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Investment Risk-Taking by Public Pension Plans: Potential Consequences for Pension Funds, State and Local Governments, and Stakeholders in Government

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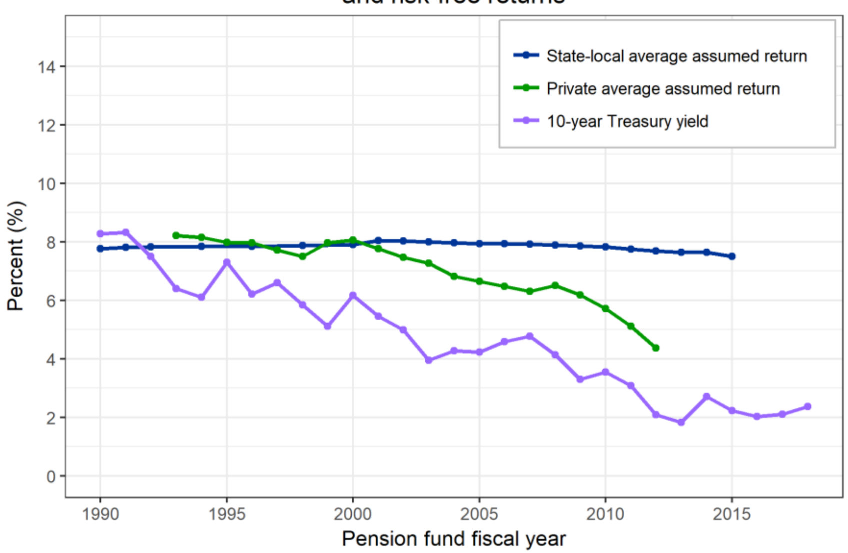
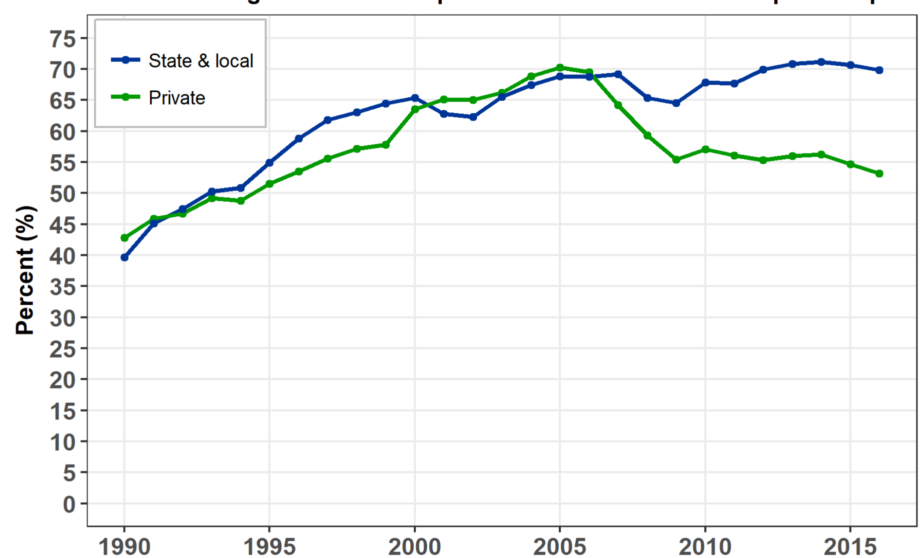
Introduction

- Public pension plans in the US:
  - Public pension assets: $4 trillion (FRB)
  - Underfunded by approx. $1.95 trillion (FRB/BEA) despite contribution increases.
- The decline in risk-free interest rates since the 1980s and 1990s has created a very difficult investing environment for public pension plans.
- Public plans largely maintained assumed returns, increased risk. (e.g., an ~11% shortfall → ~$400b for U.S. as a whole , > 1 year of all sales taxes collected by all state and local govts).



