Actuarial Essentials

Board of Administration Educational Day
January 21, 2020

CalPERS

Topics

1. Actuarial Fundamentals For Defined Benefit Plans
2. CalPERS Current and Projected Status
3. Important Risks / Maturity Measures
4. Key Board Actions

What are DB and DC Plans?

- Defined benefit (DB) versus defined contribution (DC) plans
  - DB Plans
    - Annuities defined by a formula or set of rules
    - Employer bears majority of investment risk
  - DC Plans
    - Account balances funded by employer and employee contributions
    - Member bears majority of investment risk
    - 457, 401(k), 403(b)

Prevalence of DB and DC Plans

- Private sector employers replacing DB plans with DC plans
  - More predictable costs
  - Portable
  - Easy to understand
- Public employers continuing to sponsor DB plans
  - Retirement security for members
  - Reviewing funding policies and benefit design to mitigate risk

Basic Funding of DB Plans

- Common DB plan funding policies
  - Fund members' benefits during working career
    - Spread costs evenly throughout career
    - Alternate "actuarial cost methods" used to spread costs
  - Unexpected experience must be addressed

Entry Age Actuarial Cost Method

- Terminology - Normal Cost

Normal Cost

Estimated annual amount (expressed as a percentage of pay) to fund a member's projected benefit from hire date to termination, death, disability or retirement

Normal Cost Under Entry Age Normal Method

- Normal Cost (NC)
  - Typically expressed as a % of pay (e.g., 20%)
  - Expected to remain level (as a % of payroll) from year to year
  - Can increase or decrease based on unexpected experience, plan changes, assumption changes (but not investment experience)
  - Contributed annually
  - Often shared by members (i.e., required member contributions)
  - Sufficient to completely fund the members' benefits if all experience matches assumptions

Entry Age Actuarial Cost Method

- Terminology – Accrued Liability

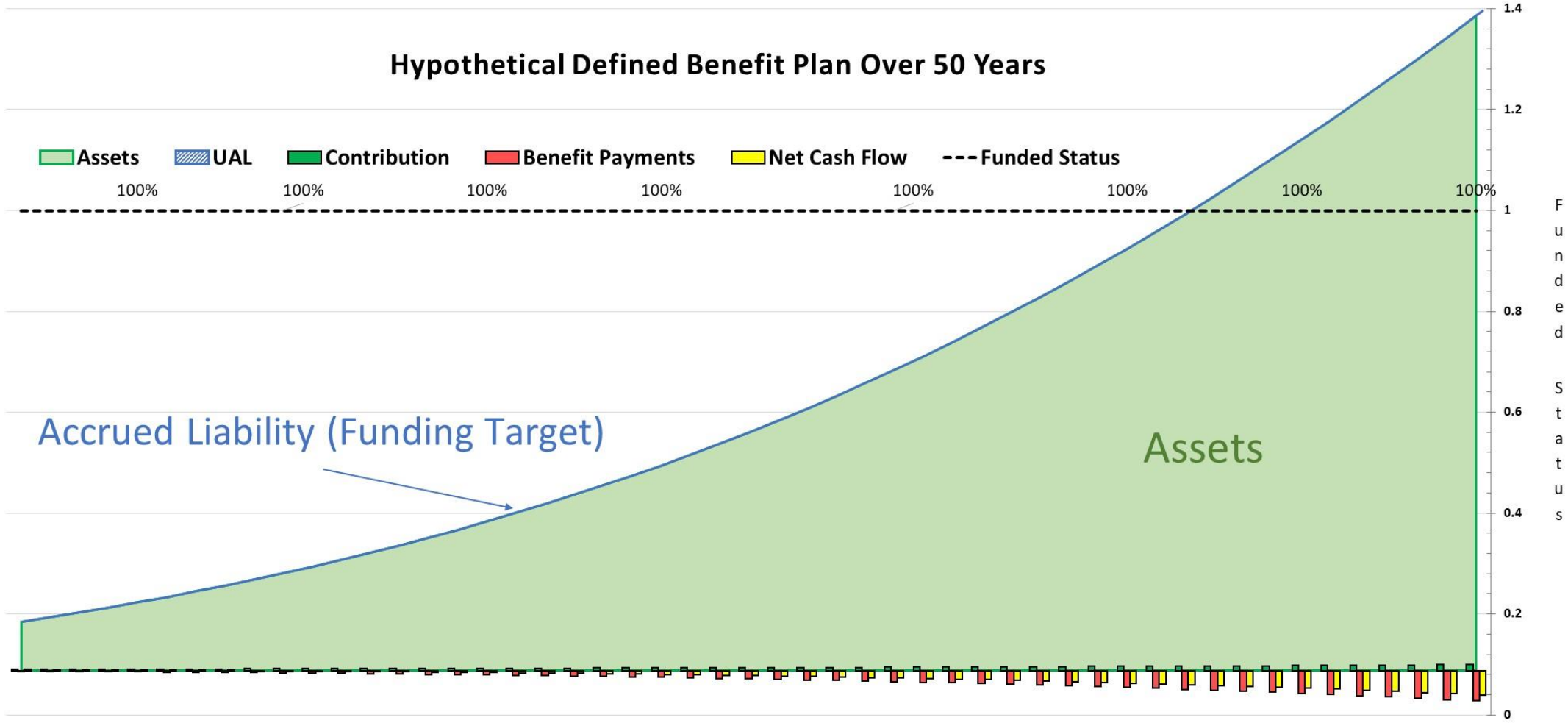
Accrued Liability

The value of a member's projected benefit less the normal costs that are expected to be paid in the future for that member

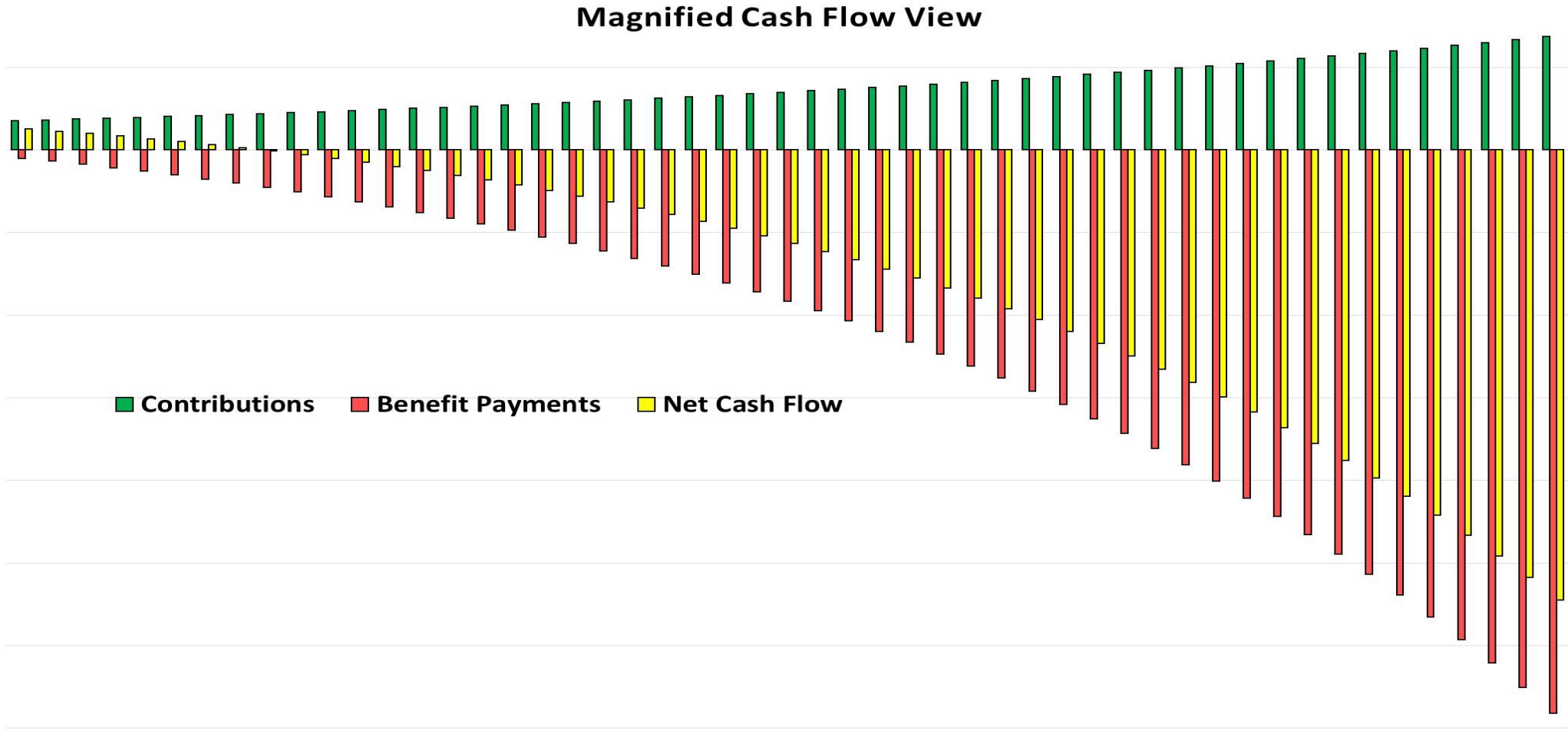
Accrued Liability Under Entry Age Normal Method

