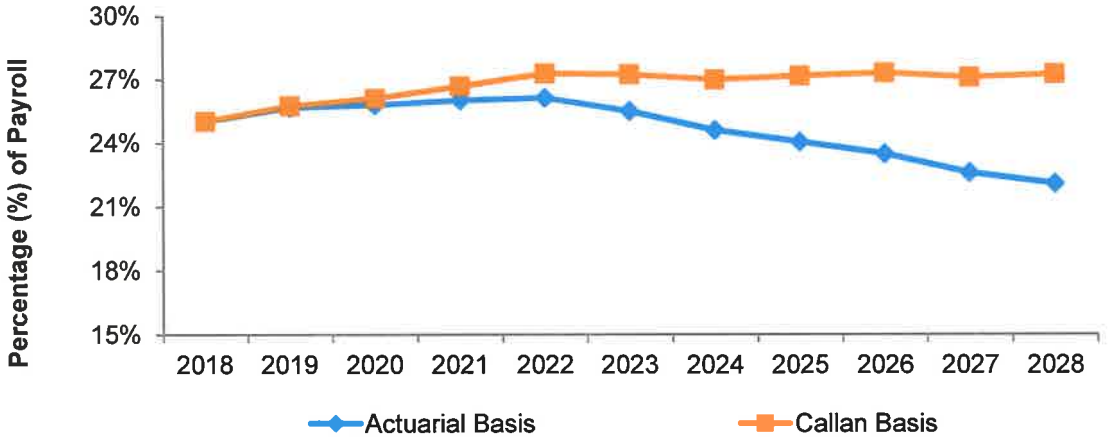


- Increased retirements over the next 5 years have no meaningful impact on employer contribution rates:
  - Actuary already assumes a high rate of retirement at first eligibility.

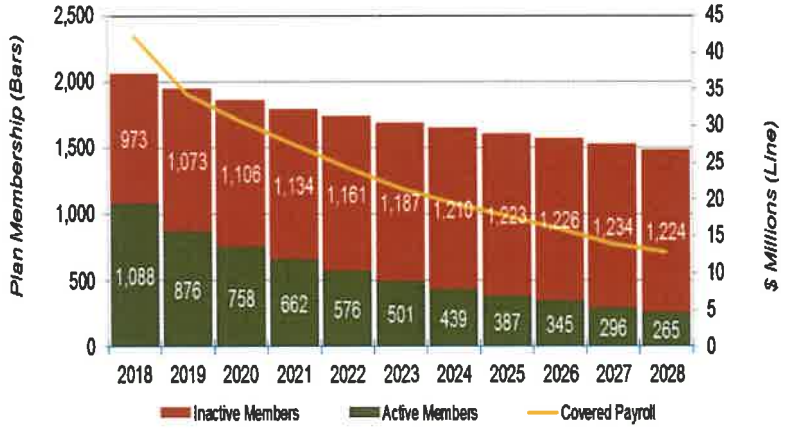
Step 1 - Building the Actuarial Valuation Model

4. Closing the Plan – Impact on Employer Contribution Rates

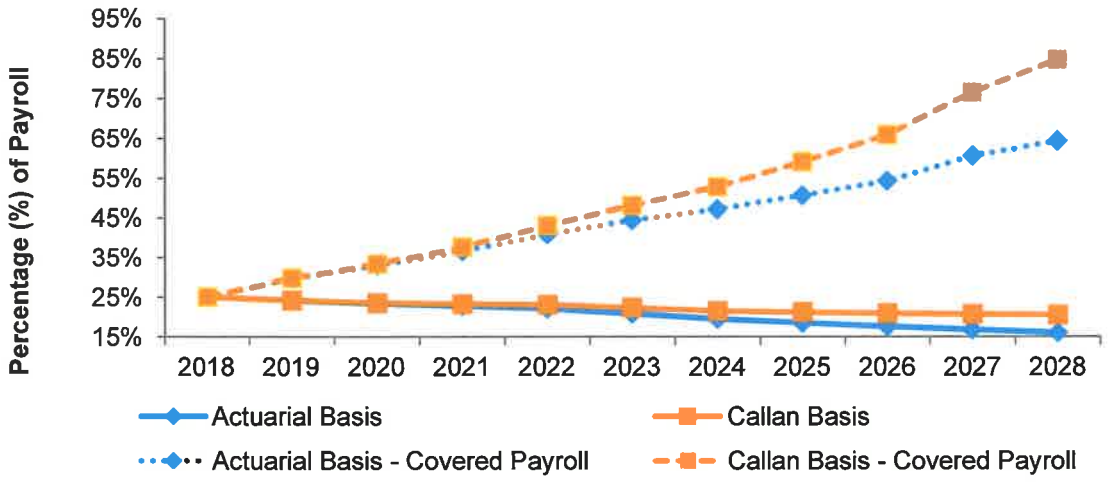
1. Level Population Contribution Rates - 15 Year Closed



Plan Membership - Close



4. Closing the Plan Contribution Rates - 15 Year Closed

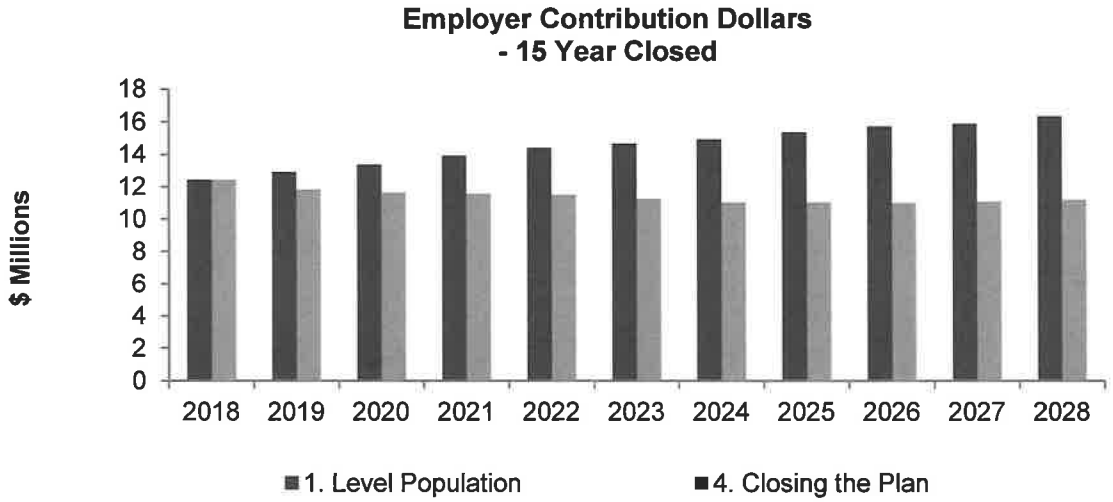


- Closing the Plan to new entrants has the impact of lowering the employer contribution rate:
  - A lower rate if the same total payroll as the level population projection (i.e. $42M rising to $50M).
  - A higher rate if covered payroll for those that remain in the plan, as shown in the membership chart above (i.e. $42M falling to $12M).

Step 1 - Building the Actuarial Valuation Model

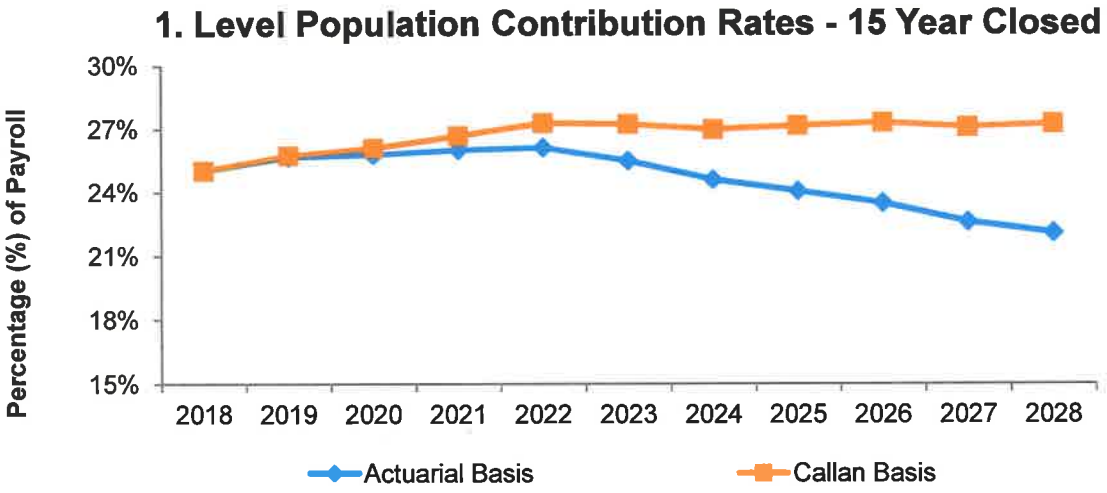
4. Closing the Plan – Impact on Employer Contribution Rates

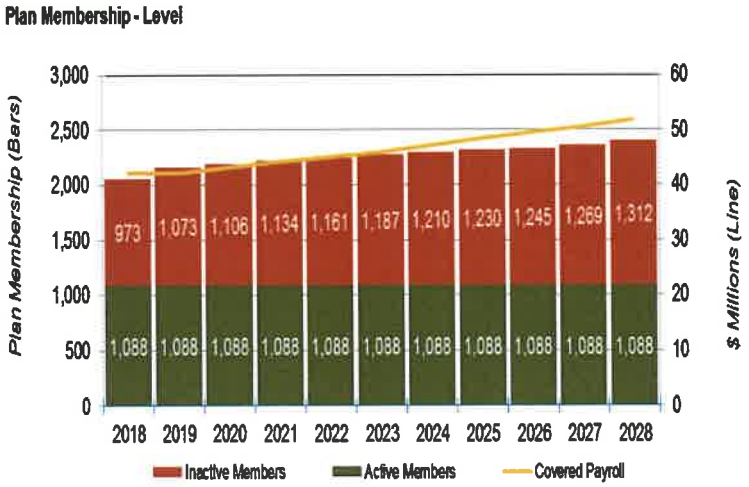
- Closing the Plan lowers the total dollars of contributions to fund the Unfunded Liability.
- In addition, these figures exclude any additional contribution to a defined contribution plan.

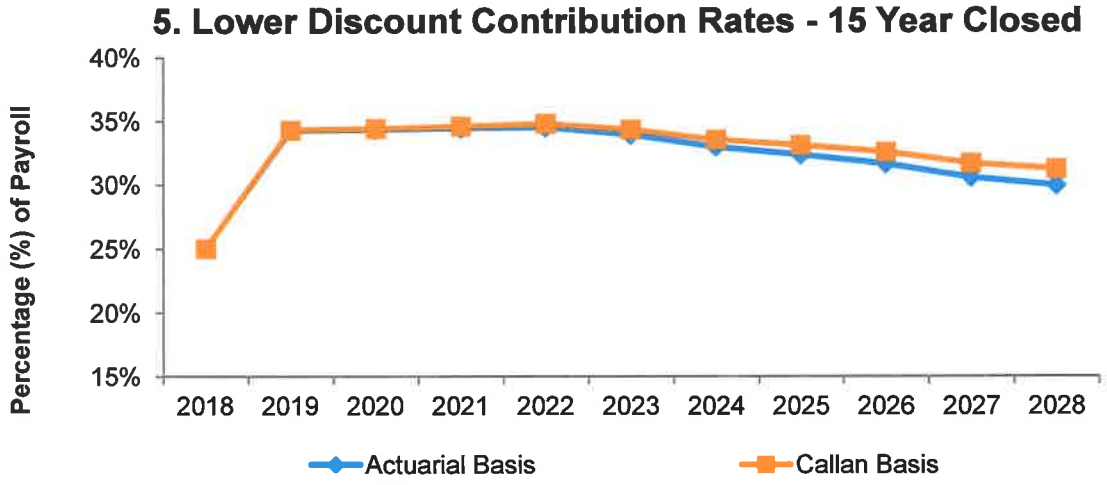


Step 1 - Building the Actuarial Valuation Model

5. Lowering the Discount Rate – Impact on Employer Contribution Rates





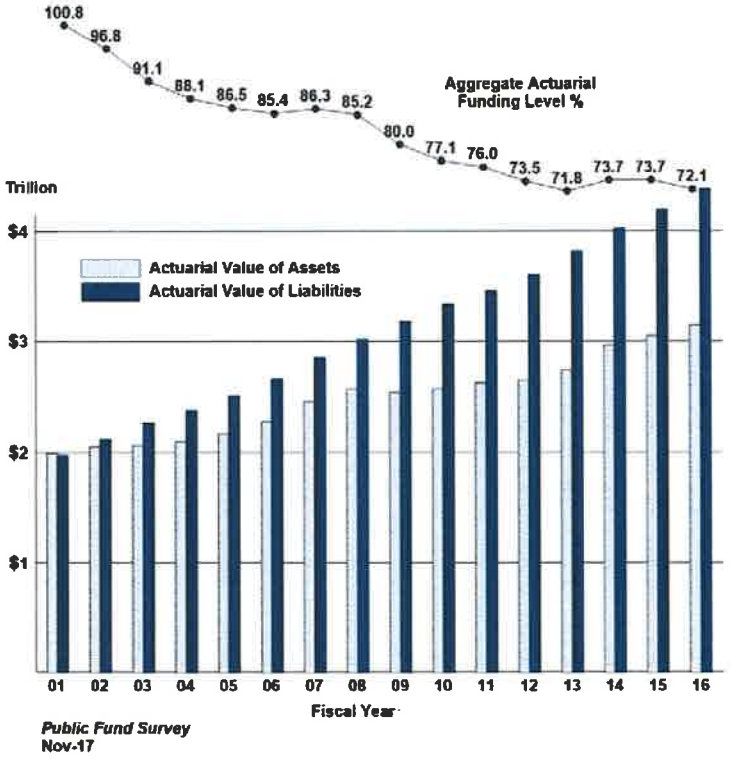


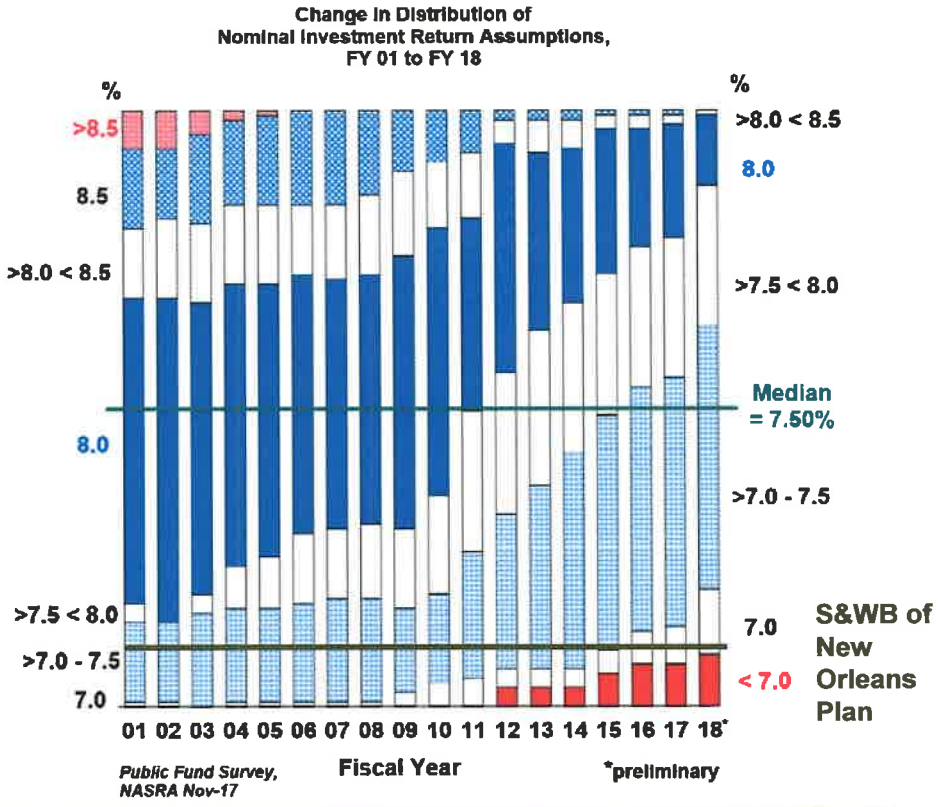
- Assuming a level population, lowering the discount rate in 2019 to 6% has the immediate impact of increasing the contribution rate by 8% of total payroll.
  - However, the contribution rate declines over time because the return hurdle rate is lower.
  - The gap between the actuarial basis and the Callan basis closes.

Step 1 - Building the Actuarial Valuation Model

5. Lowering the Discount Rate

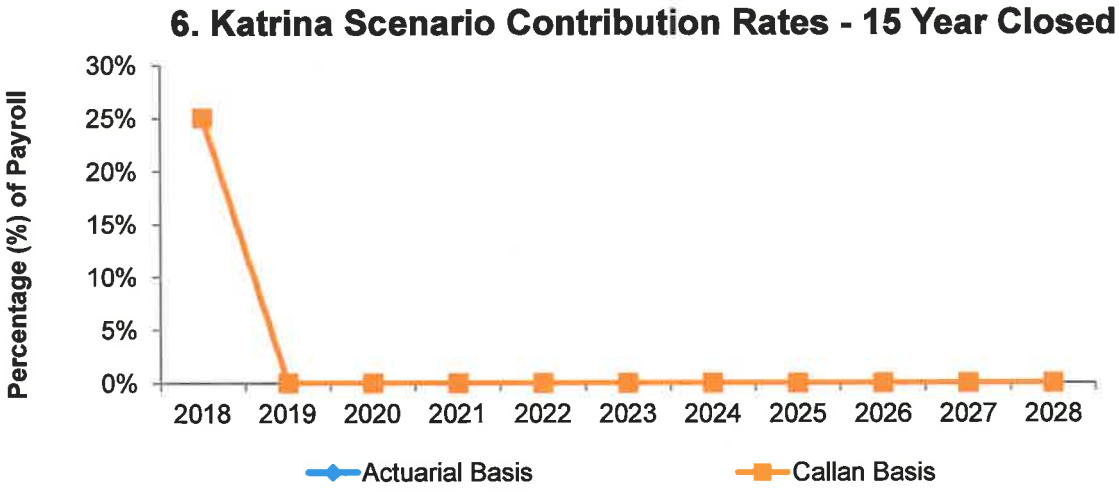
- S&WB of New Orleans Plan is well positioned relative to other public funds recently surveyed by the National Association of State Retirement Administrators (NASRA):
  - Plan's funded ratio at 1/1/2017 was 81% and Discount Rate = 7.00%.
  - Median Funded Ratio of peer group was 73.8% (aggregate 72.1%) and Discount Rate = 7.50%.