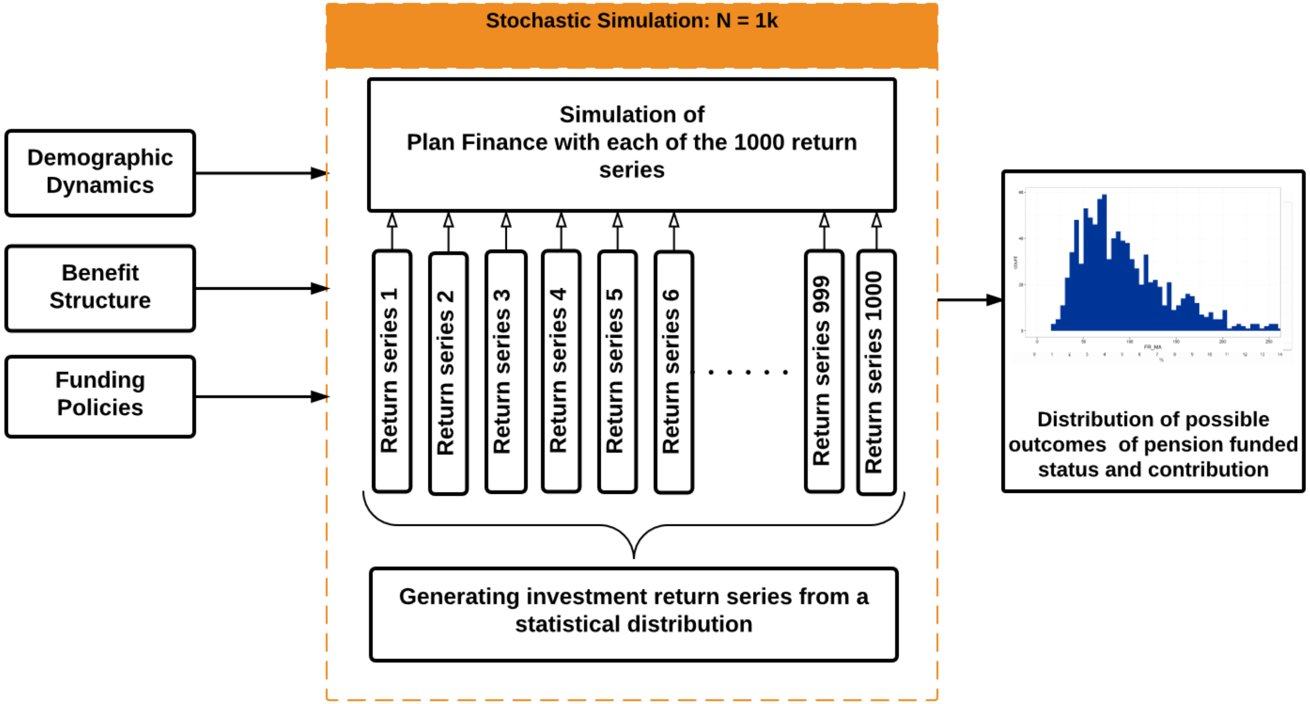
Sources:
State-local assumed return from Public Plans Database
Private assumed returns provided by Andonov, Bauer, and Cremers
10-Year Treasury yield from Federal Reserve Bank of St. Louis (FRED)



Source: Authors' analysis of Z.1 Financial Accounts of the United States, Federal Reserve Board, Tables L.118.b, L.1

Stochastic simulation method

Model structure and goals: Mimic the behavior of real-world plans and simulate alternative funding policies and return scenarios.



A prototypical fund that resembles real-world pension plans in important ways:

- Demographics, benefit structure, stable workforce
- Actuarially determined contributions are made (including 5% employee contribution; alternatively, can override ADC)
- 75% initial funded ratio