- Accrued Liability (AL)
  - Assets = AL if actual experience matches expected experience
  - AL can be considered the plan's funding target
  - Equals the accumulation of past Normal Costs

Expected Progression of Actuarial Results



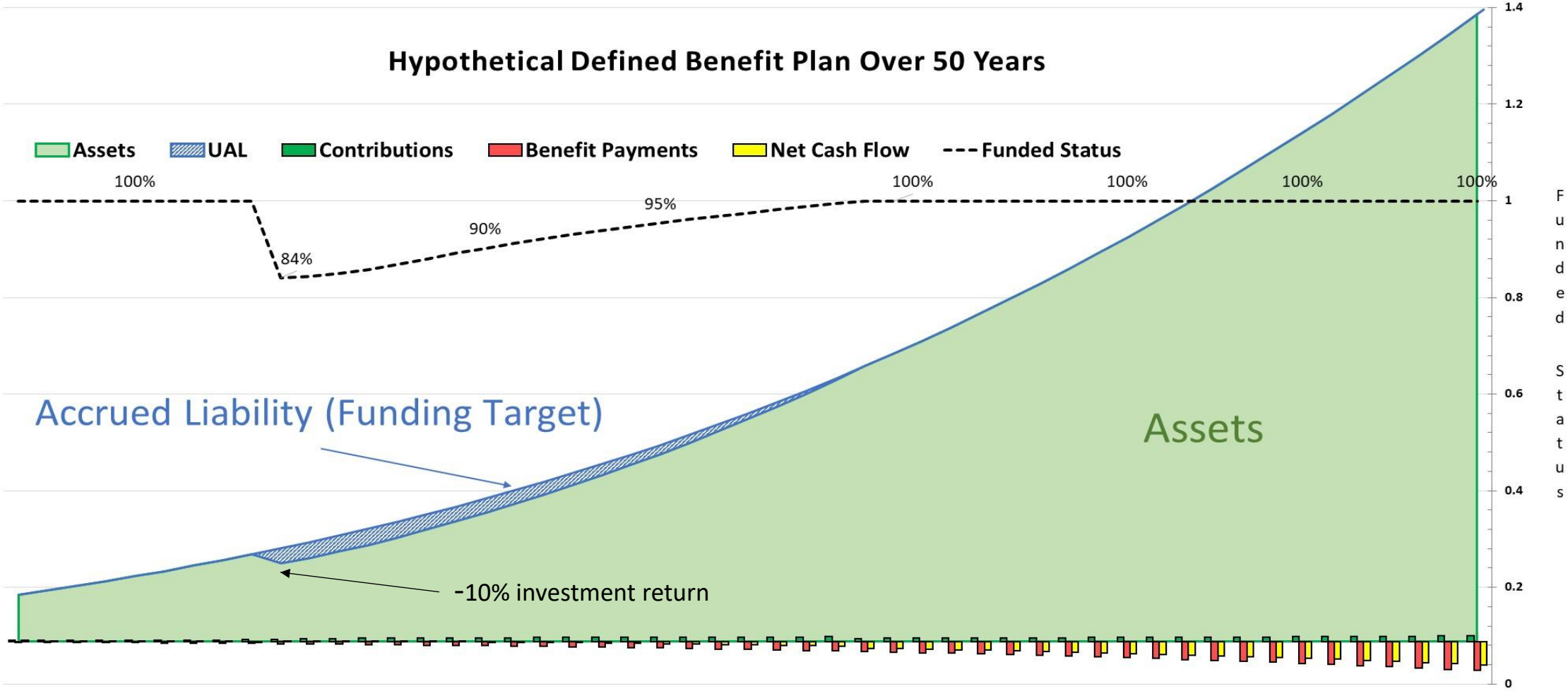
Expected Progression of Cash Flow



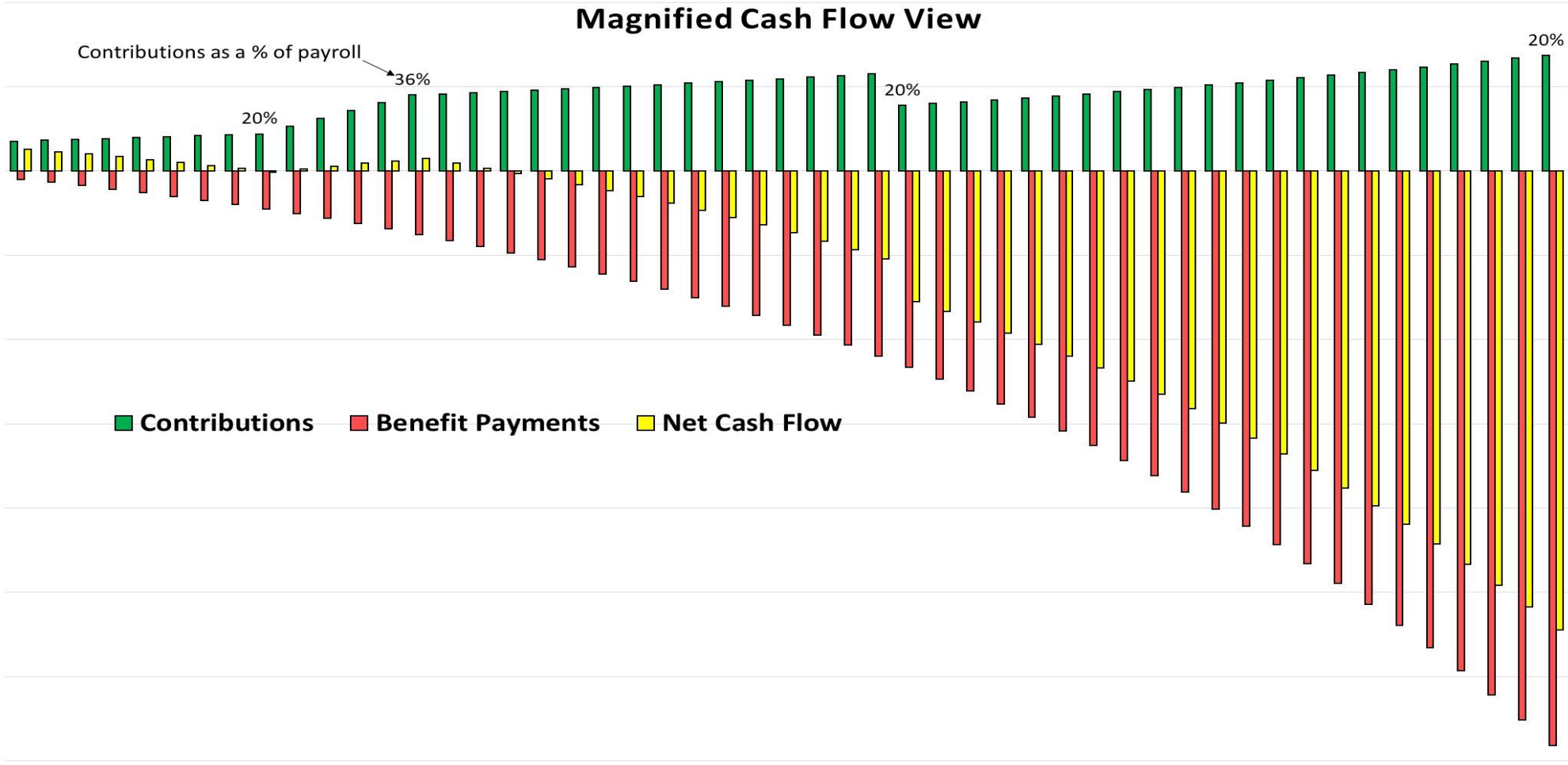
What if Experience Deviates From Expectations?