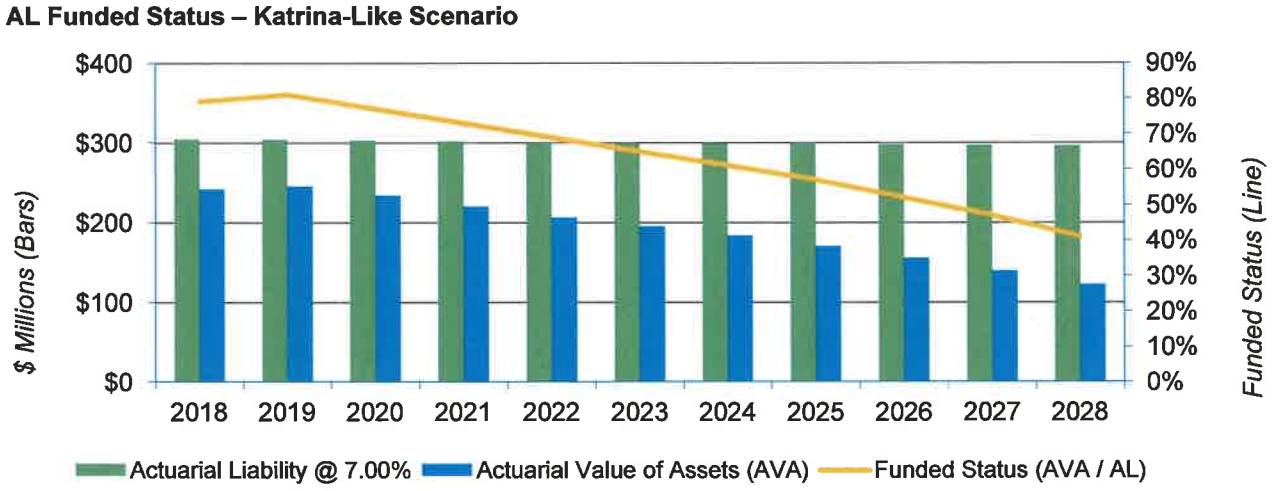




Step 1 - Building the Actuarial Valuation Model

6. Katrina-Like Scenario



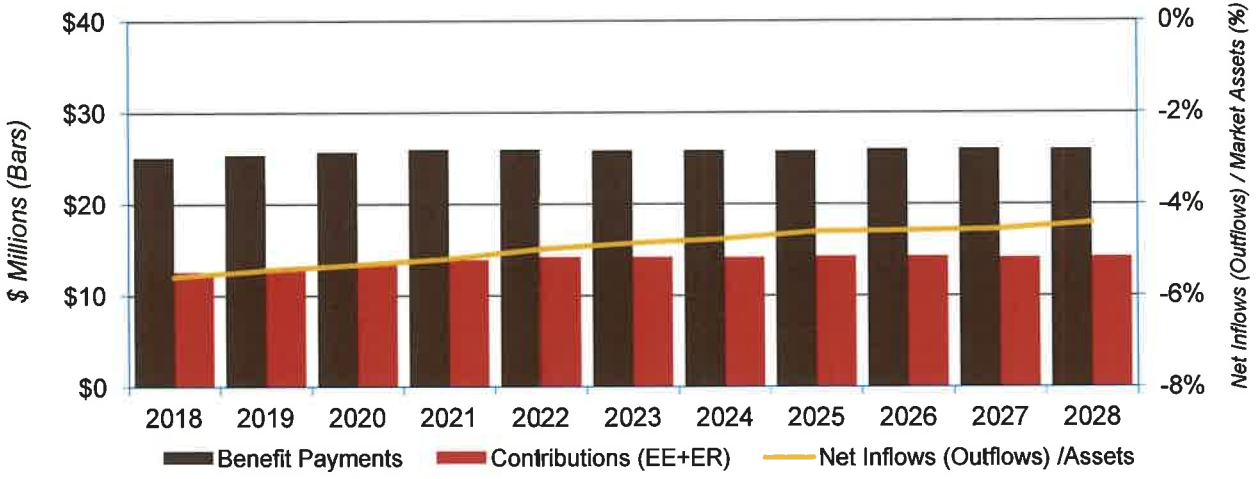


- A Katrina-like scenario assumes no further employee or employer contributions, beginning in 2019.
- The impact to the plan would be a declining asset base and rising liquidity needs.
  - For example, 2019 benefit payments as a percentage of the current market value of assets is ~11%
  - Ensuring a source for liquidity in the asset allocation should be an important element.
- If contributions stop indefinitely, the Fund is expected to be exhausted by the end of 14th year.

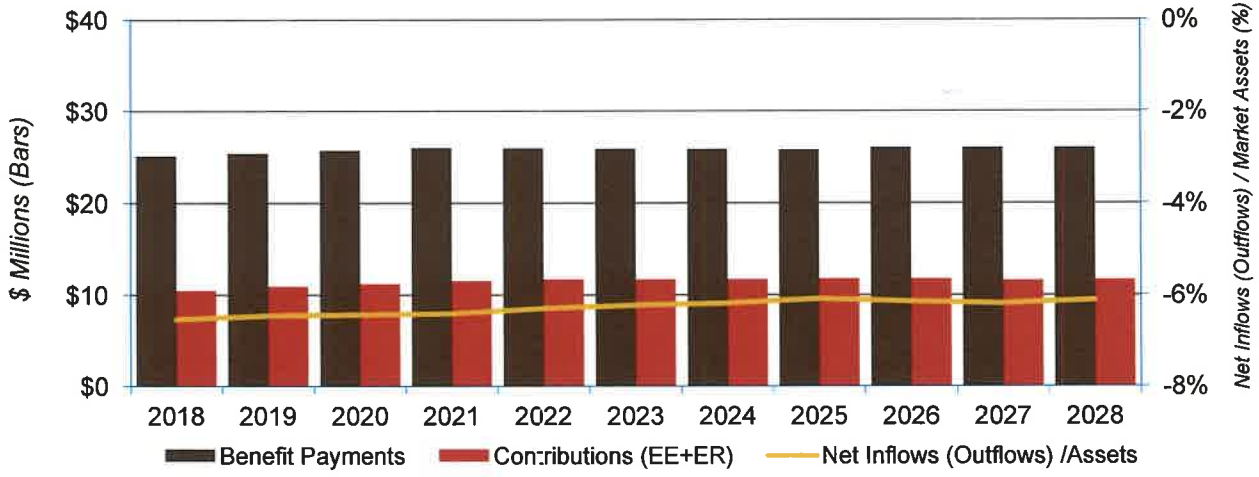
Step 1 - Building the Actuarial Valuation Model

Net Cash Flow – 1. Level Population

Cash Flow Analysis - 15 Year Closed Amortization



Cash Flow Analysis - 30 Year Open Amortization



- Net Cash Flow = Total Contributions – Benefit Payments:
  - taken as a percentage of the market assets as of the beginning of the year.
- Liquidity needs help define the appropriate time horizon for investments and shape the ability of the Plan to commit to illiquid asset classes.
- Liquidity needs depend on the funding policy, and are in the range of 4-7% of assets each year, which are manageable with only a small allocation to cash:
  - 2 to 3 months of benefit payments with no contributions equal 1.8-2.8% cash.

Step 2 - Defining the Capital Market Expectations

2018-2027 Capital Market Expectations

Asset Class	Index	Projected Return*	Projected Risk
Equities			
Broad Domestic Equity	Russell 3000	6.85%	18.25%
Large Cap	S&P 500	6.75%	17.40%
Small/Mid Cap	Russell 2500	7.00%	22.60%
Global ex-US Equity	MSCI ACWI ex USA	7.00%	21.00%
International Equity	MSCI World ex USA	6.75%	19.70%
Emerging Markets Equity	MSCI Emerging Markets	7.00%	27.45%
Fixed Income			
Short Duration	Bloomberg Barclays 1-3 Yr G/C	2.60%	2.10%
Domestic Fixed	Bloomberg Barclays Aggregate	3.00%	3.75%
Long Duration	Bloomberg Barclays Long G/C	3.00%	10.95%
TIPS	Bloomberg Barclays TIPS	3.00%	5.25%
High Yield	Bloomberg Barclays High Yield	4.75%	10.35%
Non-US Fixed	Bloomberg Barclays Glbl Agg xUSD	1.40%	9.20%
Emerging Market Debt	EMBI Global Diversified	4.50%	9.60%
Other			
Real Estate	Callan Real Estate Database	5.75%	16.35%
Private Equity	TR Post Venture Capital	7.35%	32.90%
Hedge Funds	Callan Hedge FoF Database	5.05%	9.15%
Commodities	Bloomberg Commodity	2.65%	18.30%
Cash Equivalents	90-Day T-Bill	2.25%	0.90%
Inflation	CPI-U	2.25%	1.50%

** Geometric returns are derived from arithmetic returns and the associated risk (standard deviation).*

Step 2 - Create Alternative Asset Mixes

Portfolio Optimization Mixes

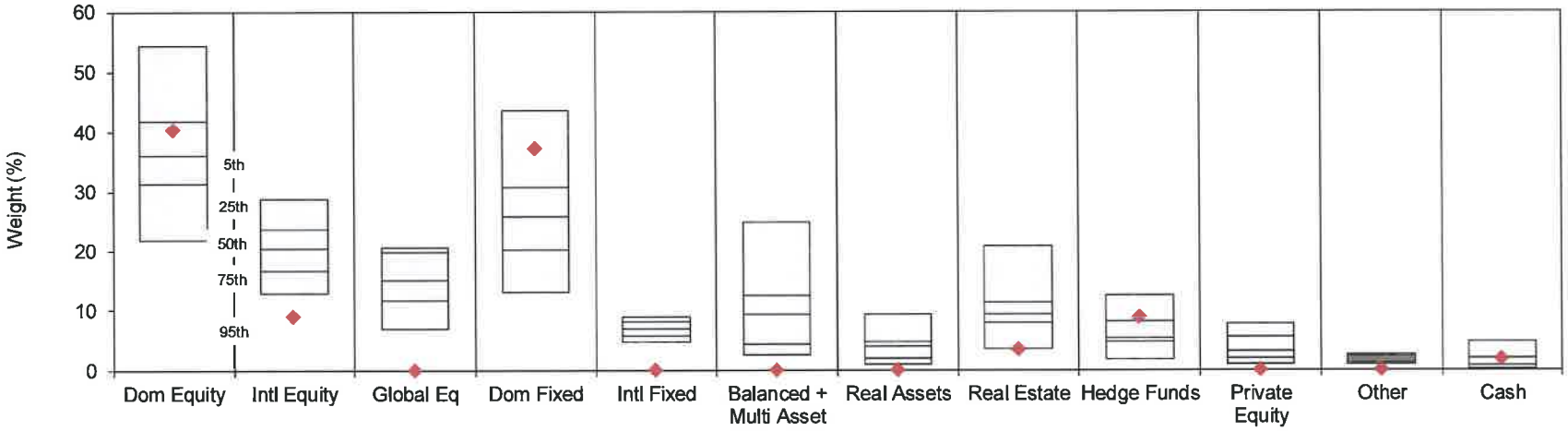
Component	Target	Min	Max	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Broad US Equity	40.25%	0%	100%	25%	27%	29%	32%	34%
Global ex US Equity	9%	0%	100%	18%	20%	22%	23%	25%
Real Estate	3.25%	0%	100%	8%	8%	9%	10%	11%
Hedge Funds	8.75%	0%	100%	8%	9%	9%	9%	9%
Domestic Fixed	37%	0%	100%	40%	35%	30%	25%	20%
Cash Equivalents	1.75%	1%	1%	1%	1%	1%	1%	1%
Total	**100%**			**100%**	**100%**	**100%**	**100%**	**100%**
Total Fixed Income+Cash	**38.75%**			**41%**	**36%**	**31%**	**26%**	**21%**
Asset-Only								
Expected Return	5.64%			5.57%	5.76%	5.93%	6.10%	6.26%
Standard Deviation	10.05%			9.60%	10.46%	11.33%	12.21%	13.09%
Sharpe Ratio	0.329			0.337	0.327	0.317	0.308	0.299

- Analysis uses the current asset classes, with a small constraint on cash to account for the drag on returns from net negative cash flow needs:
  - Liquidity needs can be managed with the fixed income allocation, or alternatively through an overlay program.
- Mixes optimized in return and risk; Mix 1 is closest to the current target allocation:
  - Favors slightly higher non-US equity and real estate and much lower US equity allocations.
- Mix 5 is the most aggressive asset mix considered, with only 20% allocated to domestic fixed income.
- See appendix for asset class education material.

Step 2 - Create Alternative Asset Mixes

Peer Group Comparisons - What are Others Doing?

Callan Public Fund DB Plan Sponsor Database
Market Assets between $100M and $1B
Actual Allocation as of December 31, 2017, Count =75

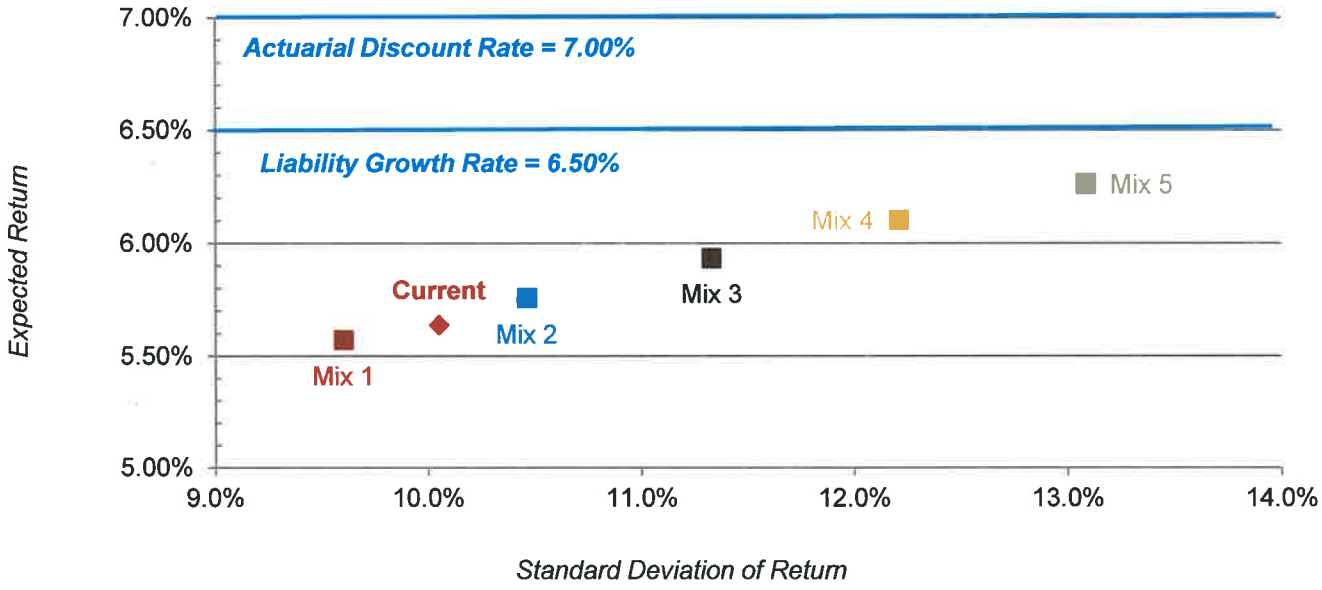


	Dom Equity	Intl Equity	Global Eq	Dom Fixed	Intl Fixed	Balanced + Multi Asset	Real Assets	Real Estate	Hedge Funds	Private Equity	Other	Cash
5th Percentile	54%	29%	21%	44%	9%	25%	9%	21%	12%	8%	3%	5%
25th Percentile	42%	24%	20%	31%	8%	12%	5%	11%	8%	6%	2%	2%
Median	**36%**	**20%**	**15%**	**26%**	**7%**	**9%**	**4%**	**9%**	**5%**	**3%**	**2%**	**1%**
75th Percentile	31%	17%	12%	20%	6%	4%	2%	8%	5%	2%	1%	0%
95th Percentile	22%	13%	7%	13%	5%	3%	1%	3%	2%	1%	1%	0%
% of Companies Invested	97%	88%	9%	100%	3%	28%	25%	73%	48%	40%	3%	61%
Plan Target ◆	40.25%	9%	0%	37%	0%	0%	0%	3.25%	8.75%	0%	0%	1.75%

- The graph above shows the actual asset allocation for a peer group of public funds of similar asset size:
  - Median domestic fixed income allocation is 26%.