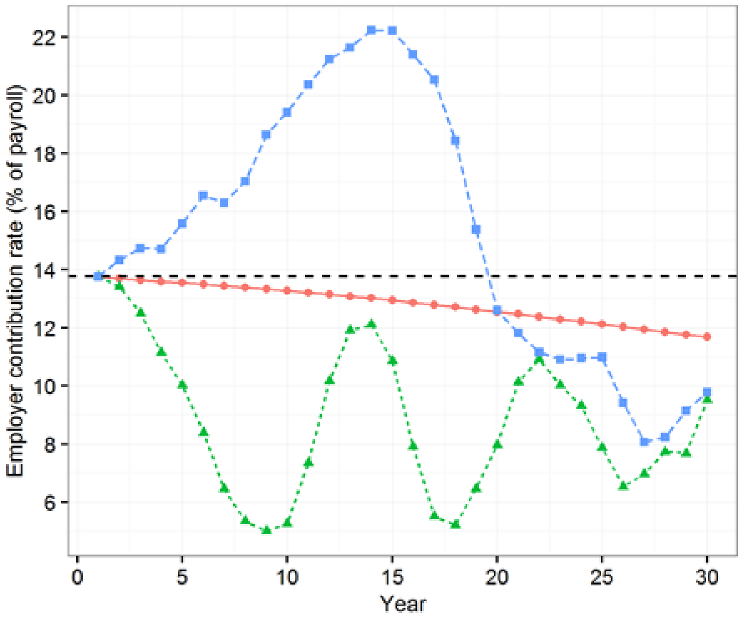
Illustrative simulations

Employer contributions and funded ratio can be highly variable, even if expected returns are correct on average.

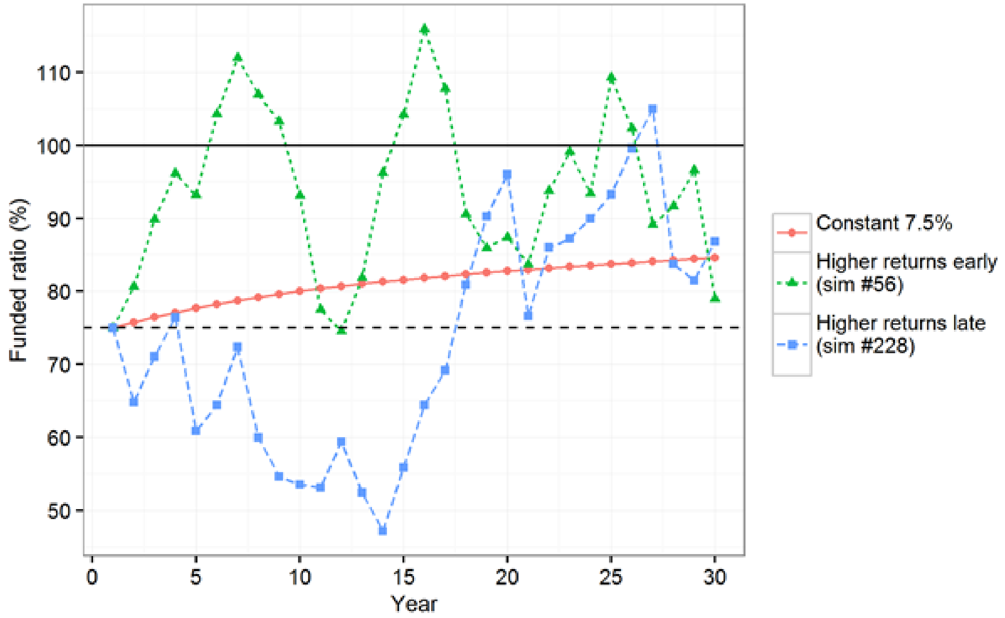
Three individual simulations, all with 7.5% discount rate and 7.5% compound annual returns.

- Deterministic run: constant returns
- Stochastic run : high returns in early years
- Stochastic run : low returns in early years