- Unexpected experience results in assets <> AL
  - Unfavorable experience leads to unfunded accrued liability (UAL)
  - Separate employer contribution needed to payoff (amortize) unfunded liability
    - Based on amortization policy

Impact of Single Unexpected Event on Valuation Results



Impact of Unexpected Event on Cash Flow



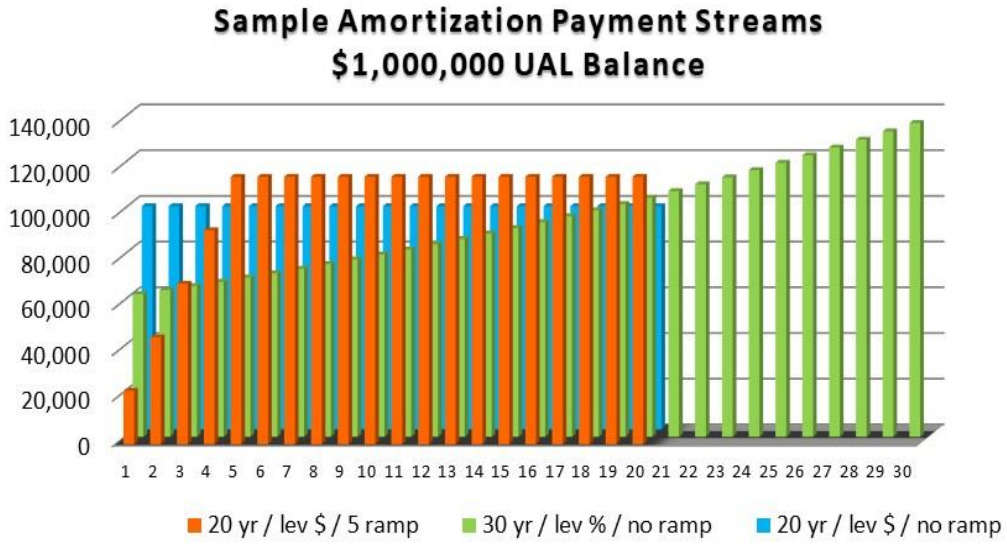
Dealing With Unfunded Liability

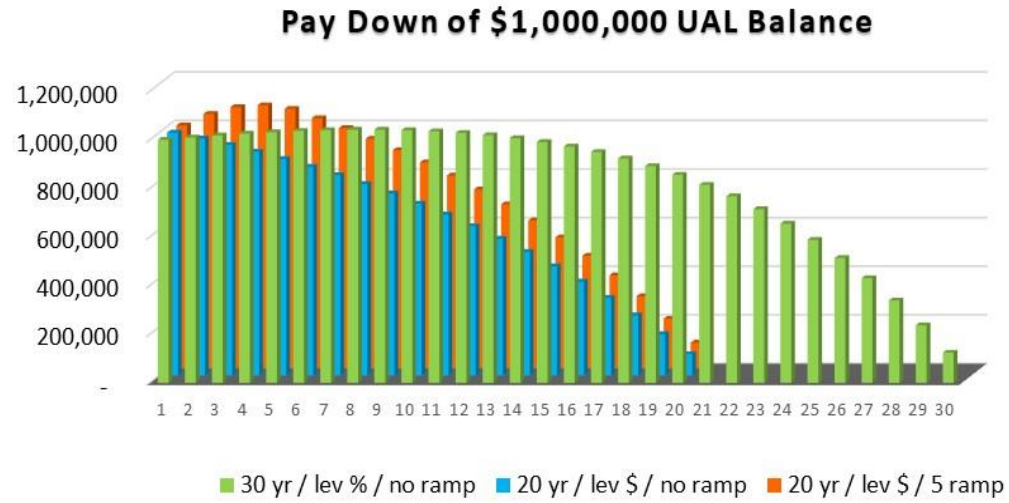
- Amortization Policy
  - Systematic approach for eliminating positive or negative unfunded liabilities
  - Adopted by the Board
  - Should consider:
    - Benefit security
    - Intergenerational equity
    - Contribution volatility

Dealing With Unfunded Liability

- Amortization Policy
  - Shorter periods enhance benefit security but increase volatility
  - Longer periods reduce volatility but may harm benefit security / intergenerational equity
  - Payment pattern can be level dollar or fluctuate
    - Level percent of pay
    - Ramp

Alternate Amortization Approaches





<u>Interest paid</u>

- 20 Year / level $ / no ramp – $955,131
- 20 Year / level $ / 5-year ramp – $1,107,997
- 30 Year / level % / no ramp – $1,858,651