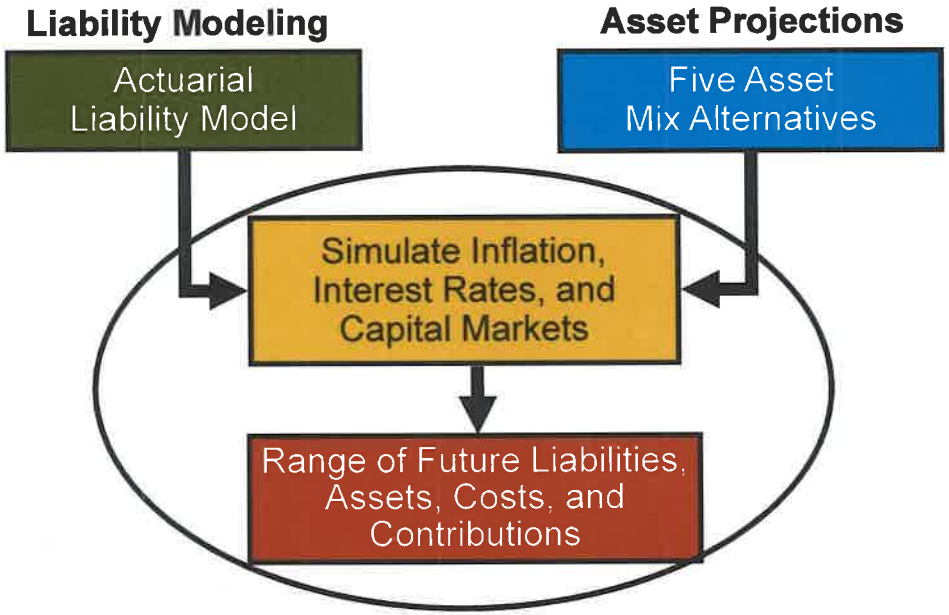
Step 2 - Create Alternative Asset Mixes

Efficient Frontier



- Graph plots the return and risk characteristics of Current policy, and Mixes 1 through 5.
- The Liability Growth Rate of 6.5% represents the targeted return, and is lower than the actuarial discount rate:
  - The actuary assumes a 5% overall salary increase while the actual payroll growth is expected to be equal to 3%, resulting in actuarial gains that lower the overall return target.
- Efficient frontier demonstrates that Callan doesn't expect the markets to deliver the liability growth rate over the next 10 years period (without positive alpha contribution from active managers) for the asset mixes considered:
  - A reasonable contribution to return from active management (alpha) is 0.25-0.50%, and is consistent with the Plan's actual fund performance (see Since Inception Fund Returns vs. Benchmark/Policy Returns)

Step 3 - Simulating the Financial Condition

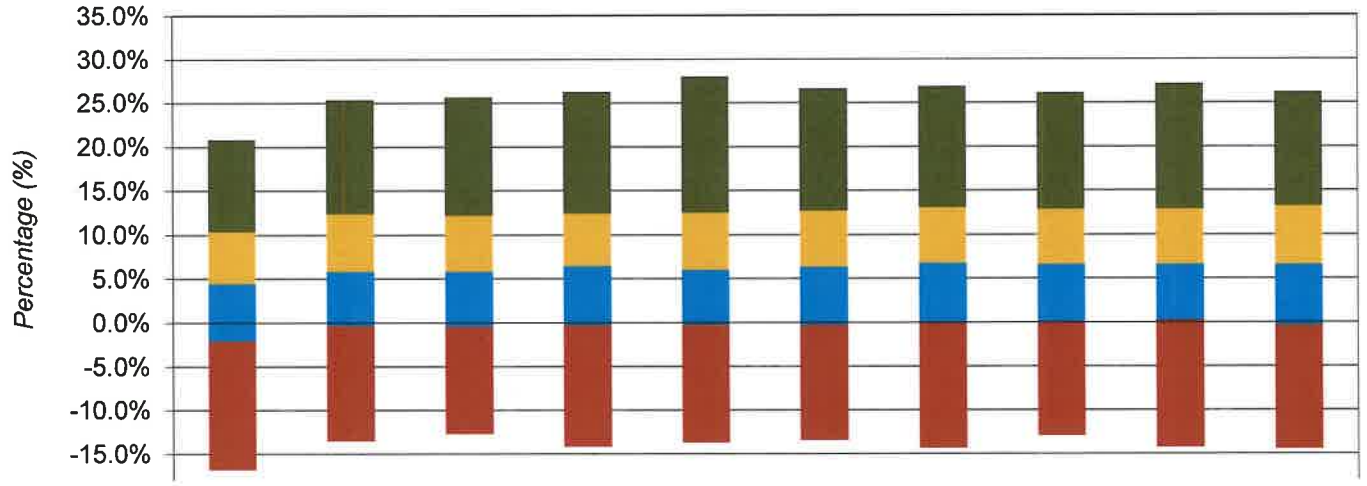


- This section demonstrates a ***stochastic forecast***: the modeling of uncertainty associated with the capital markets.
  - Simulate three (3) key variables: inflation rate, interest rate, asset class returns.
  - Assume annual rebalancing of portfolio mixes.
  - Generate 2,000 simulations per year, per asset mix to capture possible future economic scenarios and their effect on the pension plan.
  - Rank the results from highest to lowest to develop probability distributions.
- Test workforce scenarios: 1. Level; 2. Increasing; 4. Close the Plan under the two funding policies.

Step 3 - Range of Simulated Total Returns – Current Policy

What is Simulation Analysis? Annual Returns vs. 10 Year Compound Returns

- *Simulation begins by generating a range of annual returns for each asset mix.*

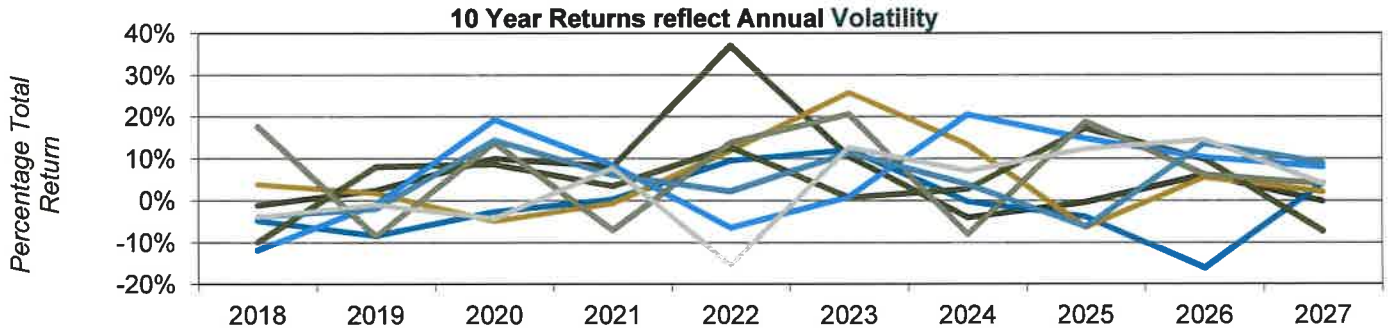


← **2.5th percentile (Best-case)**

← **50th percentile (Expected)**

← **97.5th percentile (Worse-case that suggests a 2.5% probability of occurring**

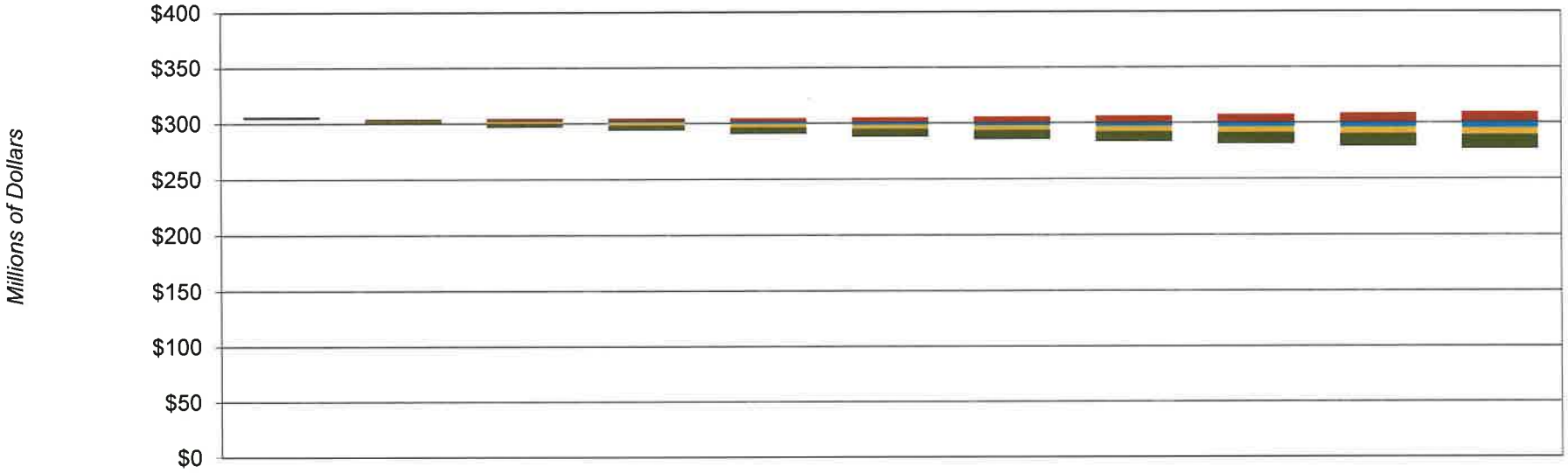
Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	10-Year Return
2.5th	20.8%	25.4%	25.7%	26.2%	28.0%	26.6%	26.9%	26.1%	27.2%	26.2%	10.6%
25th	10.4	12.4	12.2	12.4	12.5	12.7	13.1	12.9	12.9	13.3	7.3
50th	**4.4**	**5.8**	**5.7**	**6.4**	**5.9**	**6.2**	**6.7**	**6.5**	**6.6**	**6.5**	**5.6**
75th	-2.1	-0.4	-0.4	-0.3	-0.3	-0.3	-0.1	0.0	0.2	-0.4	4.0
97.5th	**-16.8**	**-13.5**	**-12.7**	**-14.2**	**-13.7**	**-13.4**	**-14.4**	**-12.9**	**-14.3**	**-14.5**	**0.9**
VAR	**21.2**	**19.3**	**18.5**	**20.6**	**19.7**	**19.7**	**21.0**	**19.5**	**20.8**	**21.0**	**4.7**



- *10 Year Compound returns are generated from a path of annual returns and demonstrate the volatility.*

Step 3 - Range of Actuarial Liability – Current Policy

1. Level Population

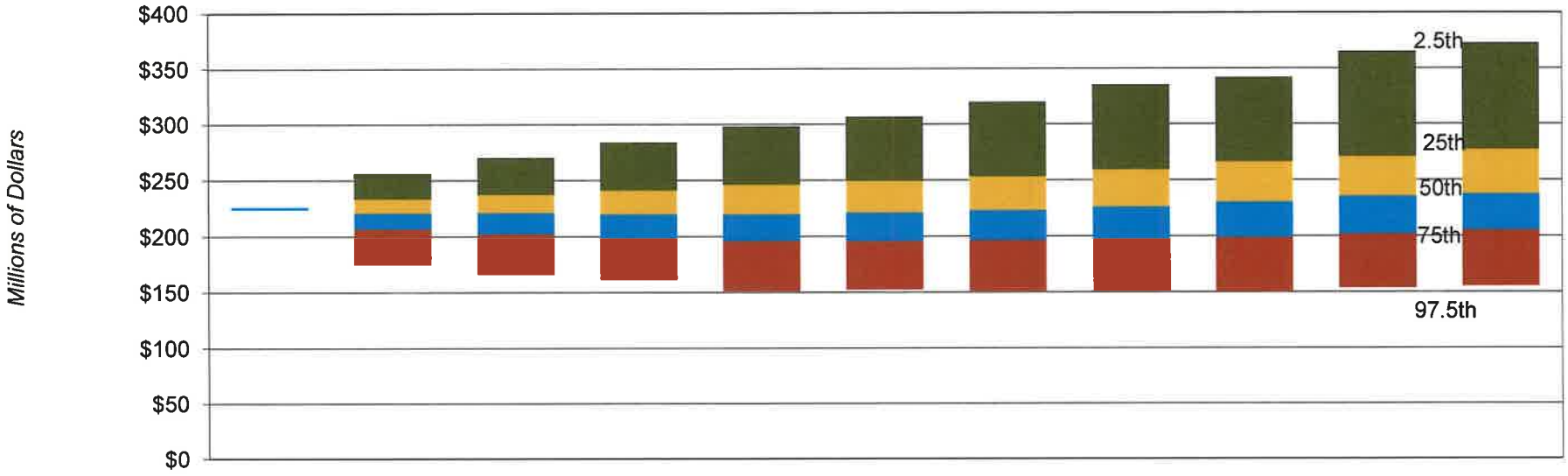


Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
97.5th	$304	$304	$304	$305	$305	$305	$306	$306	$307	$308	$309
75th	304	303	303	302	301	301	300	300	300	300	300
50th	304	303	302	301	299	298	297	297	296	296	295
25th	304	302	300	298	296	295	293	292	291	290	289
2.5th	304	300	297	294	291	288	286	283	281	279	277
VAR	0	1	3	4	5	7	8	9	11	13	14

- Actuarial liabilities have much less capital market risk, since they are not marked to market using current interest rates. Chart above assumes discount rate of 7.00% remains constant.
- Current variability reflects the uncertainty of inflation, as it impact participant's salary:
  - COLA variability only if actual inflation is below 2% - capped at 2% maximum annual increase.
- Chart also demonstrates why a duration-matching bond strategy may not be appropriate: while duration is long, liabilities have no market-based interest rate sensitivity.

Step 3 - Range of Market Values – Current Policy

1. Level Population – 15 Year Closed

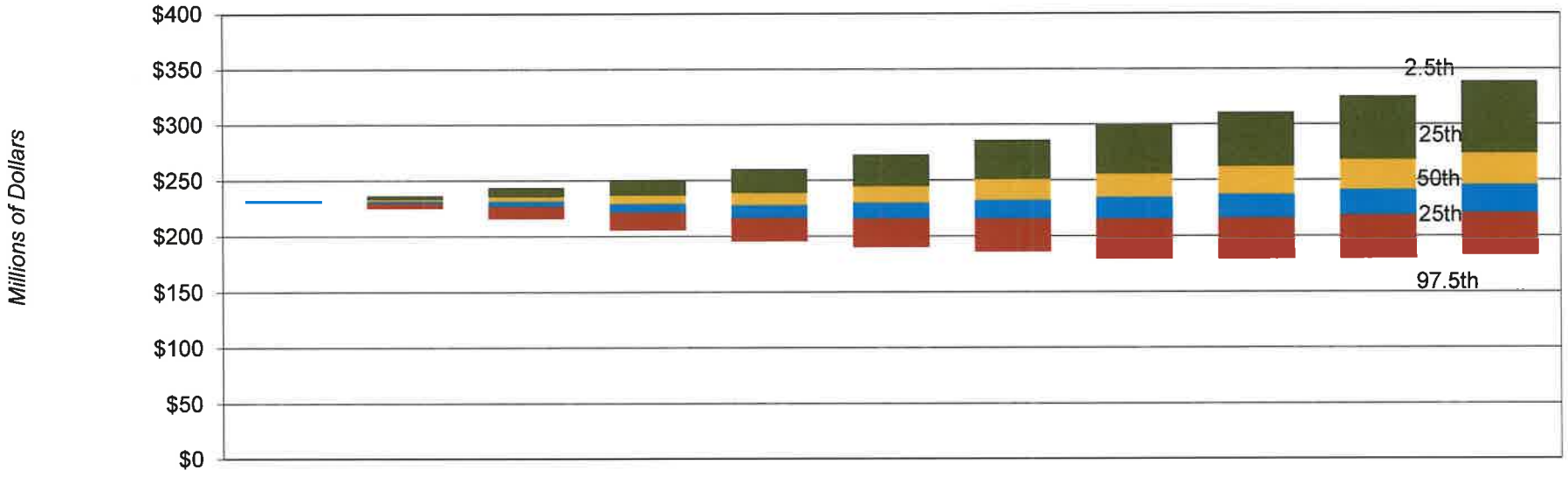


Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.5th	$224	$256	$270	$284	$298	$307	$320	$335	$342	$365	$373
25th	224	234	238	241	246	250	253	259	266	271	277
50th	**224**	**221**	**221**	**220**	**219**	**221**	**223**	**226**	**230**	**235**	**237**
75th	224	207	202	198	196	195	196	197	198	201	205
97.5th	**224**	**175**	**166**	**161**	**151**	**152**	**151**	**150**	**150**	**154**	**155**
VAR	**0**	**46**	**55**	**58**	**68**	**69**	**72**	**76**	**80**	**82**	**82**

- Market assets are impacted by both asset returns and cash flows, and shows significantly more volatility than the liabilities.
- Range of outcomes widens as time horizon lengthens, and distribution of asset values shows non-symmetry (skew).
- VAR (or value at risk) measures downside risk, or the difference between the expected (50th percentile) and worse-case (97.5th percentile) results, in this case how much the assets could fall.

Step 3 - Range of Actuarial Asset Values – Current Policy

1. Level Population – 15 Year Closed

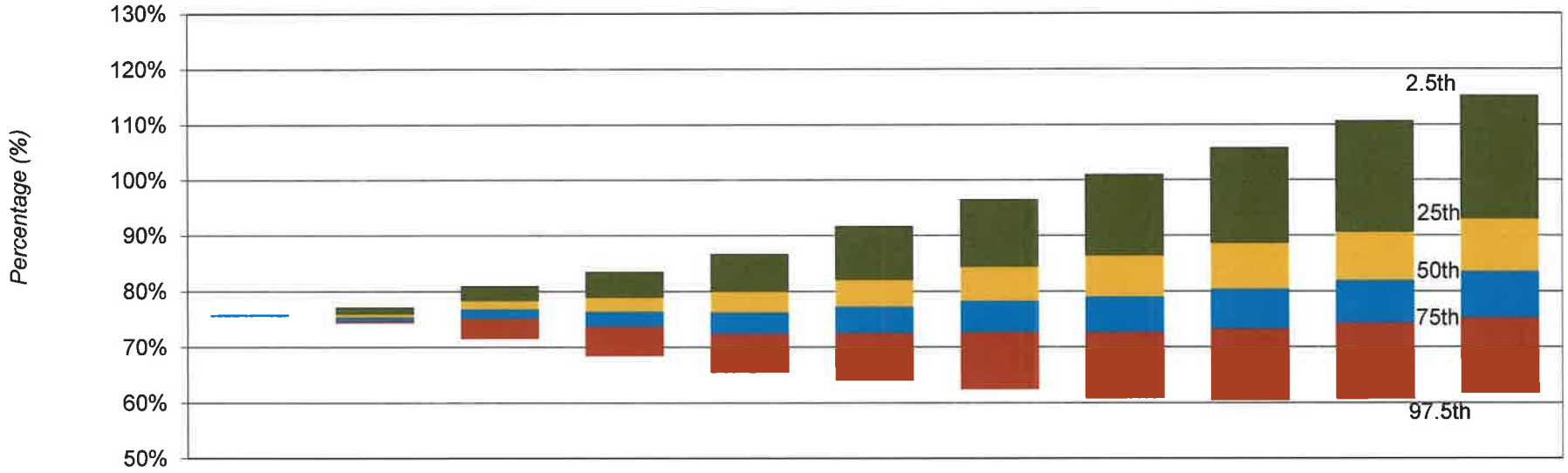


Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.5th	$230	$237	$244	$250	$260	$273	$286	$299	$311	$325	$339
25th	230	233	236	237	239	245	251	256	262	268	274
50th	**230**	**232**	**231**	**229**	**228**	**230**	**232**	**234**	**237**	**241**	**245**
75th	230	230	226	221	216	215	215	215	216	218	220
97.5th	**230**	**225**	**216**	**205**	**195**	**190**	**186**	**179**	**179**	**180**	**183**
VAR	**0**	**7**	**15**	**24**	**32**	**40**	**46**	**55**	**58**	**62**	**63**

- Asset performance is smoothed over a 7-year period.
- VAR (or value at risk) measures downside risk, or the difference between the expected (50th percentile) and worse-case (97.5th percentile) results.
- Smoothing marginally reduces volatility and downside risk (VAR) when measuring funded ratio performance.