Employer contribution rate



Funded ratio



Funding policy: 30-year level pct open with 5-year asset smoothing

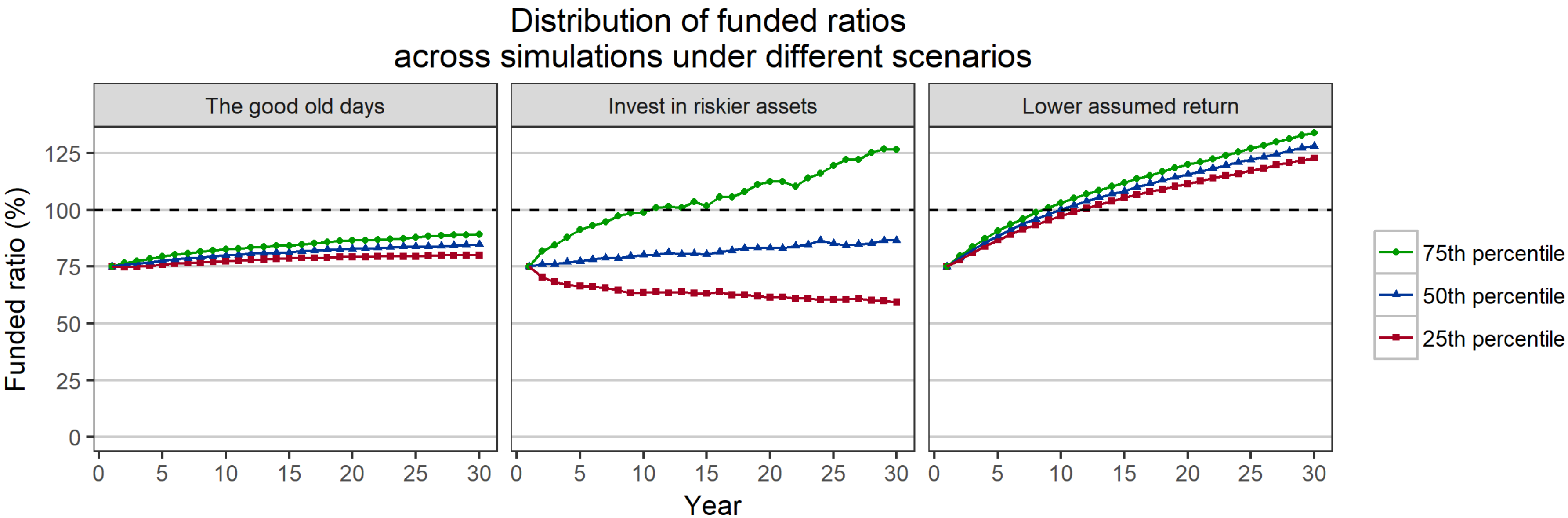
Scenarios for plan responses to a decline over time in risk-free returns

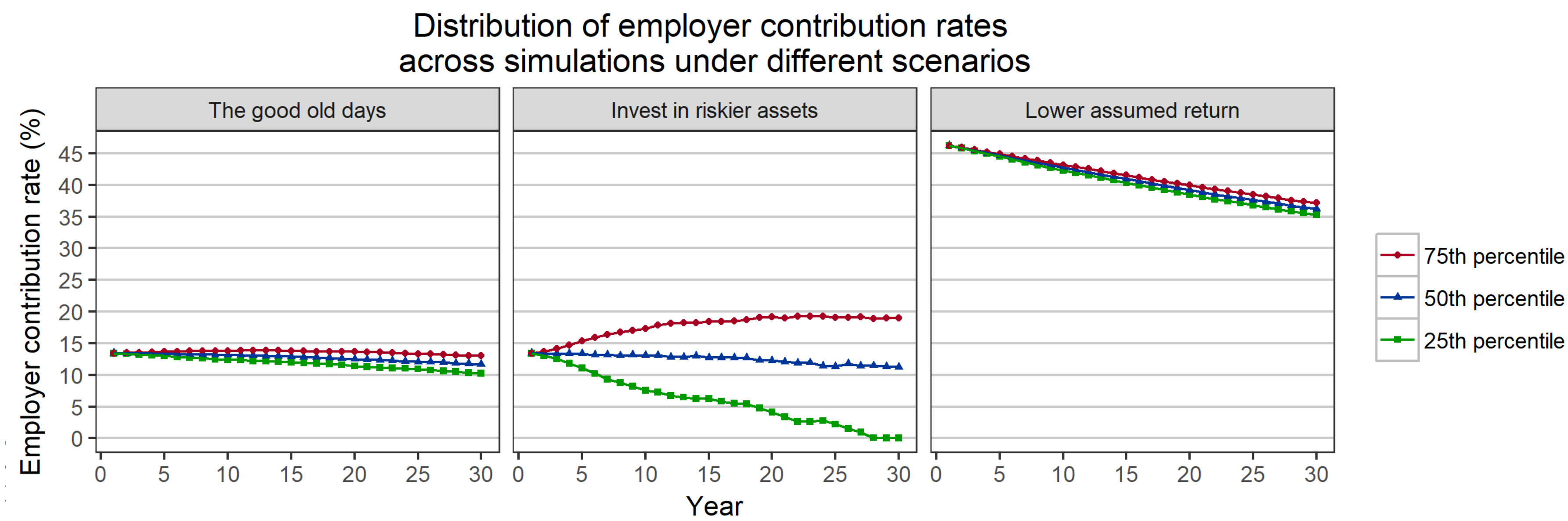
	Risk-free rate	Expected Compound Return	Return volatility (Standard deviation)	Assumed return (Discount rate)
The "good old days" (High risk-free rate)	6.7	7.5	1.8	7.5
Invest in riskier assets, justfifying high expected return	2.7	7.5	**12.0**	7.5
Maintain allocation and lower expected return	2.7	**3.5**	1.8	**3.5**