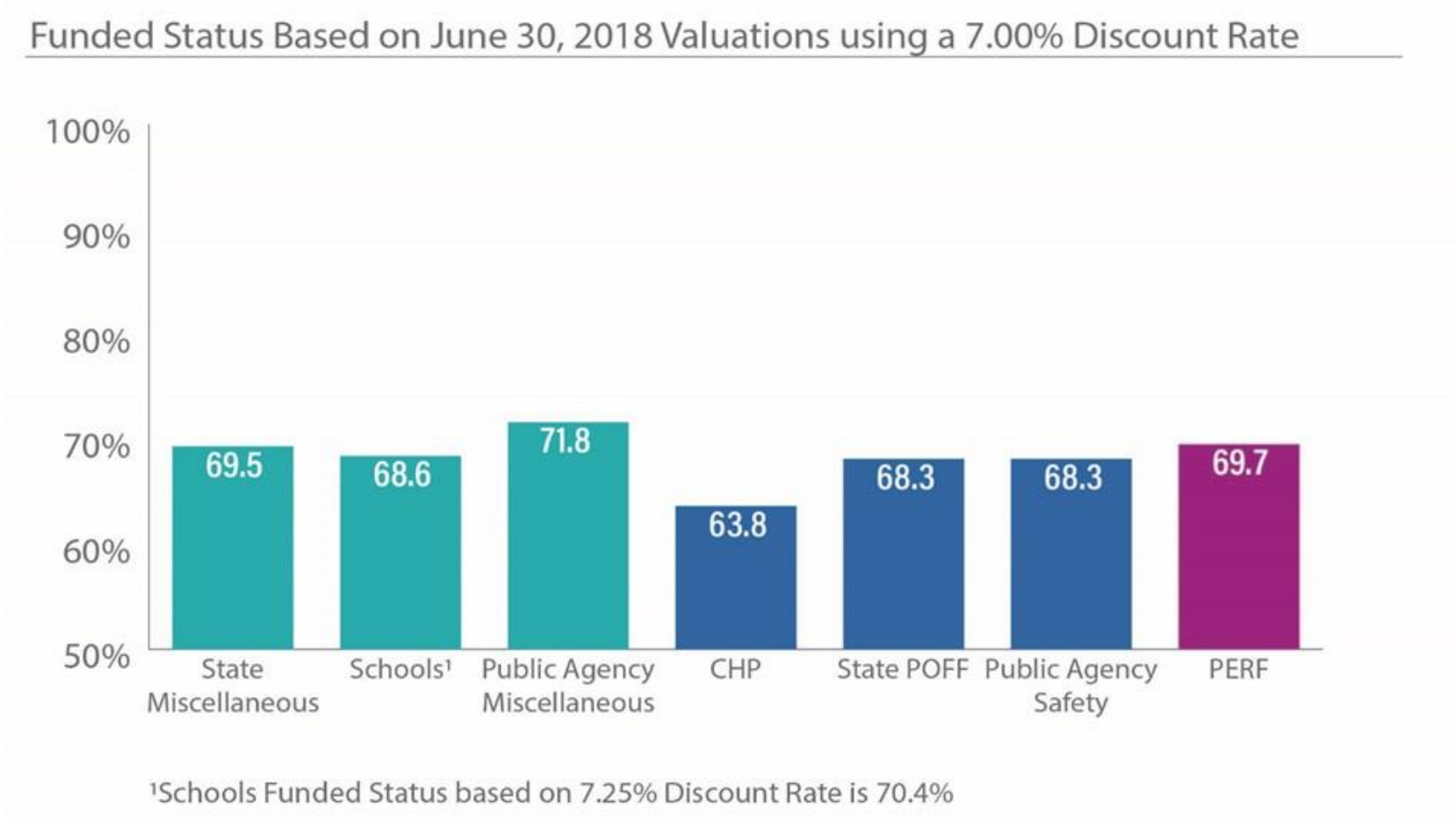
Measuring Assets

- Actuarial Value of Assets (AVA)
  - Most common – recognition of asset gains/losses over 4-5 years
    - AVA > MV after investment losses
    - AVA < MV after investment gains
    - Often used with a corridor (e.g., 80-120% MV)
  - Market Value
    - Can result in higher contribution volatility
    - Can be used with direct rate smoothing (e.g., 5-year ramp on UAL payment)
    - CalPERS current approach

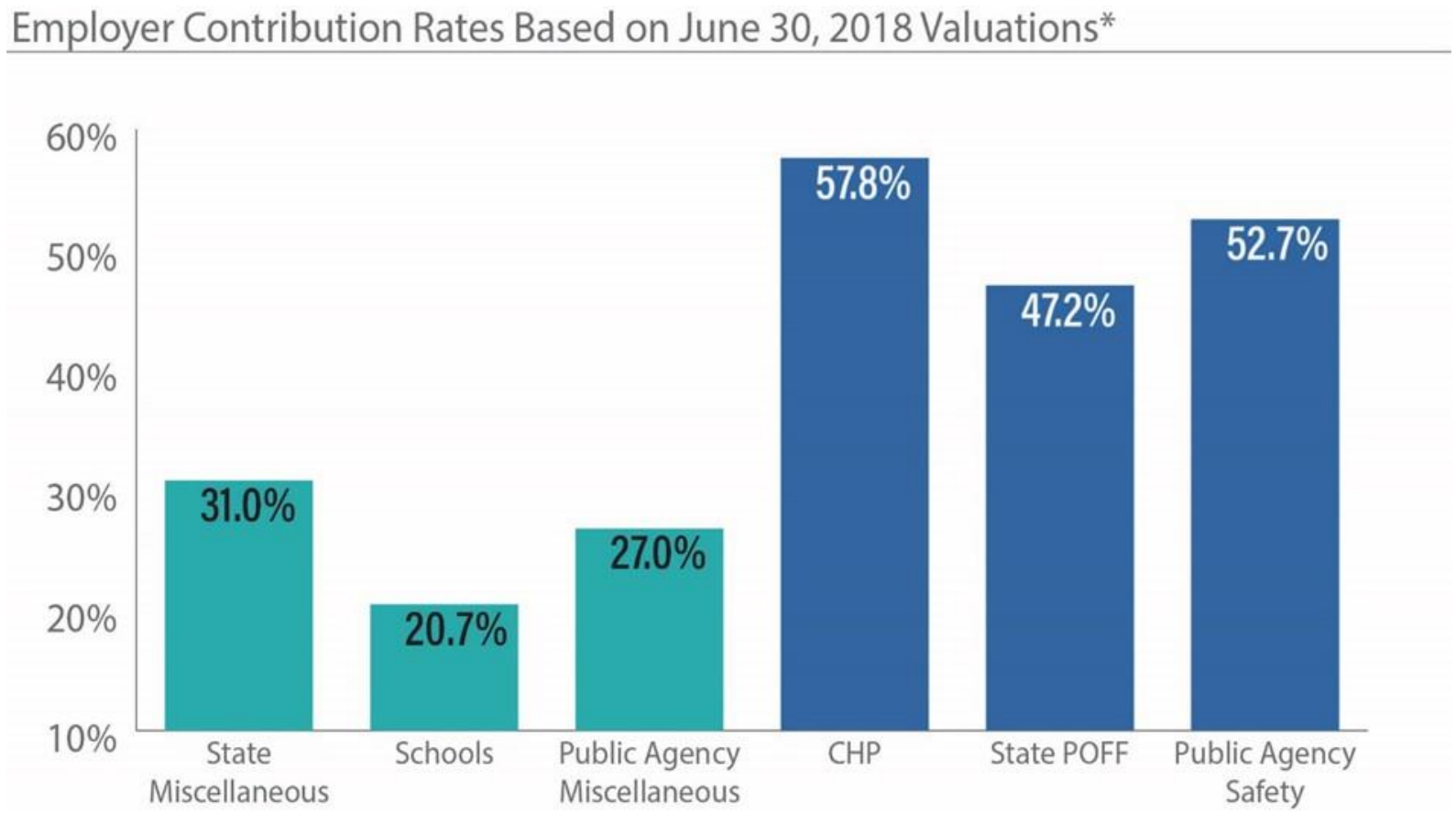
Assumptions for Future Experience

- Actuarial Assumptions
  - Demographic
    - Mortality
    - Merit / seniority pay increases
    - Retirement rates
    - Disability rates
    - Termination rates
  - Economic
    - Price and wage inflation
    - Investment return (discount rate)