Step 3 - Range of Funded Ratio (AVA/AL) – Current Policy

1. Level Population – 15 Year Closed

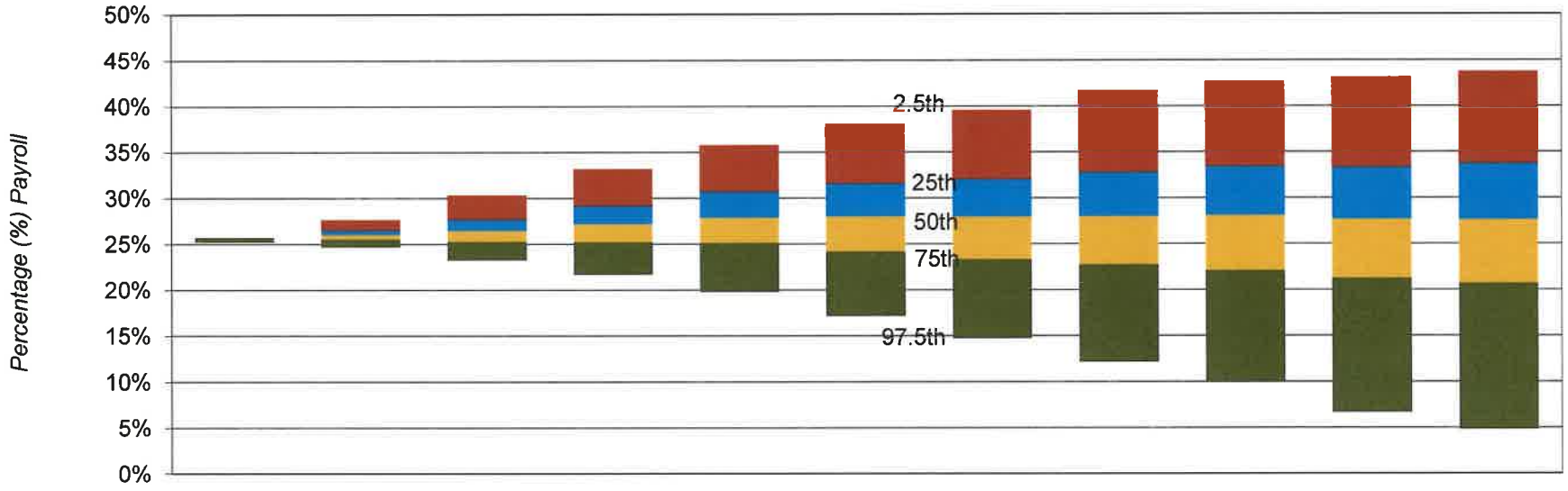


Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.5th	75.5%	78.4%	81.0%	83.6%	86.7%	91.7%	96.5%	101.0%	105.9%	110.7%	115.2%
25th	75.5	77.2	78.3	78.9	79.9	82.1	84.4	86.4	88.6	90.6	93.0
50th	**75.5**	**76.6**	**76.8**	**76.3**	**76.2**	**77.2**	**78.2**	**79.0**	**80.4**	**81.9**	**83.5**
75th	75.5	75.9	75.1	73.7	72.4	72.5	72.7	72.6	73.2	74.3	75.2
97.5th	**75.5**	**74.3**	**71.5**	**68.4**	**65.4**	**64.1**	**62.4**	**60.9**	**60.4**	**60.7**	**61.7**
VAR	**0.0**	**2.2**	**5.2**	**7.9**	**10.8**	**13.1**	**15.8**	**18.1**	**19.9**	**21.2**	**21.8**

- The funded ratio combines assets and liabilities and captures one dimension of investment risk: how much larger can the unfunded liability grow as the funded ratio falls.
  - A larger unfunded liability will increase the annual contribution requirement.
- Funded ratio volatility is largely driven by asset volatility, highlighting the importance of the asset mix decision.

Step 3 - Range of Employer Contribution Rate – Current Policy

1. Level Population – 15 Year Closed

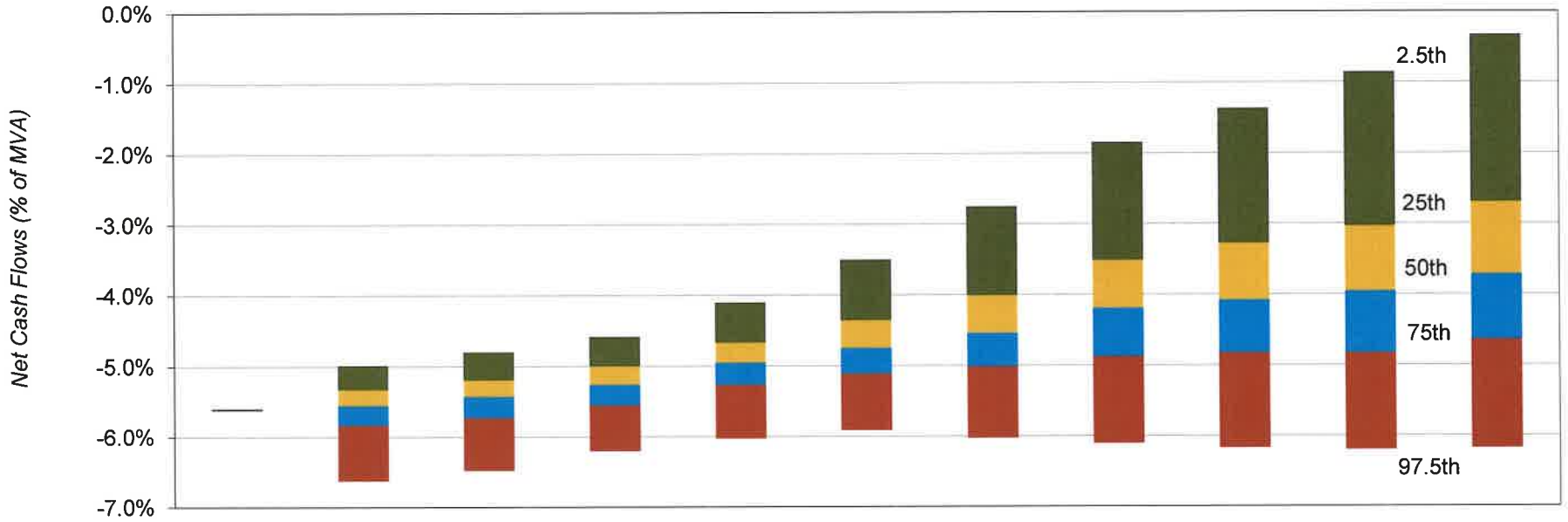


Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
97.5th	25.22%	27.66%	30.31%	33.19%	35.77%	38.07%	39.57%	41.70%	42.69%	43.14%	43.72%
75th	25.22	26.52	27.66	29.12	30.66	31.56	32.01	32.78	33.39	33.31	33.71
50th	**25.22**	**25.99**	**26.42**	**27.17**	**27.85**	**27.99**	**27.93**	**27.97**	**28.09**	**27.66**	**27.61**
25th	25.22	25.52	25.26	25.19	25.12	24.17	23.32	22.76	22.08	21.24	20.65
2.5th	**25.22**	**24.69**	**23.24**	**21.71**	**19.79**	**17.13**	**14.71**	**12.14**	**9.96**	**6.66**	**4.81**
VAR	**0.0**	**1.7**	**3.9**	**6.0**	**7.9**	**10.1**	**11.6**	**13.7**	**14.6**	**15.5**	**16.1**

- The potential range of outcomes for employer contributions is another important measure of investment risk. The range of contribution in any one year is an important measure of risk.
- Note that a worse-case scenario is unlikely to occur in every year, so the study will focus on contributions over multiple periods like a 5 and 10-year time horizons.
- Cumulative analysis focuses on contributions starting in 2019, since investment risk taken this year will impact next years contribution amount.

Step 3 - Range of Net Outflows for Current Policy

1. Level Population – 15 Year Closed



Percentile	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.5th	-5.6%	-5.0%	-4.8%	-4.6%	-4.1%	-3.5%	-2.8%	-1.8%	-1.4%	-0.9%	-0.3%
25th	-5.6	-5.3	-5.2	-5.0	-4.7	-4.4	-4.0	-3.5	-3.3	-3.0	-2.7
50th	-5.6	-5.6	-5.4	-5.3	-5.0	-4.8	-4.5	-4.2	-4.1	-4.0	-3.7
75th	-5.6	-5.8	-5.7	-5.6	-5.3	-5.1	-5.0	-4.9	-4.8	-4.8	-4.6
97.5th	-5.6	-6.6	-6.5	-6.2	-6.0	-5.9	-6.0	-6.1	-6.2	-6.2	-6.2
VAR	**0.0**	**1.1**	**1.0**	**0.9**	**1.1**	**1.2**	**1.5**	**1.9**	**2.1**	**2.2**	**2.5**

- Liquidity needs show some potential for higher outflows in worse case scenarios, but in all cases are forecast to remain very manageable.
- As a general rule of thumb, Callan uses a threshold of -10% in any one year as an indicator that there are liquidity concerns impacting the asset allocation decision.

Step 3 - Liquidity Analysis

1. Level Population – 15 Year Closed

Net Cashflow in Year 3

Percentile	100%	90%	80%	70%	60%
2.5th	-4.7%	-5.2%	-5.9%	-6.7%	-7.9%
25th	-5.1	-5.7	-6.4	-7.3	-8.5
50th	**-5.4**	**-6.0**	**-6.7**	**-7.7**	**-8.9**
75th	-5.7	-6.3	-7.1	-8.1	-9.4
97.5th	**-6.4**	**-7.1**	**-8.0**	**-9.1**	**-10.6**
VAR	**1.0**	**1.1**	**1.3**	**1.4**	**1.7**

Net Cashflow in Year 5

Percentile	100%	90%	80%	70%	60%
2.5th	-4.3%	-4.8%	-5.4%	-6.2%	-7.2%
25th	-5.1	-5.7	-6.4	-7.3	-8.5
50th	**-5.5**	**-6.1**	**-6.9**	**-7.8**	**-9.2**
75th	-5.9	-6.5	-7.4	-8.4	-9.8
97.5th	**-6.9**	**-7.6**	**-8.6**	**-9.8**	**-11.4**
VAR	**1.4**	**1.5**	**1.7**	**2.0**	**2.3**

Net Cashflow in Year 8

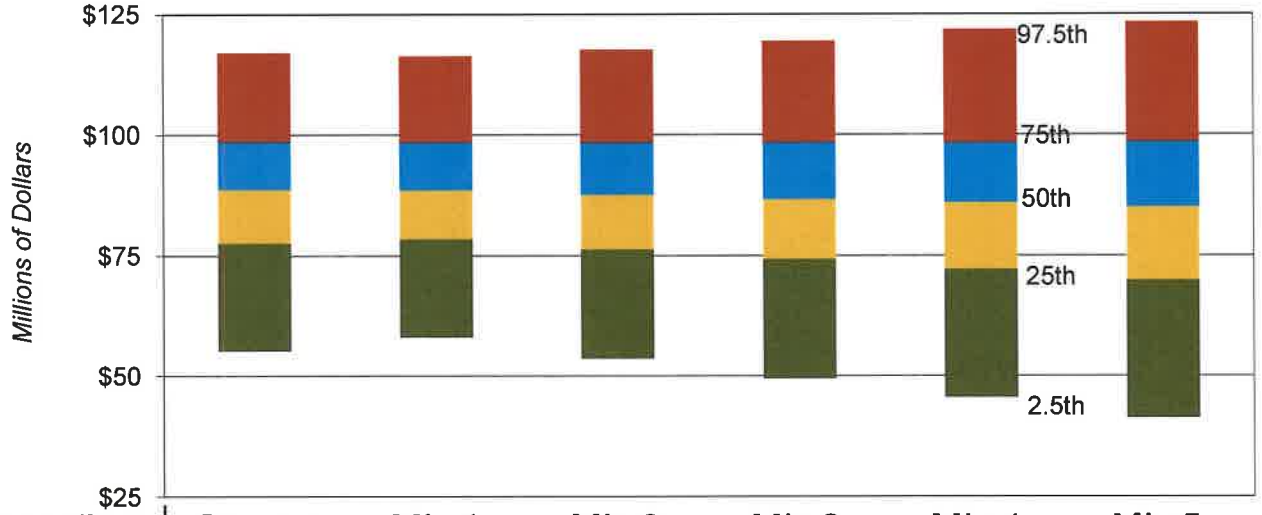
Percentile	100%	90%	80%	70%	60%
2.5th	-3.3%	-3.6%	-4.1%	-4.7%	-5.5%
25th	-5.0	-5.5	-6.2	-7.1	-8.3
50th	**-5.7**	**-6.3**	**-7.1**	**-8.1**	**-9.5**
75th	-6.4	-7.1	-8.0	-9.2	-10.7
97.5th	**-7.9**	**-8.8**	**-9.9**	**-11.3**	**-13.2**
VAR	**2.2**	**2.5**	**2.8**	**3.2**	**3.7**

- Using net cash flow analysis, the purpose is to ascertain how much of the asset allocation could be devoted to less liquid alternative asset classes or private market investment strategies.
- Each column represents the portion of the portfolio that is publically traded:
  - For example, 100% means all of the asset classes are publicly traded
  - As highlighted, 80% implies only a portion of the portfolio is traded, while the other 20% is in private investments.
- Focusing on worse-case outcomes and a threshold of -10% in any one year, the analysis supports up to 20% of the portfolio in less liquid strategies as are considered in Mix 1 through Mix 5.

Step 3 - Range of PV Cumulative Contributions over 10 Years

1. Level Population – 15 Year Closed: Compare Asset Mixes

- The chart below seeks to demonstrate the risk and reward tradeoffs between different asset allocation strategies in contribution space over multiple time horizons:
  - Accumulate dollars of employer contribution over a 10 year period and discount by the 7% actuarial return.
- **Blue** highlights the median case (50th percentile) and measures the **reward** for taking on investment risk.
  - The higher the return target, the lower the total contributions to the plan. Mix 5 has a lower contribution than Mix 1.
- **Red** highlights the downside scenarios (97.5th percentile) and demonstrate the **risk**.
  - The higher the return target, the greater the volatility. Mix 5 could have a higher contribution than Mix 1 in worse-cases.

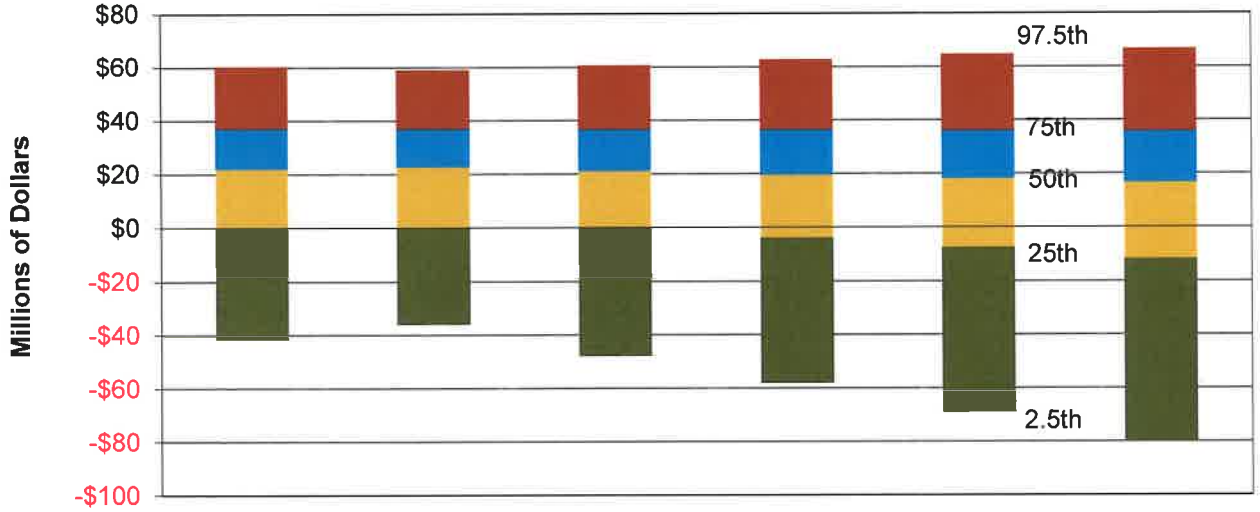


	Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Risk	**97.5th**	**$117**	**$116**	**$118**	**$119**	**$122**	**$123**
	75th	99	98	98	98	98	98
Reward	**50th**	**89**	**89**	**88**	**87**	**86**	**85**
	25th	78	78	76	74	72	70
	2.5th	55	58	54	49	45	41
	VAR	**28**	**28**	**30**	**33**	**36**	**38**

Step 3 - Range of PV Unfunded Liability(MVA) the End of 10 Years

1. Level Population – 15 Year Closed: Compare Asset Mixes

- Charts compare the remaining unfunded liability at the end of 10 years (January 1, 2028) across the different asset mixes, and is another source for evaluating the risk and return tradeoffs of an asset allocation strategy.
  - Market Value measurement with no asset smoothing
  - Discounted on a present value basis using the 7% discount rate.



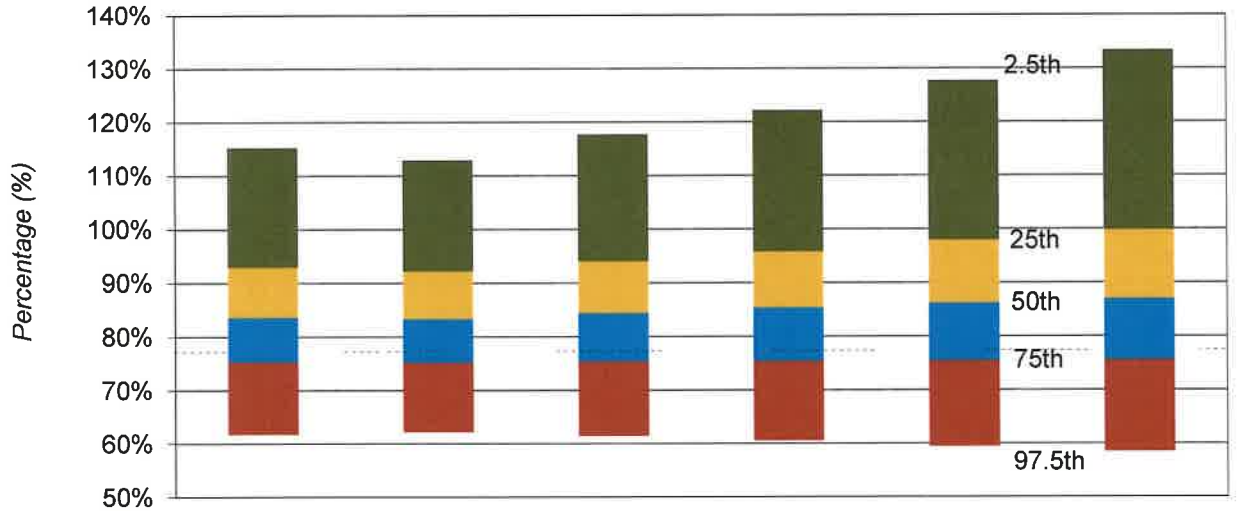
	Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Risk	**97.5th**	**$60**	**$59**	**$61**	**$63**	**$65**	**$67**
	75th	37	37	37	36	36	36
Reward	**50th**	**22**	**22**	**21**	**19**	**18**	**16**
	25th	3	4	0	-4	-8	-12
	2.5th	-42	-36	-48	-58	-69	-80
	VAR	**39**	**37**	**40**	**43**	**47**	**50**

** Negative number implies surplus.*

Step 3 - Range of Funded Ratio (AVA/AL) the End of 10 Years

1. Level Population – 15 Year Closed: Compare Asset Mixes

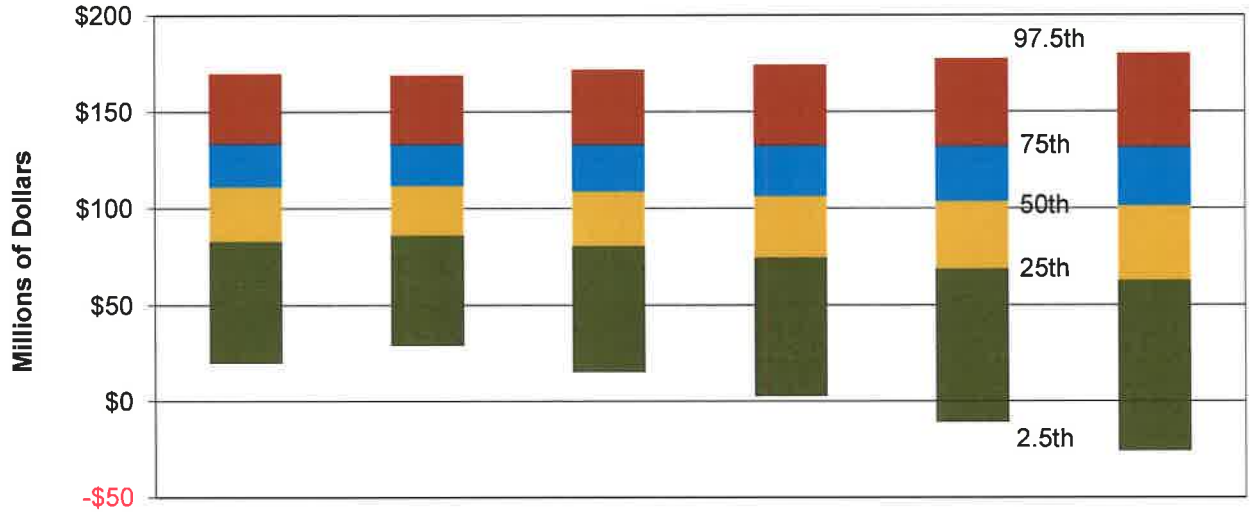
- Charts show the funded ratio at the end of 10 years using the smoothing of assets measurement without any discounting.
  - Black line indicates the Plan's current funded ratio of 76% as of January 1, 2018.
- Risk appears at the bottom of the table for this analysis because it is worse-case scenario where the funded ratio falls because the unfunded liability increased.



	Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
	2.5th	115%	113%	118%	122%	128%	133%
	25th	93	92	94	96	98	100
Reward	**50th**	**84**	**83**	**84**	**85**	**86**	**87**
	75th	75	75	75	75	75	76
Risk	**97.5th**	**62**	**62**	**61**	**60**	**59**	**58**
	VAR	**-22**	**-21**	**-23**	**-25**	**-27**	**-28**

Step 3 - Range of Ultimate Net Cost over 10 Years

1. Level Population – 15 Year Closed: Compare Asset Mixes



	Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Risk	97.5th	$169.7	$168.8	$171.8	$174.2	$177.3	$180.0
	75th	133.3	132.9	132.7	132.2	131.9	131.4
Reward	50th	110.9	111.6	108.6	106.1	103.5	101.1
	25th	82.9	86.0	80.4	74.5	68.7	62.6
	2.5th	19.9	29.1	15.2	2.6	-10.9	-25.8
	VAR	58.8	57.3	63.1	68.1	73.8	78.9

* *Negative number implies surplus.*

Tradeoff Current to Mix 3

Up $4.5M

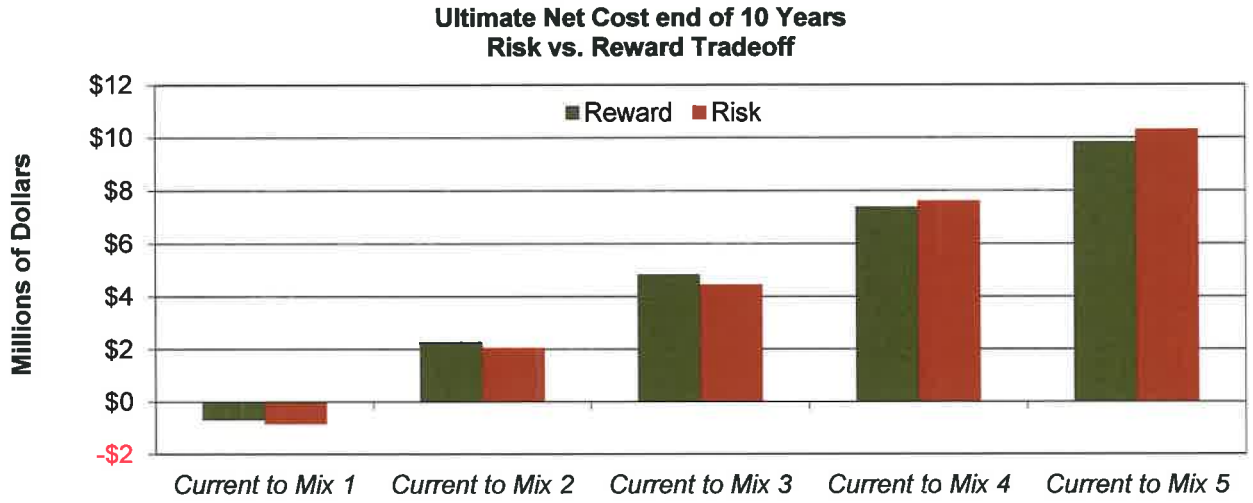
Down $4.7M

The potential reward is more than the increase in risk

- Ultimate Net Cost quantifies the total cost of operating the Plan and can demonstrate the tradeoff between minimizing contributions relative to a goal of improving the funded status
- Ultimate Net Cost = PV of Cumulative Contributions + PV Unfunded Liability (MVA) over 10 years.
- To compare the alternative asset allocation strategies, we employ a risk and reward analysis:
  - Reward measures the difference in the median case (50th percentile) over a 10 year horizon.
  - Risk measures the difference in the worse-case outcomes (97.5th percentile) over a 10 year horizon.

Step 4 - Defining Risk Tolerance

1. Level Population – 15 Year Closed: Compare Asset Mixes

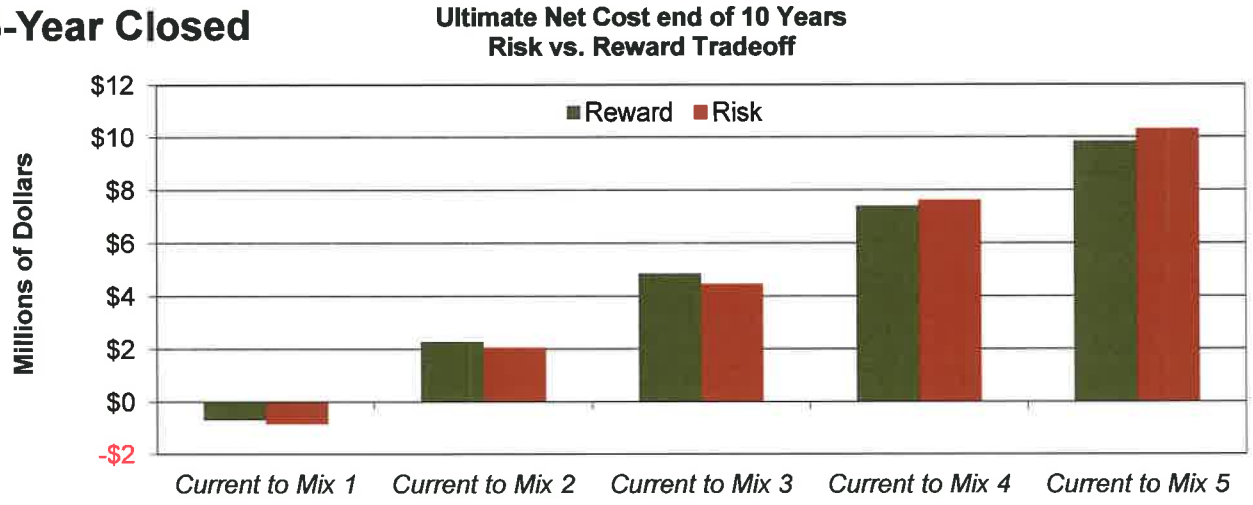


- Chart above graph the differences between the reward and risk numbers shown on the prior slide.
  - Each alternative mix is compared to the current target policy of 37% fixed income.
- The analysis supports moving to the indicated asset mix if the green bars are higher than the red bars, or the reward is greater than the increase in risk.
- This type of analysis supports Mix 2 and Mix 3 as reasonable options, showing that the increase in reward overcomes the increase in risk:
  - More aggressive options like Mix 4 and Mix 5 are less favorable as red bars are higher than the green bars.
- If the same analysis were applied to a shorter time horizon like 5 Years, Mix 2 would be favored.
- Conclude that a lower fixed income target, in the range of 30-35%, is favored.

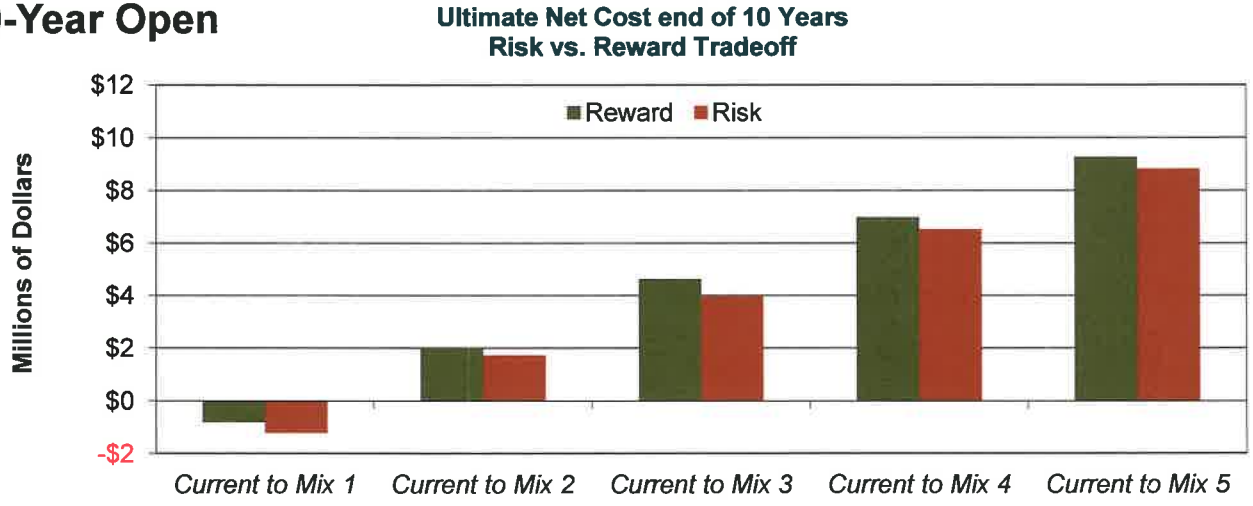
Step 4 - Defining Risk Tolerance

Impact of Funding Policy

15-Year Closed



30-Year Open

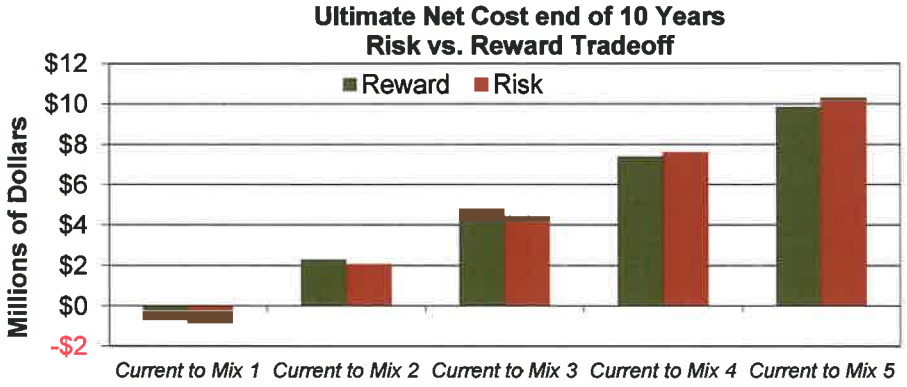


- The risk and reward tradeoff analysis changes with the funding policy.
- A closed amortization funding policy suggests Mix 2 or Mix 3, as more contribution dollars are exposed to risk.
- Open amortization suggests a more aggressive mix like Mix 4 or Mix 5, because a lower amount of contribution dollars are exposed to risk.

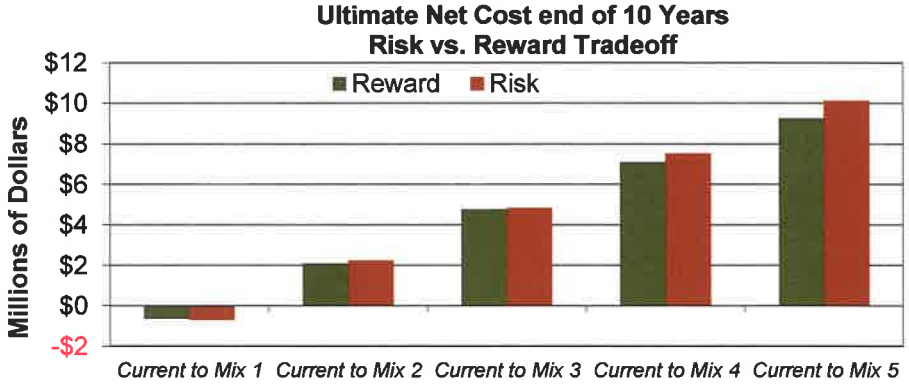
Step 4 - Defining Risk Tolerance

Impact of Different Workforce Scenarios

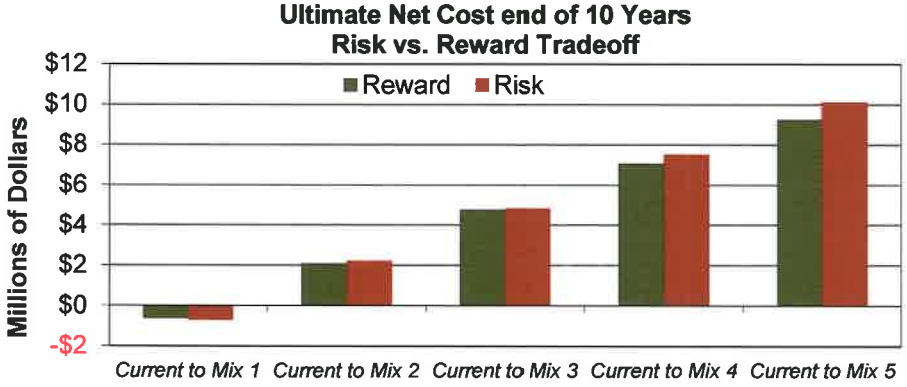
1. Level Population: 15-Year Closed



4. Close the Plan: 15-Year Closed



2. Increasing Population: 15-Year Closed



- Increasing the active employee population supports Mix 3, similar to the level population results.
- Closing the plan to new hires seems to support a less aggressive investment policy like the current policy or Mix 1.

Step 4 - Defining Risk Tolerance

7. Scenario Analysis

- Within the stochastic results, we examine specific downside scenarios included in the stochastic range
  - Each scenario has a path of inflation, interest rates, US bond and equity returns (shown year by year, and cumulative over 5 years)
  - Tech Bubble had 3 years of negative equity years in succession
  - Great Recession had a large equity drawdown, -35-40% return, in any one year
  - 1974 market scenario of rising yields and very low bond returns.

	Inflation					*High Quality Corporate Yields*						*US Equity Returns*					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5	Cumulative Returns US Bonds	Year 1	Year 2	Year 3	Year 4	Year 5	Cumulative Returns US Equity
Stagflation	1.5%	2.1%	4.9%	4.6%	3.0%	3.6%	3.7%	4.5%	4.6%	3.6%	3.6%	(6.1%)	(2.5%)	(4.7%)	14.6%	10.1%	1.9%
Tech Bubble	2.3%	1.1%	-0.4%	0.3%	2.0%	3.9%	3.1%	2.1%	2.4%	2.1%	4.4%	(2.9%)	(8.8%)	(1.0%)	(35.0%)	25.2%	(6.5%)
Great Recession 1	1.2%	1.5%	2.1%	1.2%	-1.9%	3.3%	4.5%	4.4%	4.0%	3.1%	3.7%	(5.6%)	(43.4%)	11.7%	11.3%	31.4%	(2.7%)
Great Recession 2	3.4%	3.3%	3.2%	4.1%	2.9%	3.8%	4.0%	3.8%	4.4%	3.4%	4.3%	2.2%	17.7%	(35.9%)	5.8%	12.5%	(1.7%)
Great Recession 3	2.8%	2.1%	3.0%	3.6%	3.9%	4.1%	4.6%	3.9%	5.2%	5.2%	2.1%	3.9%	(1.4%)	(1.4%)	(33.2%)	12.4%	(5.3%)
Bond Market 1	1.8%	0.9%	2.6%	2.8%	2.5%	4.1%	4.7%	5.5%	6.1%	6.8%	(1.1%)	10.5%	(43.2%)	47.7%	34.3%	2.8%	5.1%
Bond Market 2	2.3%	0.6%	-0.3%	0.7%	0.7%	3.6%	3.4%	4.0%	5.8%	5.9%	(0.0%)	23.1%	(6.3%)	(14.2%)	(31.0%)	(3.0%)	(7.9%)

- The scenario analysis shows the downside risk associated with weak capital markets and demonstrates the benefits to having a less risky asset allocation, like Mix 1 and Mix 2.