CalPERS Funded Status June 30, 2018



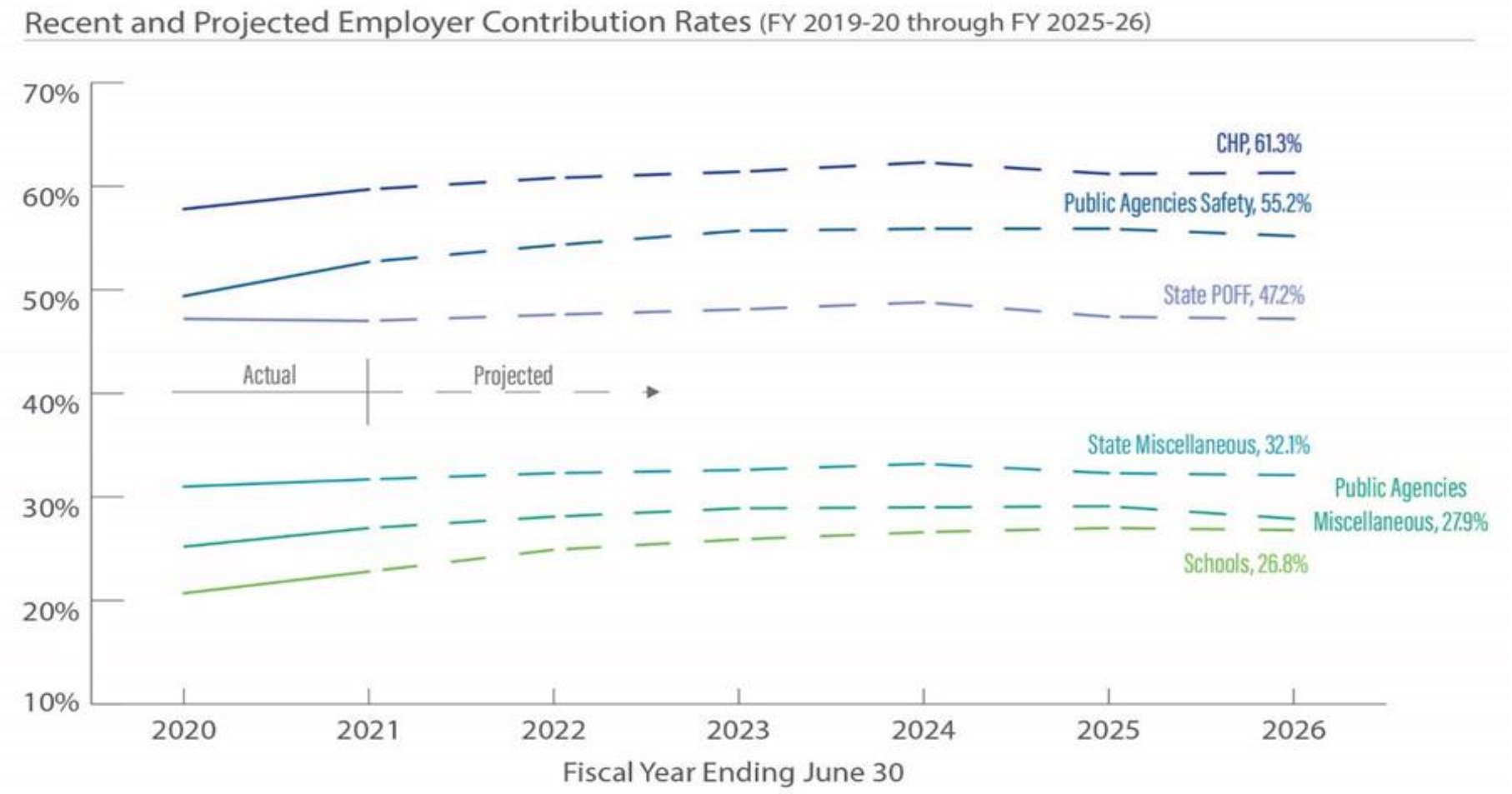
CalPERS Employer Contributions



CalPERS Employer Contributions

- Average public agency employer contribution rates
  - Miscellaneous plans: 27.0% of payroll (25.2% last year)
  - Safety plans: 52.7% of payroll (49.0% last year)
- Required contributions expected to increase over next several years
- Additional discretionary payment (ADPs) have helped
- Risk of increased contribution volatility due to plan maturity and to a lesser extent modifications to the amortization policy

CalPERS Projected Employer Contributions



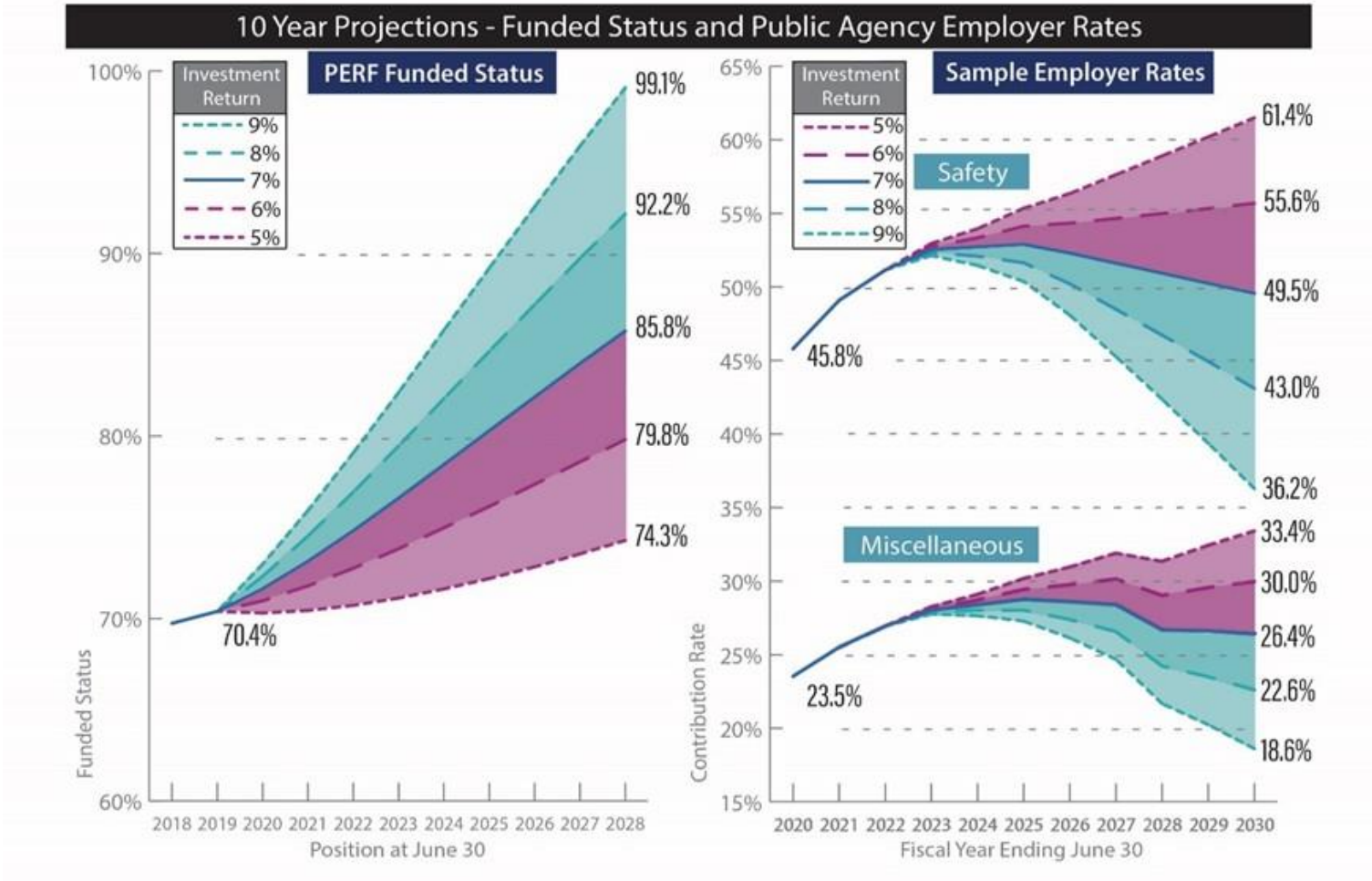
Important Risks

- Investment
- Inflation
- Mortality
- Employers ability to pay required contributions

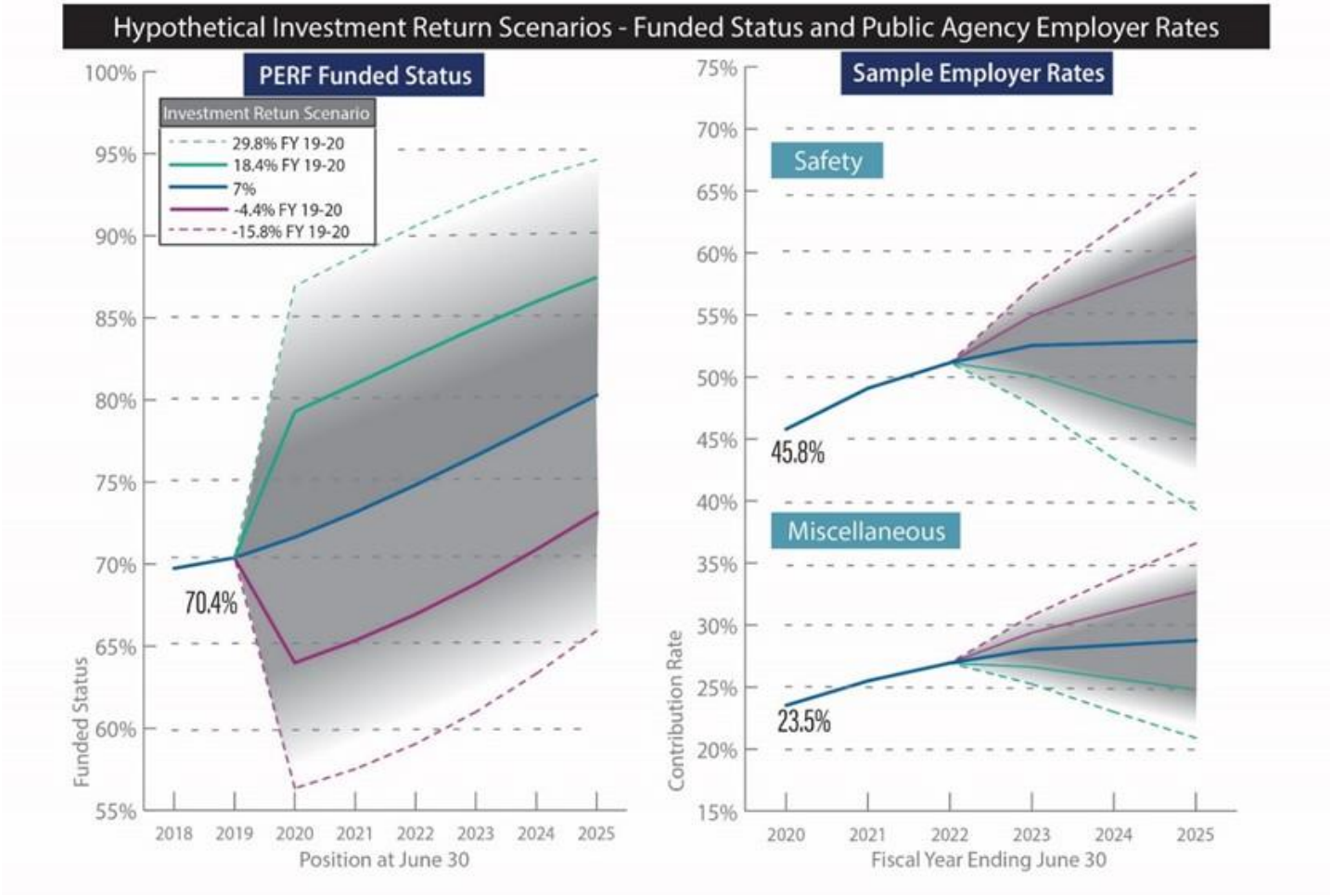
Important Risks - Investment

- Investment
  - Future returns under 7% will increase future employer contributions
    - Impact is phased-in over 5 years
  - Outlook for future returns could change
    - Would likely result in change to the discount rate
    - Would impact both future employer and employee contributions

Important Risks - Investment



Important Risks - Investment



Important Risks - Inflation

- Inflation
  - Inflation impacts pay increases and cost of living adjustments
  - Inflation is also a component of expected investment return
  - Unexpected increases or decreases in inflation have somewhat offsetting impacts
  - Future inflation is less of a risk than future “real” investment returns

Important Risks - Mortality

- Mortality
  - Mortality has been gradually improving for decades
  - Recent analysis does show slowing of improvement or declines for some groups
    - Opioid crisis
    - Obesity
  - CalPERS current mortality assumptions assume future improvement in mortality
  - If actual mortality improvements are better than expected, employer and employee costs will increase accordingly

Important Risks – Employers' Ability to Make Contributions

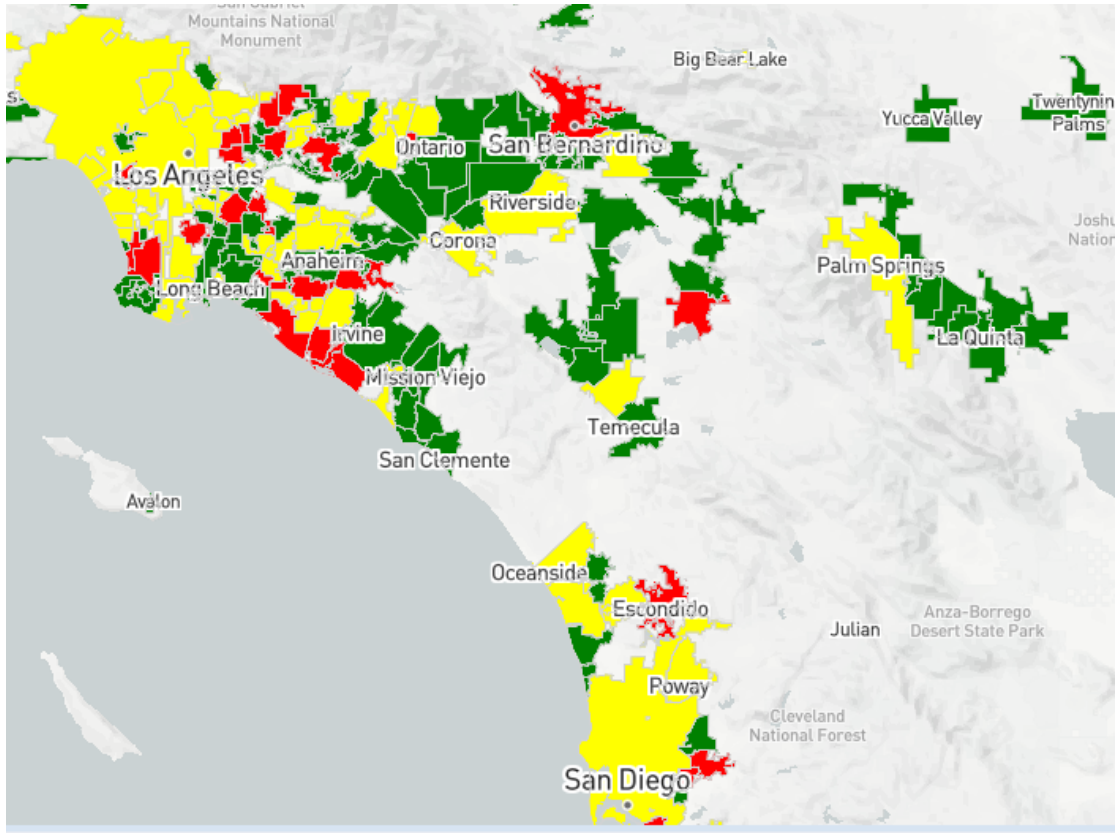
- Required employer contributions are rising
  - Primarily due to decrease in the discount rate
  - Agencies are telling CalPERS this is problematic
- Future investment losses (returns less than 7%) or further decrease to the discount rate would exacerbate problem
- We believe this is a significant risk to the security of member benefits

Important Risks – Employers' Ability to Make Contributions

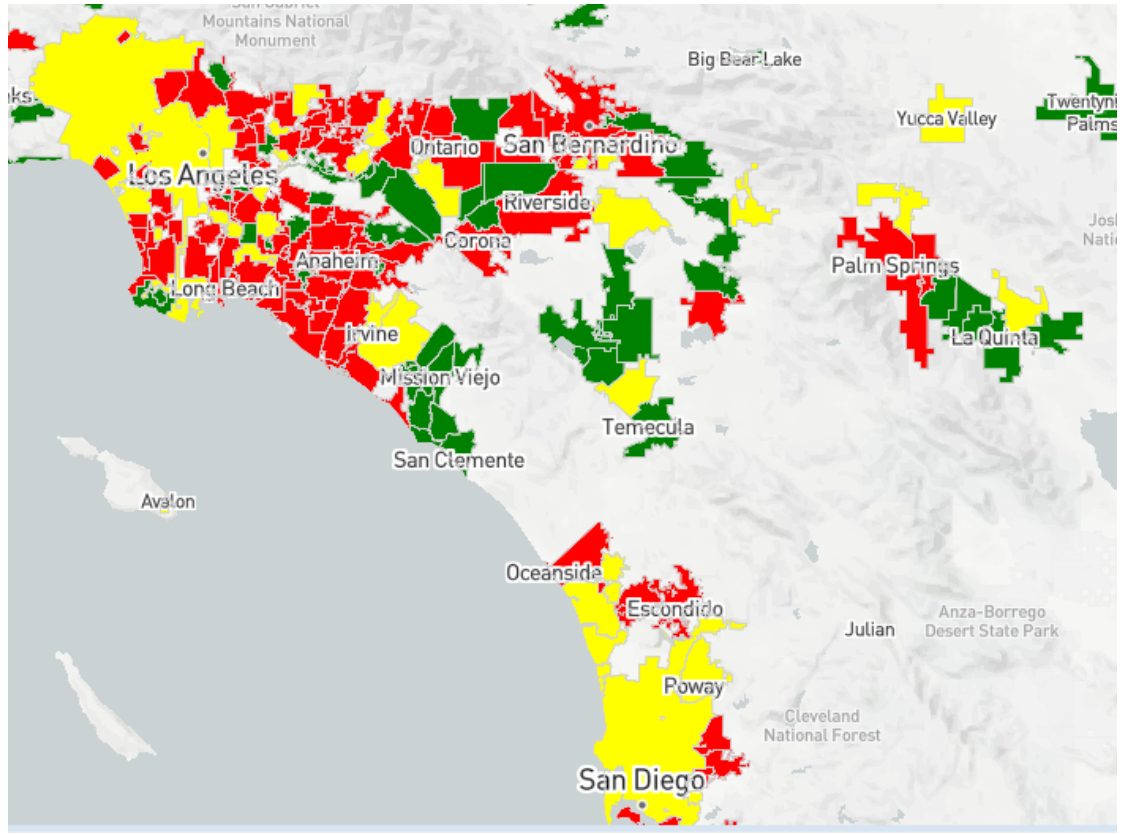
- Local Government High-Risk Dashboard - California State Auditor
  - Assigns risk designation for various categories based on CSA methodology
    - Pension costs
    - Future pension costs
    - Several others (e.g., general fund reserves, liquidity, OPEB funding, etc.)
  - Risk designations
    - Red – significant risk of experiencing fiscal distress
    - Yellow – some risk of experiencing fiscal distress
    - Green – low risk of experiencing fiscal distress
  - Different methodologies could produce different results