	Cumulative Contributions over 5 Years (2019-2023)						*Funded Status End of 5 Years*						*Ultimate Net Cost (UNC) over 5 Years (2023)*					
	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5	Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5	Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Stagflation	55	55	55	56	56	56	64%	64%	63%	63%	62%	62%	121	122	123	124	125	126
Tech Bubble	54	55	56	56	57	57	52%	51%	50%	48%	46%	44%	143	144	148	153	156	160
Great Recession 1	57	57	58	58	59	60	61%	61%	60%	59%	58%	56%	127	125	128	131	134	137
Great Recession 2	52	52	52	52	52	52	63%	66%	65%	65%	64%	63%	121	115	116	118	119	121
Great Recession 3	55	55	55	55	56	56	51%	51%	49%	48%	47%	46%	149	149	152	154	156	159
Bond Market 1	53	53	54	54	54	54	72%	71%	71%	71%	72%	72%	102	105	104	104	104	104
Bond Market 2	49	49	48	48	48	48	48%	50%	50%	49%	48%	47%	147	141	143	144	145	146

Step 5 – Select an Appropriate Target Mix

Summary and Conclusions

- Sewage & Water Board of New Orleans Plan is well positioned relative to other public funds recently surveyed by NASRA.
  - Funded ratio is 80% (1/1/2017), Discount Rate = 7.00%.
- The liability and demographic profiles suggest the Plan has a sufficiently long time horizon in which to assume investment risk.
- Liquidity needs are manageable but negative, and depend on the funding policy:
  - For a 15-year closed amortization funding policy, net outflows are between 4% and 5% of Plan assets each year for the next 10 years.
  - For a 30-year open amortization funding policy, net outflows increase to 6% and 7% of Plan assets.
  - Despite net negative cash flows, the analysis suggests the Plan can take on some illiquidity risk in investments, up to 20% of the total asset allocation.
  - Sufficient liquidity can be provided within fixed income allocation, or through an overlay strategy.
- The total value of the Actuarial Liability is not expected to rise materially in each of the workforce scenario tested, unless there is significant growth in the active population.
- Liability volatility is overshadowed by asset volatility, which drives funded status volatility.
  - Liability volatility stems from inflation uncertainty and its impact on future salary growth (not COLA)
  - Asset volatility can be managed by exposure to beta (stocks, bonds) and by implementation strategies.

Step 5 – Select an Appropriate Target Mix (Continued)

Summary and Conclusions

- The current discount rate target is 7.0%, however our model shows the liability growth rate to be closer to 6.5% due to lower salary increase expectations.
  - The current target mix has a large gap in return expectations over the next 10 years relative to the liability growth rate.
  - A more aggressive asset mix with less fixed income would serve to close the return gap
- The conclusions of the study support a slightly more aggressive asset allocation similar to Mix 2 or Mix 3. Mix 3 is Callan's preferred choice using the risk and reward tradeoff analysis, however Mix 2 is a reasonable option if the Board is concerned about downside risk.
  - One exception is the conclusions lend support for an asset mix with slightly more fixed income, like Mix 1, if the S&WB of New Orleans decides to close the Plan to new hires.
  - For all of the other workforce scenarios and funding policies tested, the risk and reward tradeoff analysis supports a slightly more aggressive asset mix with marginally less fixed income.
- Mix 3 offers a refinement to the current target that includes meaningful exposure to market beta, to alpha seeking strategies, and to alternative asset classes like private real estate and hedge funds to meet the Plan's return target:
  - Maintains a fixed income allocation that is slightly above the median allocation for other public plans in the peer group.
  - Relative to the peer group, Mix 3 moves the overall asset allocation in the direction of the median allocations for the other asset classes.
- Education slides for private Real Estate and Multi-Asset Class strategies (a hedge fund substitute) are provided in the next section.

Step 5 – Select an Appropriate Target Mix (Continued)

Summary and Conclusions

Component	Target	Mix 2	Change	Mix 3	Change
Broad US Equity	40.25%	27%	-13.25%	29%	-11.25%
Global ex US Equity	9%	20%	11%	22%	13%
Real Estate	3.25%	8%	4.75%	9%	5.75%
Hedge Funds	8.75%	9%	0.25%	9%	0.25%
Domestic Fixed	37%	35%	-2%	30%	-7%
Cash Equivalents	1.75%	1%	-0.75%	1%	-0.75%
Total	**100%**	**100%**		**100%**	
Total Fixed Income+Cash	**38.75%**	**36%**		**31%**	
Asset-Only					
Expected Return	5.64%	5.76%		5.93%	
Standard Deviation	10.05%	10.46%		11.33%	
Sharpe Ratio	0.329	0.327		0.317	

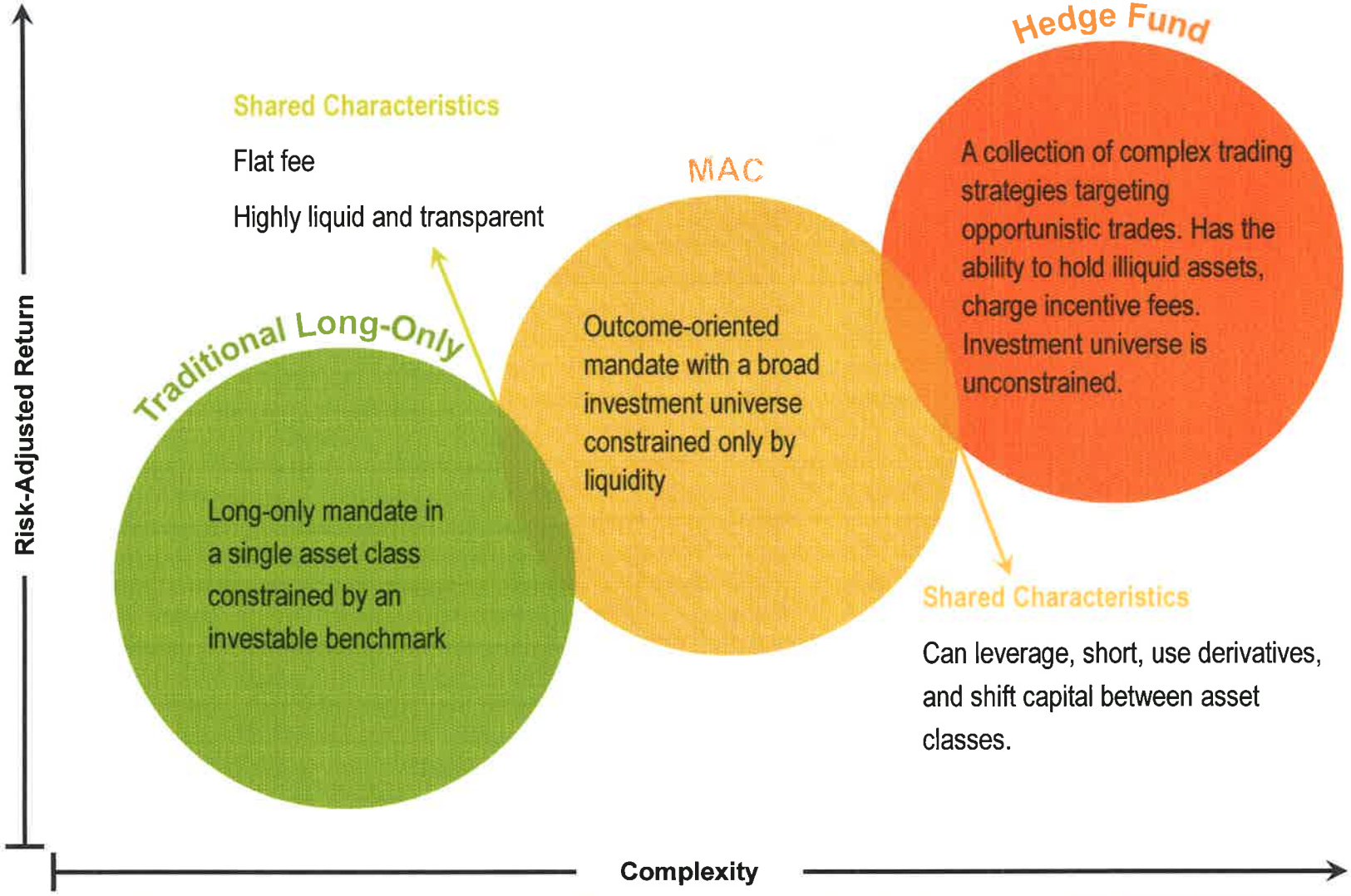
- The table above highlights the change to the asset allocation strategy associated with moving to Mix 2 or Mix 3.
- The Board will want to consider a formal transition plan for the assets for the purposes of managing the transaction costs and potential market impacts, particularly with respect the recommended changes to the equity allocations.


Education Material
Private Real Estate
Multi-Asset Class Strategies

Multi-Asset Class (MAC)

- Multi-asset class products are outcome-oriented solutions (no benchmark) that invest across multiple asset classes.
- Leverage may be employed to target overall volatility, a specific return, or to achieve a desired risk factor weighting
- MACs have many appealing features that make them attractive:
  - Diversification
  - Dynamic risk management
  - Focus on drawdown protection (risk management)
  - Ability to use derivatives and invest in most asset classes (constrained only by liquidity)
  - Liquid, transparent, with static fees (ranging from 0.50% – 1.40%)
- MAC strategies are more complex than traditional long only strategies
- Implementation risk is high - MAC strategies are unconstrained and highly dependent on manager skill
- They typically take a "multi-horizon" approach that considers short, intermediate and long-term time horizons and may employ a non-traditional asset allocation framework
- Performance evaluation requires greater patience as the strategies are benchmark agnostic and typically designed to deliver higher risk-adjusted returns over a time period measured in years not quarters (typically 5+ years)

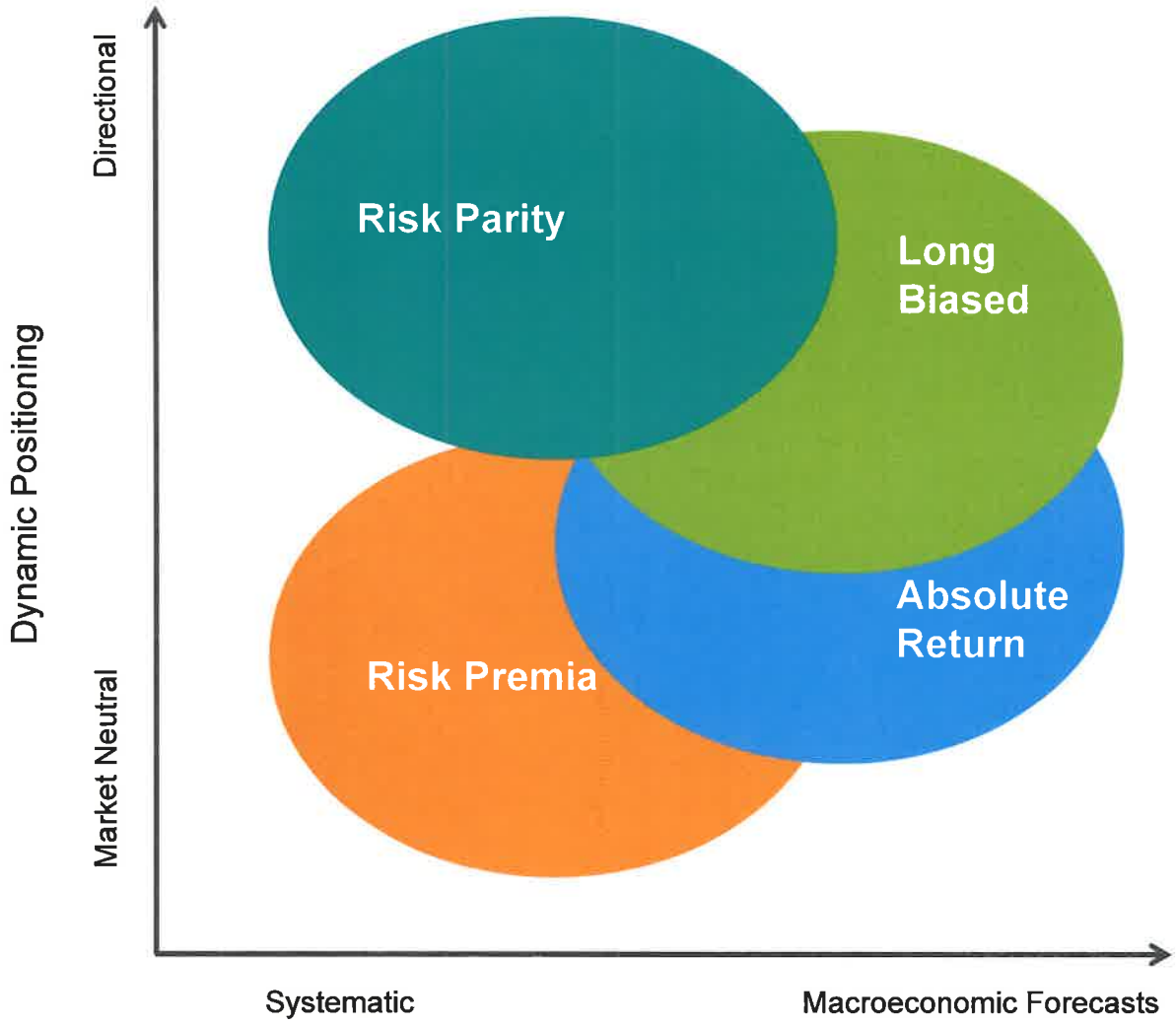
Bridging The Gap



Categorizing the Multi-Asset Class Universe

Qualitative Questions

- Portfolio Structure
  - Relative Value
  - Directional
  - Long Only
- Investment Structure
  - Systematic
  - Fundamental
  - Dynamic risk management



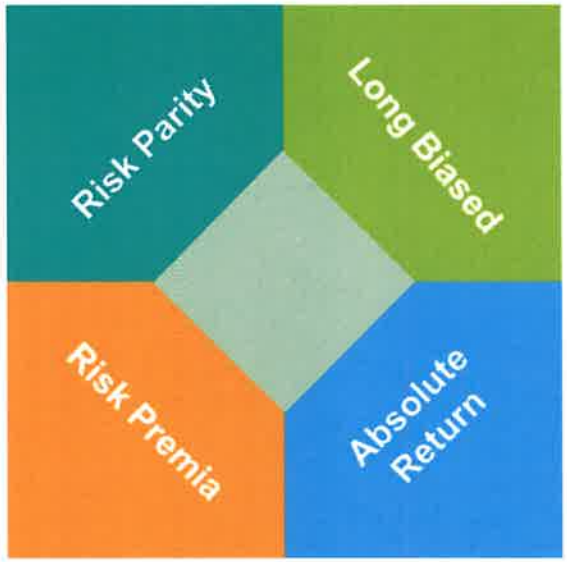
Callan Categorization of Multi-Asset Class Strategies

Risk Parity

- Equal risk-weighted (or close to) exposure to major asset classes/risk factors/economic regimes
- Exposure implemented through long positions with lower volatility holdings levered to meet desired risk target
- Common Benchmarks: T-bills + 5-8%

Long Biased

- Bias to directional asset class exposure
- Higher volatility than absolute return
- Shorting and derivatives may be employed but to a lesser extent
- Macroeconomic forecasting central to idea generation and portfolio positioning
- Dynamic risk management
- Common benchmarks: T-bills + 5-8%; CPI + 4-6%



Risk Premia

- Exposure to academic and behavioral risk factors
- Often with risk balancing between factors
- Implemented through market neutral positions with leverage applied to reach volatility target between 5-15%.
- Common Benchmarks: T-bills + 6-10%

Absolute Return

- Bias to relative value exposures
- Emphasis on downside protection via derivatives and diversifying positions
- Macroeconomic forecasting central to idea generation and portfolio positioning
- Common benchmarks: T-bills + 3-7%; CPI + 3-5%

Real Estate: A Definition

	Privately Traded	Publicly Traded
Equity	**Equity Ownership in Commercial Real Estate** Includes: office, industrial, retail, multifamily, hotel, and other specialty property types	**Real Estate Securities** Includes: Real Estate Investment Trusts (REITs), Real Estate Operating Companies, and Real Estate Development Companies
Debt	**Mortgage Loans** Includes: Senior mortgages, mezzanine debt, among others	**Mortgage-Backed Securities** Includes: CMBS and CDOs (Typically held in bond portfolios)

All strategies exist domestically and internationally

The Case For Investing in Real Estate

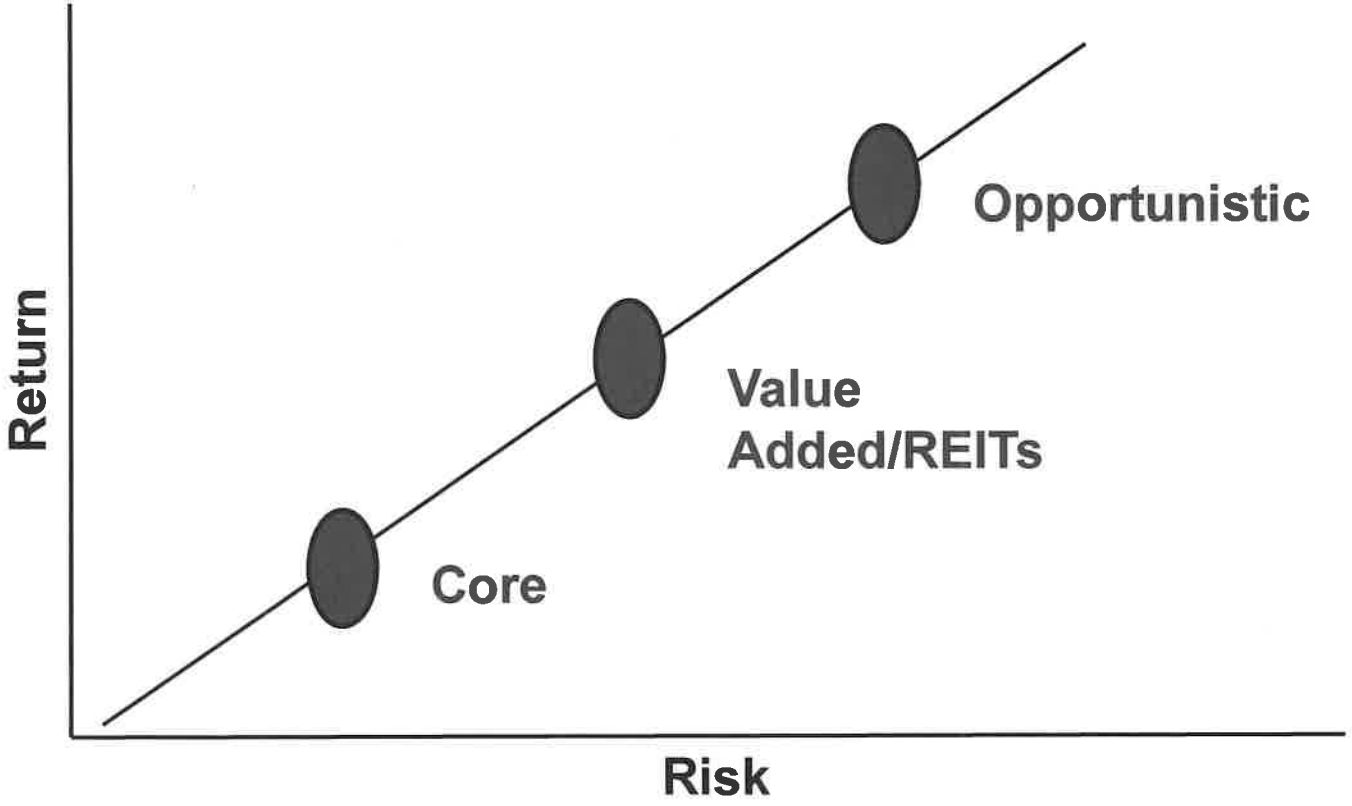
- Competitive returns
- Diversification benefits when added to portfolios of stocks and bonds
- Low correlations with stocks and bonds
- Strong income component
- Inefficiency creates return opportunities
- Inflation protection characteristics
- Diversification benefits of combining public and private real estate

The Case Against Investing in Real Estate

- All real estate is cyclical
- Private real estate is:
  - Not valued daily
  - Illiquid
  - Management intensive/implementation risks
  - High fees compared to mainstream asset classes
  - Lack of investable indices; benchmarking issues
- Public real estate
  - Volatility
  - Lower diversification benefits than private real estate; positively correlated with small/mid-cap equity
  - Small share of the real estate investable universe (<10%)

Implementation – Real Estate Strategies

Risk and Return By Strategy



Core Private Real Estate Strategies

- Most conservative equity real estate approach and most prevalent in institutional portfolios.
- Existing properties with quality construction and design features, quality tenants and staggered lease schedules.
- At least 80% leased upon purchase.
- Located in economically diversified metropolitan areas.
- Investment structures using all cash or limited leverage (less than 40%).
- Predictable income and cash flows. Two-thirds of the anticipated total return will be from income.
- Investment vehicles include core open-end funds and separate accounts (large investors only).