Important Risks – Employers' Ability to Make Contributions

Pension Costs



Future Pension Costs



* Taken from the California State Auditor website and based on methodology developed by CSA

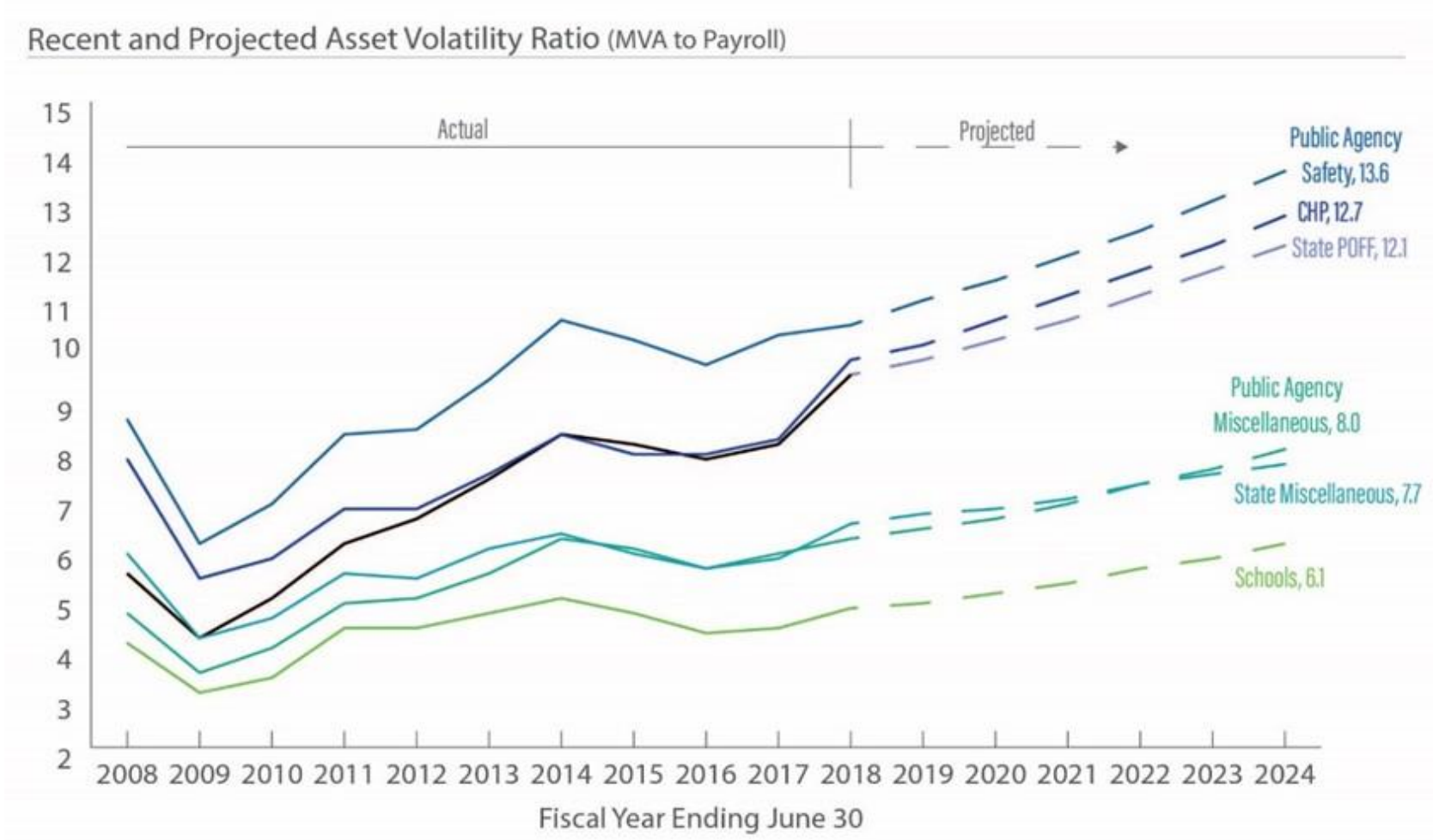
Maturity Measures

- Asset volatility ratio = assets / payroll
- Liability volatility ratio = liability / payroll
- Retiree liability to total liability
- Liability duration

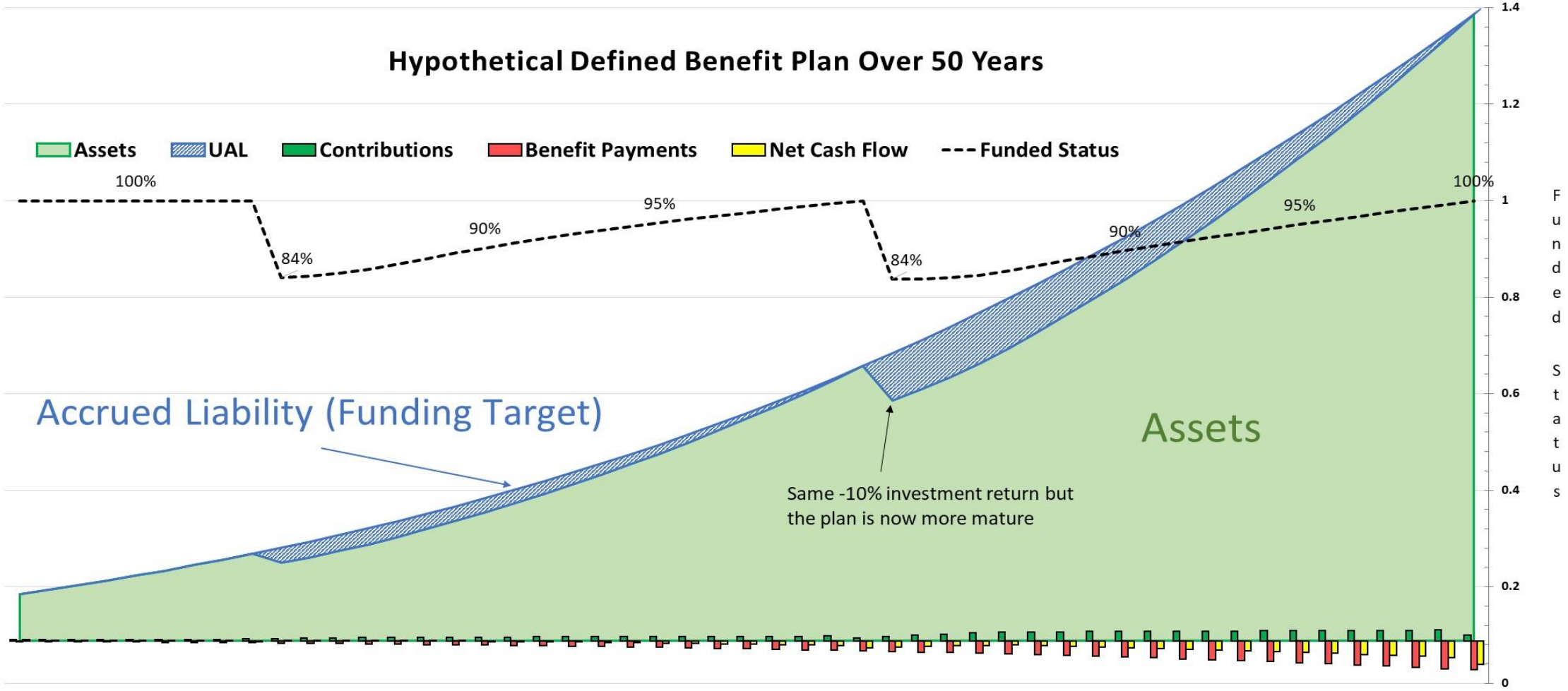
Progression of Maturity Measures

- Asset volatility ratios are increasing
  - Indicates greater potential for significant contribution volatility due to investment performance
- Liability volatility ratios are increasing
  - Indicates greater potential for contribution volatility due to unexpected liability changes
- Retiree liabilities are becoming a larger portion of total liabilities
  - Increased cash flow needs
  - Impacts investment decisions

Maturity Measures – Asset Volatility Ratio



Asset Volatility Ratio - Illustration



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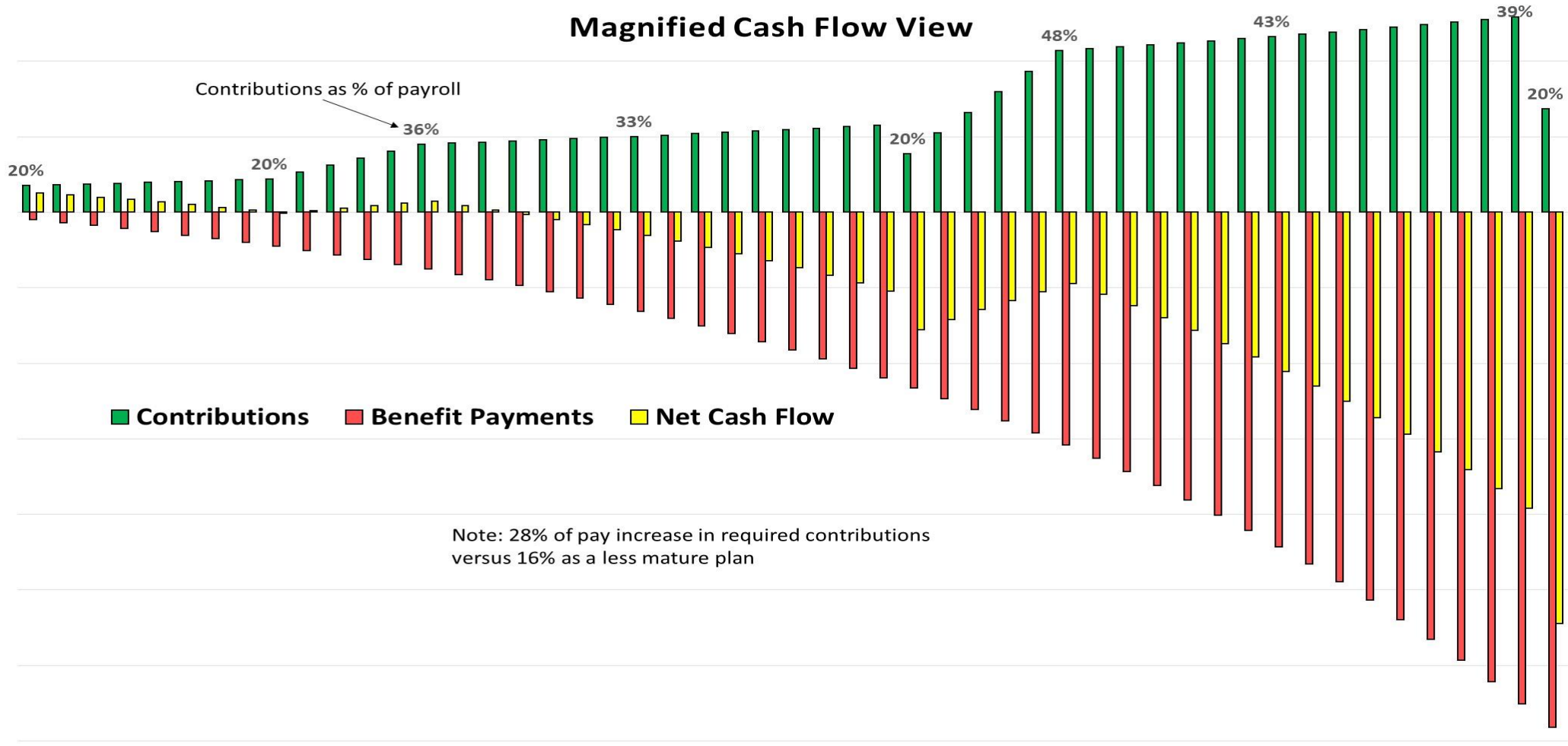

Key Board Actions

- Investment Policies
- Funding Policies
- Actuarial Assumptions

Board Actions - Investment Policy

- Investment policy actions taken by board
  - Set risk tolerances
  - Adopt investment allocation policies that:
    - meet risk tolerances
    - maximize investment return
  - Set discount rate based upon investment allocation

Board Actions – Investment Policy

- Asset Liability Management (ALM)
  - Integrated analysis of assets and benefit liabilities
  - Full ALM study performed every 4 years
    - Actuarial, Investment and Finance offices all involved
    - Mid-cycle review after 2 years
    - Used to set asset allocation and discount rate

Board Actions – Funding Policies

- Funding Policies
  - Actuarial cost method
  - Amortization policies
  - Risk mitigation policies

Board Actions – Actuarial Cost Method

- Actuarial cost method
  - Entry age normal cost method currently used
  - Widely used in the public sector
  - No significant reason to change at this time

Board Actions – Amortization Policy

- Amortization policies
  - Board adopted new policy in 2018
  - Applies to new UAL bases only
  - Shortened payoff periods in some cases
  - Switched from “level % of pay” to “level dollar”
  - Removed 5-year ramp for assumption changes
  - Include possible relief measures for financial necessity

Board Actions – Risk Mitigation Policy

- Risk mitigation policy
  - Adopted by board in 2016
  - Requires methodical reduction in asset volatility over time
    - Triggered by strong annual investment performance
    - Results in discount rate decreases
  - Has not been triggered since adoption
    - Temporarily suspended while discount rate dropped to 7%
  - Investment return of 9% or higher for year ending 6/30/2020 will trigger the policy

Board Actions - Assumptions

- Demographic
  - Experience study performed every 4 years
  - CalPERS actuaries recommend demographic assumptions based on:
    - Results of experience study
    - Actuarial judgement regarding future expectations
  - Most assumptions are modified slightly after every study

Board Actions - Assumptions

- Economic
  - Investment return (discount rate) is main assumption
  - CalPERS team will provide recommendation based on ALM process
    - Must meet actuarial standards of practice
  - The discount rate assumption may include a margin for adverse experience
    - Conservative approach to protect against unfavorable investment results
    - Affects PEPRA members
  - Phasing into a lower discount rate assumption is possible but not ideal
    - Each year's discount rate must satisfy actuarial standards of practice
    - Direct rate smoothing is preferable approach

Pension Outlook Tool

- Pension Outlook Tool
  - Available to board members through Insight and some employers through myCalPERS
  - Will be available on the CalPERS website by June 30, 2020 to anyone
  - Can be used by board members to aid in decision making