Open-end Core Funds

- U.S. Core Open-end Funds
  - 24 core open-end funds in the NCREIF ODCE universe
  - Funds invest in the U.S only; diversified by region
  - Most diversified by property type across office, retail, industrial, and apartments; additional core funds outside of the ODCE universe that invest in only one property type. Some include specialty property types (hotel, self storage, student housing)
  - Infinite-life
  - Quarterly appraisal based valuations
  - Quarterly liquidity; however, not guaranteed
  - Total universe size: $173 billion
  - Gross Asset Values: $705 million - $42 billion
  - Leverage: 15% - 30%
  - Dynamic universe; funds with 40+ years of history and newly formed funds
  - Entry queues for some funds, but not all
    - *Can present implementation problems, but likely to call capital in one to two quarters*
  - Easy to benchmark using NFI-ODCE, a leveraged fund level benchmark

Non-Core Private Real Estate Strategies

Non-Core strategies take advantage of dislocations of capital, growth opportunities, and emerging strategies, emerging markets, and emerging managers which may not be "institutional."

Both value added and opportunistic are considered Non Core.

Non-Core strategies extend a wider net across the real estate investment opportunity set than Core strategies alone.

Return enhancement is a primary objective of Non-Core strategies.

Manager expertise, investor controls, and vintage year diversification are key in implementing Non-Core strategies.

Non-core strategies and vehicles have many parallels with private equity.

Value Added Real Estate Strategies

- Value Added
  - Seeks a competitive income return with potential for capital appreciation
  - Acquires properties and incorporates re-leasing, repositioning, and re-development strategies
  - Once value has been created, the property is targeted for sale
  - Leverage ranges from 40% to 75%
  - Anticipated one half of the total return will be from income and one half from appreciation
- Investment Vehicles
  - Closed End funds
  - Separate Accounts (for larger investors)
  - Open End Funds

APPENDIX and GLOSSARY OF TERMS

Step 3 –Ranges of Outcomes

1. Level Population – 15 Year Closed: Compare Asset Mixes

7% Present Value

Cumulative Contributions

Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$117	$116	$118	$119	$122	$123
75th	99	98	98	98	98	98
50th	89	89	88	87	86	85
25th	78	78	76	74	72	70
2.5th	55	58	54	49	45	41
VAR	28	28	30	33	36	38

Unfunded Liability (MVA)

Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$60	$59	$61	$63	$65	$67
75th	37	37	37	36	36	36
50th	22	22	21	19	18	16
25th	3	4	0	-4	-8	-12
2.5th	-42	-36	-48	-58	-69	-80
VAR	39	37	40	43	47	50

** Negative number implies surplus.*

Ultimate Net Cost

Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$169.7	$168.8	$171.8	$174.2	$177.3	$180.0
75th	133.3	132.9	132.7	132.2	131.9	131.4
50th	110.9	111.6	108.6	106.1	103.5	101.1
25th	82.9	86.0	80.4	74.5	68.7	62.6
2.5th	19.9	29.1	15.2	2.6	-10.9	-25.8
VAR	58.8	57.3	63.1	68.1	73.8	78.9

** Negative number implies surplus.*

No Discount

Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$173	$173	$175	$177	$180	$183
75th	144	144	144	144	144	144
50th	128	128	126	125	124	122
25th	110	112	108	105	102	98
2.5th	73	78	71	64	58	53
VAR	45	44	48	52	57	61

Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$119	$116	$119	$123	$127	$131
75th	72	72	72	71	71	70
50th	43	44	41	38	35	32
25th	6	8	1	-8	-15	-23
2.5th	-82	-71	-94	-114	-135	-157
VAR	76	72	78	85	92	99

** Negative number implies surplus.*

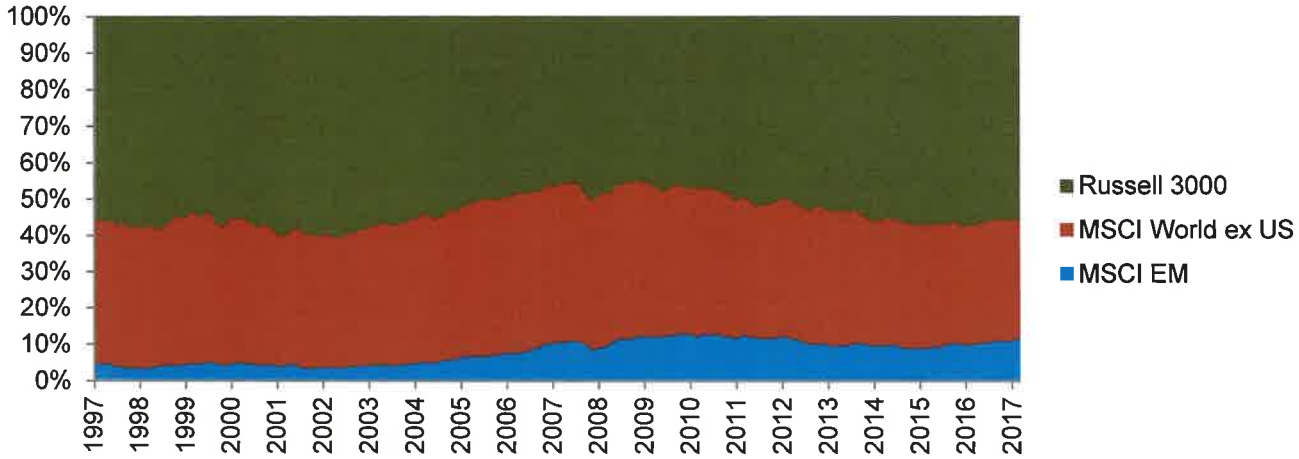
Percentile	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$278.5	$279.6	$284.3	$289.0	$293.3	$297.8
75th	213.7	212.0	210.8	209.5	208.7	207.9
50th	171.5	173.4	168.5	163.6	159.4	155.1
25th	119.8	125.1	114.6	103.4	93.1	82.0
2.5th	3.9	16.2	-8.2	-33.5	-60.0	-89.7
VAR	107.0	106.2	115.9	125.4	133.8	142.7

** Negative number implies surplus.*

Why More Non-US Equity?

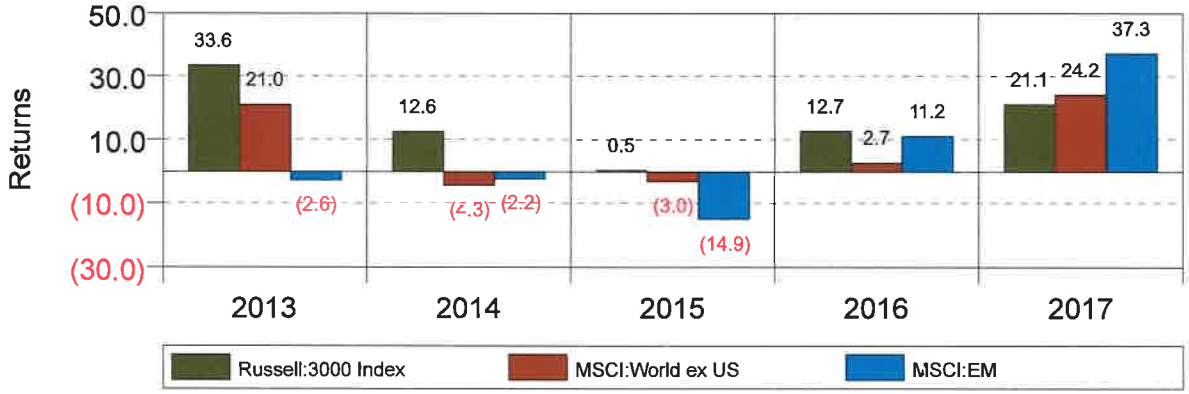
Developed and Emerging Market Exposures

Relative sizes of world stock markets (1997-Present)



- Non-US equity is approximately 50% of total global equity
- Emerging markets now represent roughly 10% of global markets

Annual Returns
for 5 Years Ended December 31, 2017



- Performance and economic outlook for Non-US equity (including emerging markets) have dramatically improved
- Over 93% of corporate plan sponsors in Callan's database have exposure to international equity
- The median allocation was 17.5% at 12/31/17

Defining the Capital Market Expectations

Key to Constructing Efficient Portfolios

		Broad	Lg Cap	Sm/Mid	Global ex-US	Int'l Eq	Emerge	Sht Dur	Dom Fix	Long D	TIPS	Hi Yield	NUS Fix	EMD	Real Est	Pvt Eqt	Hedge Fd	Comm	Cash Eq	Inflation
1	Broad Domestic Equity	1.000																		
2	Large Cap	0.996	1.000																	
3	Small/Mid Cap	0.966	0.940	1.000																
4	Global ex-US Equity	0.874	0.872	0.839	1.000															
5	International Equity	0.840	0.840	0.800	0.987	1.000														
6	Emerging Markets Equity	0.866	0.860	0.845	0.936	0.865	1.000													
7	Short Duration	-0.250	-0.240	-0.270	-0.271	-0.250	-0.290	1.000												
8	Domestic Fixed	-0.110	-0.100	-0.135	-0.130	-0.110	-0.160	0.870	1.000											
9	Long Duration	0.109	0.112	0.096	0.080	0.094	0.043	0.739	0.930	1.000										
10	TIPS	-0.054	-0.045	-0.080	-0.049	-0.030	-0.085	0.525	0.600	0.532	1.000									
11	High Yield	0.636	0.635	0.610	0.627	0.605	0.615	-0.140	0.020	0.190	0.060	1.000								
12	Non-US Fixed	0.013	0.050	-0.100	0.013	0.060	-0.090	0.480	0.510	0.539	0.340	0.120	1.000							
13	EMD	0.573	0.570	0.555	0.577	0.550	0.580	-0.040	0.100	0.143	0.180	0.600	0.010	1.000						
14	Real Estate	0.732	0.730	0.705	0.677	0.660	0.650	-0.165	-0.030	0.168	0.000	0.560	-0.050	0.440	1.000					
15	Private Equity	0.948	0.945	0.915	0.927	0.895	0.910	-0.260	-0.200	-0.005	-0.110	0.640	-0.060	0.570	0.715	1.000				
16	Hedge Funds	0.802	0.800	0.770	0.761	0.730	0.755	-0.130	0.080	0.287	0.075	0.570	-0.080	0.540	0.605	0.780	1.000			
17	Commodities	0.152	0.150	0.150	0.161	0.155	0.160	-0.220	-0.100	-0.041	0.120	0.100	0.050	0.190	0.200	0.180	0.210	1.000		
18	Cash Equivalents	-0.043	-0.030	-0.080	-0.040	-0.010	-0.100	0.300	0.100	-0.041	0.070	-0.110	-0.090	-0.070	-0.060	0.000	-0.070	0.070	1.000	
19	Inflation	-0.010	-0.020	0.020	0.010	0.000	0.030	-0.200	-0.280	-0.288	0.180	0.070	-0.150	0.000	0.100	0.060	0.200	0.400	0.000	1.000

- Relationships between asset classes is vitally important
- To determine portfolio mixes, we use mean-variance optimization
- Return, standard deviation and correlation determine the composition of efficient asset mixes

Glossary of Terms

Actuary

A specialist in the application of mathematics, probability, statistics and risk theory to financial problems involving future uncertainty. These uncertainties are usually associated with life insurance, property and casualty insurance, annuities, pension or other employee benefit plans and investments.

Actuarial (Accrued) Liability (AL)

The actuarial present value of all benefits accrued or earned under the Plan as of the beginning of the year, based on the anticipated salary increases for pay-related plans. Under the entry age normal cost method, the actuarial liability is the difference between the actuarial present value of future benefits and the actuarial present value of future normal cost.

Actuarial Value of Assets (AVA)

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an actuarial valuation.

Alternative Investments

Refers broadly to non-traditional investment strategies such as hedge funds, private equity, distressed debt, commodities and futures.

Glossary of Terms (Continued)

Bond

A bond is a debt instrument issued by entities such as corporations, municipalities, federal, state and local government agencies for the purpose of raising capital through borrowing. Bonds typically pay interest periodically while repaying the principal, or par value, at maturity. Bonds with maturities of five years or less are often called notes.

Cost-of-Living Adjustment (COLA)

An increase (or decrease) in pension benefits according to the rise (or fall) in the cost of living as measured by an index, often the Consumer Price Index (CPI).

Deterministic Forecast

An outcome that is precisely determined in advance, using single estimates and without variation.

Diversification

The allocation of funds across different asset classes or securities within a portfolio.

Equity

The ownership interest of common and preferred stockholders in a company.

Glossary of Terms (Continued)

Funded Status

The status of a pension plan that has accumulated and set aside assets for the payment of retirement benefits to employees. Funded status is measured as the ratio of the Actuarial Value of Assets / Actuarial Liability.

Government Accounting Standards Board (GASB)

The designated organization for establishing standards of financial accounting and reporting in the public sector.

Inflation

A period in which the general level of prices for goods and services is increasing, and, thus, purchasing power is decreasing.

Liquidity

In general, liquidity refers to the ease by which a financial asset can be converted into cash. Liquidity is often more narrowly defined as the ability to sell an asset quickly without having to make a substantial price concession.

Liquidity Risk

Liquidity risk is the risk stemming from a lack of marketability of an investment, which makes it difficult to sell when desired.

Glossary of Terms (Continued)

Market Value of Assets (MVA)

An asset valuation that is based on the price for which an asset could be sold on the valuation date (also known as fair market or actual value).

Normal Cost (NC)

The annual accrual cost attributable to the upcoming plan year.

Present Value

Present value is the value on a given date of a future payment/receipt or series of future payments/receipts, discounted to reflect the time value of money, usually by the current relevant market interest rate.

Present Value of Benefits (PVB)

The actuarial present value all benefits (accrued service plus future service) under the Plan as of the beginning of the year, based on the anticipated salary increases for pay-related plans.

Purchasing Power Risk

Purchasing power risk is the risk that a portfolio or investment will earn a return less than the rate of inflation.

Glossary of Terms (Continued)

Sharpe Ratio

The Sharpe ratio is a commonly used measure of risk-adjusted return. It is calculated by subtracting the risk-free return (usually the 3 month Treasury bill) from a portfolio's return and then dividing this excess return by the portfolio's total standard deviation (a measure of portfolio volatility, or risk). The ratio thus represents the return gained per unit of risk taken.

Standard Deviation

Standard deviation is a statistical measure of portfolio risk. It reflects the average deviation of returns from their mean. Standard deviation is used as an estimate of risk since it measures how wide the range of returns has been.

Stochastic Forecast

An outcome based on variability or a range of values, and expressed in the form of a probability distribution.

Strategic Asset Allocation

Strategic asset allocation requires rebalancing back to a pre-determined policy allocation at specified time intervals or when established tolerance bands are violated.

Glossary of Terms (Continued)

Tactical Asset Allocation

Tactical Asset Allocation involves actively altering allocation among broad asset classes in an attempt to capture the highest returns. It is also referred to as "market timing."

Unfunded Liability

The difference between the actuarial (accrued) liability and the actuarial value of assets. A surplus exists if assets exceed liabilities.

VAR (Value at Risk)

The difference between the Downside Scenario (97.5th) and the Expected Case (50th): How much could be lost in a downside scenario relative to where you expected to be.

Volatility

The degree to which an investment's market value goes up and down over time.

Disclaimers

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Aon Hewitt
Retirement & Investment

How Do Public Pension Plans Impact Credit Ratings?

December 2017

Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon plc company.

Empower Results®

Introduction

For many public sector entities, unfunded pension obligations are a meaningful component of total long-term liabilities. Since Governmental Accounting Standards Board Statement 68 (GASB 68[1]) was introduced in 2014, unfunded pension obligations (or "net pension liabilities") have been included on state and local government balance sheets as a liability, similar to any other long-term debt. Due to the magnitude of these obligations and the level of discretion allowed in both pension assumption setting and defining and/or adhering to funding policies, unfunded pension obligations are receiving increased scrutiny from multiple stakeholders, including plan participants, taxpayers, public policy groups, and credit rating agencies. The question becomes, how do pension plans influence credit ratings and consequently borrowing costs for public entities?

This paper provides perspective on the relationship between an entity's approach to managing its pension plan and its credit rating. We highlight the value that credit rating agencies place on adequate funding, proper assumptions, and sound governance. Specifically, we find that a strong approach to pension management can impact taxpayers via reduced borrowing costs for state and local entities. We conclude this paper with specific actions that can be taken by plan sponsors to positively influence credit ratings.

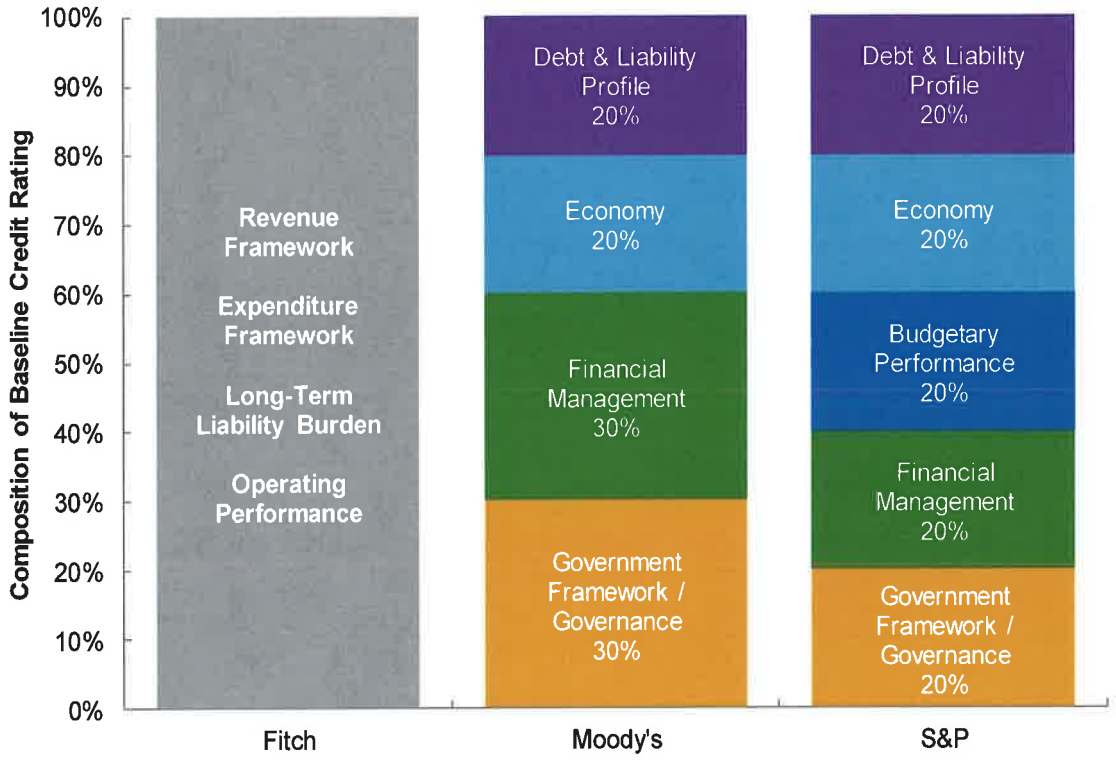
Pension Impact on State and Local Credit Ratings

We interviewed the Big Three rating agencies (Fitch Ratings [Fitch], Moody's Investor Services [Moody's], and Standard & Poor's Financial Services [S&P]) to better understand the impact pension obligations have on their state and local bond ratings, and subsequently, borrowing costs. Recent white papers and rating methodology updates published by the Big Three further emphasize the attention owed to thoughtful and appropriate pension plan management. However, this information is often buried in lengthy documents and is not easily digestible by public pension plan stakeholders. Our goal is to summarize this information to help stakeholders understand the impact pensions have on credit ratings and, as a result, make more informed decisions.

Each agency organizes its rating framework in four or five broad factors, as summarized in Chart 1. Public pension liabilities are generally compartmentalized within the debt and liability factors noted in the chart. An important distinction is that Moody's and S&P assign specific weightings to each factor, while Fitch does not in an effort to tailor its ratings to issuer-specific circumstances. Both Moody's and S&P assign a 20% weight to the broad debt and liability factors, as shown in Chart 1.

[1] See the Appendix for additional information on GASB rules for determining balance sheet liabilities for pensions.

Chart 1: Credit Rating Factor Framework Summary[2]



While each agency has a unique rating methodology, we find consistency across the firms with regard to the inclusion of both the current and future state of pension liabilities and plan management. Agencies are not just looking at where these plans stand today; they are also looking at the expected future trajectory of the plan based on how it is being managed.

The current state is captured across agencies as a net pension liability measurement at a snapshot in time. A key difference in the current state metric used across the agencies is the adjustment to the state or local government reported liability. This is an important point, as some of the adjustments made have a significant impact on the net pension liabilities that the credit rating agencies consider, as opposed to what is reported on the entity's balance sheet and/or used for planning and budgeting purposes. At one end of the spectrum is the adjustment Moody's makes to the net pension liability. The metric that is incorporated into the credit rating is adjusted to use a market discount rate (currently, 3%–4%), similar to the pension liability measures reported in corporate sector financial statements. By contrast, the median discount rate used by public plan sponsors in determining their funding contribution is 7.5%,[3] reflecting the expected long-term rate of return on assets, and resulting in a much lower reported liability. For example, for a pension plan with a 12-year liability duration, a 1% decrease in the discount rate would result in a 12% increase to the plan liability. Fitch also uses an adjusted net pension liability figure, using

[2] Sources: Fitch's "U.S. Public Finance Tax-Supported Rating Criteria," May 31, 2017; Moody's "US States Rating Methodology," April 17, 2013; and S&P's "U.S. State Ratings Methodology," October 17, 2016.
[3] NASRA Issue Brief: Public Pension Plan Investment Return Assumptions. Updated February 2017.

a static 6.0% discount rate for liabilities that are calculated at a higher discount level by the plan sponsor. These adjustments highlight the agencies' focus on the potential economic impact unfunded pension obligations may have on a state or local government's financial stability, as well as allow for easier comparison across entities. On the opposite end of the spectrum, S&P does not make any direct adjustments to the liability figures reported by the localities.

The forward-looking view of pension obligations has received increased attention and also has a direct influence on the overall credit rating. In assessing pension obligations, the Big Three consider factors such as the following:

- Are policies in place to adequately fund future obligations? For example, are contributions at least enough to "tread water" to keep pace with liability growth and new benefit accruals?
- Have entities been making their full actuarially determined contributions (ADCs) in past years?
- How will unfunded pension liabilities impact future budgets?
- Are methods and assumptions, such as amortization periods and discount rates, realistic?

These forward-looking factors contribute to a meaningful portion of the overall pension impact on credit ratings. For example, S&P equally weights its "Pension Liability Metric" (current state) and the "Pension Funding Discipline" (future state) into its pension score. There are also additional factors S&P considers that have the ability to improve or degrade the Pension Funding Discipline score by one point (on a scale of 1 to 4). Furthermore, after S&P determines the indicative credit rating from its scoring framework, there is the potential for overriding factors to further reduce the indicative rating by one notch. One of the six overriding factors is a high level of expected future liabilities, which may eventually lower the expected funded ratio to below a certain threshold and negatively impact the overall credit rating.

Both Moody's and Fitch also directly consider pension plan management and governance into their credit ratings. Moody's analysts are able to adjust the rating placement of the pension metric to reflect the additional factors listed in Table 1 and can also make below-the-line notching adjustments to reflect these factors. Fitch's methodology takes a less standardized approach, with the ultimate rating reflecting both issuer-specific quantitative and qualitative factors, which include governance and plan management.

Table 1 provides detail on the pension plan inputs, both current state and future state, that each agency factors into its overall credit rating within the debt and liability factors.

Table 1: Credit Rating Agency Pension Inputs[4]

	Fitch	Moody's	S&P
Designated Pension Weight	N/A[5]	10%	6.7%
Dedicated Inputs	**Pension Liability Metric** ▪ (Direct debt + Adjusted Net Pension Liability [ANPL]) ÷ Personal Income	**Pension Liability Metric** ▪ 3-year Average ANPL ÷ own source revenue (for states) or operating revenue and property tax (for local entities)	**Pension Liability Metric** • 3-year Average Pension Funded Ratio
	ANPL calculated: ▪ *Adjust Total Pension Liability (that entity has funding responsibility for) to reflect a fixed 6% discount rate for any liabilities calculated at a higher discount rate*	*ANPL calculated:* ▪ *Adjust Total Pension Liability (that entity has funding responsibility for) to reflect a market discount rate (Citibank Pension Liability Index)*	*Funded Ratio used:* ▪ *Aggregate of plan level Comprehensive Annual Financial Reports (CAFRs)*
	Secondary Liability Metric ▪ (Direct debt + ANPL) ÷ government revenues ▪ (Direct debt + ANPL) ÷ property value (for local govs)		**Pension Funding Discipline** ▪ Relationship between actual total contributions and service cost + interest cost + amortization component ▪ Contributions that are actuarially based or not ▪ Typical funding level of ADC ▪ See Additional Factors Considered below
	Future Expectations ▪ Capital plans/needs ▪ Pace debt paid down ▪ Adequacy of current pension contribution policies ▪ Economic expectations		**Adjustment Factors** ▪ Unfunded pension liability per capita ▪ Unfunded pension liability as % of income
Additional Factors Considered	▪ Degree of institutional control ▪ Level of benefits ▪ Practices governing contribution setting and amortization of liabilities ▪ Asset portfolio composition ▪ Risk management practices	▪ "Tread water" analysis: Measures annual government contribution required to prevent the reported NPL from growing, under reported assumptions ▪ Conservative or optimistic assumptions ▪ History of funding adequacy ▪ Discount rate ▪ Amortization period ▪ Evidence of definitive and effective steps to reduce unfunded liability	If a majority of the below apply, the Funding Discipline score may improve or worsen by one point: ▪ Amortization methods ▪ Assumed rate of return relative to trailing 5-year average ▪ Funding assumptions incorporated into projections ▪ Active to beneficiary ratio in conjunction with plan's funded ratio ▪ Frequency of experience studies

[4] Sources: Fitch's "U.S. Public Finance Tax-Supported Rating Criteria," May 31, 2017; Moody's "U.S. States Rating Methodology," April 17, 2013; and S&P's "U.S. States Ratings Methodology," October 17, 2016.
[5] Fitch does not use a standardized weighting for pension obligations.

Most of a pension plan's influence on credit ratings is captured within the debt and liability factor as described in Table 1, but pensions also have tangible impacts across other listed factors. For instance, each agency considers the impact of an entity's past, current, and future funding practices on the state or local budgetary performance. Within Fitch's Expenditure Framework (one of the key factors in its Credit Rating Factor Framework), Fitch calculates a hypothetical benchmark pension contribution. It reflects an annual payment amount required to amortize the Fitch-adjusted net pension liability on a level dollar basis over a 20-year period at a fixed rate of 5%. This benchmark is then used to highlight outliers where the reported actuarial contribution is insufficient to make progress in lowering the liability and is expected to increase pension budget demands over time. This will have a negative impact on the overall rating. Conversely, a reported actuarial contribution that is equal to or greater than the Fitch-calculated benchmark will positively impact the credit rating, further emphasizing the importance of appropriate assumption setting and funding policy.

Moody's and S&P also factor in similar considerations that allow for pensions to impact other areas in addition to the dedicated pension weights in Table 1. Pensions may also impact an entity's Financial Management score (Financial Management carries a weight of 30% for Moody's and 20% for S&P) and Budgetary Performance score (Budgetary Performance carries a total weight of 20% for S&P).

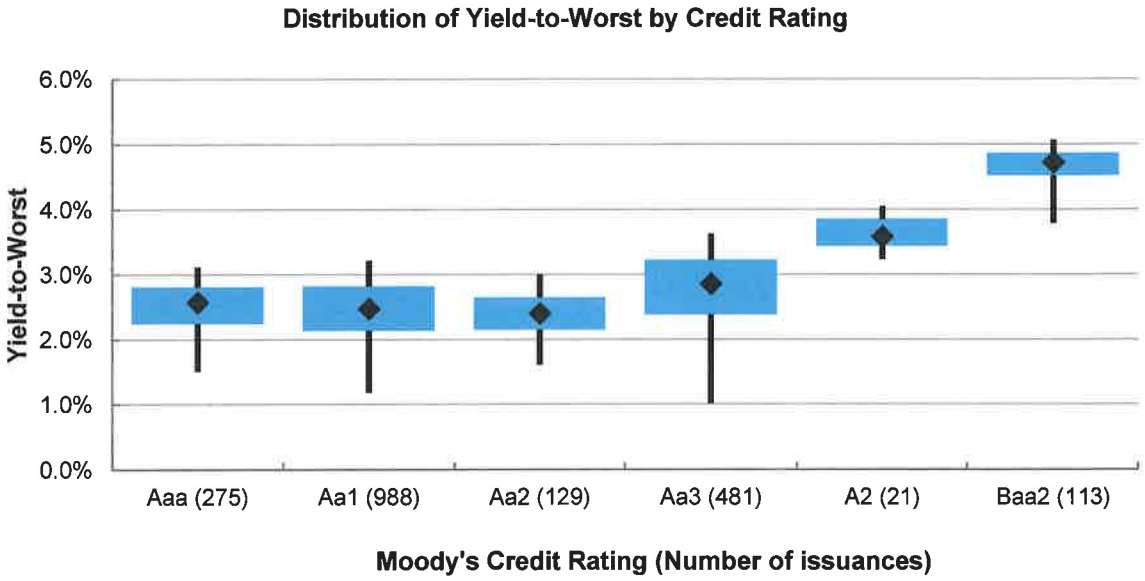
Pension management is also considered under the Governance and Operating factors (Weights: Moody's–30%; S&P–20%; Fitch–no specific weighting). Similar pension management aspects impact these factors as well, such as key assumptions used, the adequacy and appropriateness of the policies that are in place, the strategies used to control the costs and fulfill the actuarially determined contributions, and the degree of control plan entities have to make changes to plan management.

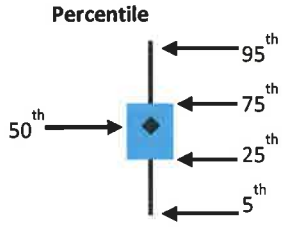
The key takeaway is that forward-looking pension plan management—and not solely the current level of an entity's net pension liability—has a meaningful impact on credit ratings. We anticipate that the attention and impact of pension plan management on credit ratings will not soon fade, especially if pension debt continues to contribute a meaningful portion of an entity's total debt.

Credit Ratings and Borrowing Costs

So what does this mean for the cost of debt for public entities? As we have shown, pension plans have a direct impact on the ultimate state or local credit rating. It is no surprise, then, that there is a relationship between credit ratings and bond yields—lower credit rated bonds tend to require a higher yield to investors and thus provide less capital to public entities. This leads us to a simple but powerful conclusion: Taxpayers in these jurisdictions are paying higher borrowing costs and could save money through healthier pension plan management.

Chart 2: Yield on State-Issued General Obligation Bonds with 10+ Year Maturity[6]





A Call to Action: Proactive Plan Management Has Real Impact

The current state of pension plans and the anticipated ability of an entity to fully satisfy future benefits directly impact the Big Three's state and local government credit ratings. And while there are certain pension factors that cannot be controlled, such as capital market returns and beneficiary demographics, there are aspects that entities can control and clear actions that can be taken to directly improve a pension's impact on its locality's credit rating. We recommend that plan sponsors consider the following:

1. Conduct an actuarial assumption audit to review the reasonability of key assumptions, including salary scale, mortality, retirement rates, and turnover rates.
    - Assumptions set to plan-specific expectations will lead to lower contribution volatility, whereas aggressive assumptions may provide short-term relief but may have long-term consequences.
2. Consider adjustments to the expected return assumption that are in line with forward-looking expectations for asset returns.

[6] Source: Barclays Bloomberg Indices as of May 31, 2017.

- For plans contributing actuarially determined amounts, failing to achieve target returns will necessitate increases in future contributions and make what was intended to be a smooth, budget-friendly progression of contribution increases far more volatile.
- For plans contributing less than the actuarially determined amounts, the funding gap will widen and become highly volatile as contribution policy will not add enough dollars to replenish losses.

3. Review the plan's funding policy, looking far enough into the future to identify potential pain points.
    - Conduct a "tread water"/hurdle rate analysis to ensure that short-term contributions are sufficient to keep pace with the growth of the plan liabilities.
    - Consider an asset-liability study to understand the range of potential future outcomes rather than a single deterministic scenario.

Selecting appropriate actuarial assumptions, avoiding excessive risk taking, and developing an adequate funding policy are actions that indicate to the Big Three that a plan sponsor is taking a proactive and realistic approach toward fully funding pensions and properly managing an entity's total debt profile. While an entity's debt priorities and revenue framework to service such debt will vary on a case-by-case basis, every jurisdiction has the ability to thoughtfully develop a funding policy and set appropriate assumptions. These initial steps will help pension stakeholders better understand their true economic costs, improve the funding outlook for public pensions, and potentially reduce borrowing costs and further taxpayer burden.

Appendix

Governmental Accounting Standards Board (GASB) Balance Sheet Entry

Since GASB 68[7] was adopted for fiscal years beginning after June 15, 2014, pension debt has been reported on the balance sheet. The net pension liability is now disclosed along with the employer's other long-term obligations. GASB 68 was introduced to provide additional transparency regarding the liabilities and funded status associated with the pension promise made by government entities to their employees. While the net pension liability is similar in concept to the funded status measure used under the prior standards, the method by which the net pension liability is calculated is somewhat different.

The asset value used to calculate the net pension liability under GASB 68 is not permitted to reflect any type of asset smoothing. This market value of asset approach differs both from the prior accounting standard methodology as well as the funding valuation approach. Further, the total pension liability used under the new standards may be significantly different from historical measures of total pension liability due to two key items outlined in the new standard: (1) The cost method used for calculating the total pension liability must be entry age normal. (2) The discount rate used for determining the total pension liability must be based on a blended rate that combines the plan trust's expected return on assets for the time period that the trust is expected to be sufficient to pay for benefit payments, together with a 20-year municipal bond rate index for any remaining payments from the plan. Plans using different cost methods may have seen an increase in liabilities due to the adoption of the entry age normal cost method, which would be further increased by the potentially lower discount rates calculated for poorly funded plans under the blended approach.

The combined effect of removing asset smoothing and potentially increasing liabilities likely resulted in a much larger net pension liability appearing on balance sheets for many public sector employers once GASB 68 was adopted. Further, due to the lack of asset smoothing, it is anticipated that during periods of economic turmoil, the net pension liability will be volatile.

[7] GASB 67 is the companion standard for the pension plan, as opposed to the plan sponsor.

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