Note:

1. All values are percentage (%).
2. These are simulated scenarios that are intended to reflect main features of investment practices in certain return environments, they are not directly based on historical data.
3. It is assumed that all portfolios have the same Sharpe ratio of 0.46, and the Sharpe ratio does not change across risk-free rate regimes

Distributions of funded ratio and employer contribution rates under different return scenarios





Plan responses to a decline over time in risk-free returns:
Summary of results

Plans faced a trade-off when risk-free rates fell: Increase risk to the pension fund, or lower return assumptions and increase government contributions

Plan funding and employer contributions under three investment-return scenarios

	Funded-ratio measures			Employer contribution measures		
	Probability (percent) of falling below 40% at any time within 30 years	Median funded ratio:		Probability of rising by more than 10% of payroll in any 5-year period (within first 30 years)	Median % of payroll:	
		Year 1	Year 30		Year 1	Year 30
Good old days (7.5% expected return, low volatility)	0	75.0	84.8	0	13.4	11.7
Invest in riskier assets (7.5% expected return, high volatility)	16.9	75.0	86.6	16.5	13.4	11.3
Lower assumed return (3.5% expected return, low volatility)	0	75.0	128.1	0	46.2	36.2

Investment risk and funding policies

- **Funding policies: Rules to determine contributions made by sponsoring governments**
  - Rules for how shortfalls are recognized and reflected in contributions
  - Statutory rules that override actuarially determined contributions

- **Trade-off in the choice of funding policies**
  - Repaying shortfalls quickly:
    - Better benefit security for beneficiaries; less burden on future taxpayers
    - Large immediate increase in contributions → sharp temp. cut in budgets or tax increases
  - Repaying shortfalls over a long time:
    - Low near-term cost; cost stability
    - Greater risk of deep underfunding and burden for future taxpayers
    - Greater insulation from investment risk for current elected officials (moral hazard)

Elements of funding policy

- **Amortization methods and periods:** How fast the unfunded liability is paid off
  - Closed or open
  - Level dollar or percent of payroll
  - Length of amortization period

57% of UAAL under "open" method (PPD, 2013)

72% of UAAL under "level pct" method (PPD, 2013)

2/3 of UAAL in plans with amort. period of 30 years or more;
Often paired with "open method" (PPD, 2013)

- **Asset smoothing:** How fast the investment gains/losses are recognized.

- **Discount rate:** Lower discount rate → higher estimate of liability and annual costs (example in paper: NC at 6% DR is ~ 2x NC at 8% DR)

- **Adjustments and overrides through caps, corridors, and statutory contribution rates**
  - Actuarially determined contributions are overriden by statutory rules in **50 percent** of the 110 large state-administered plans analyzed by a recent study over the 2001-2010 period.

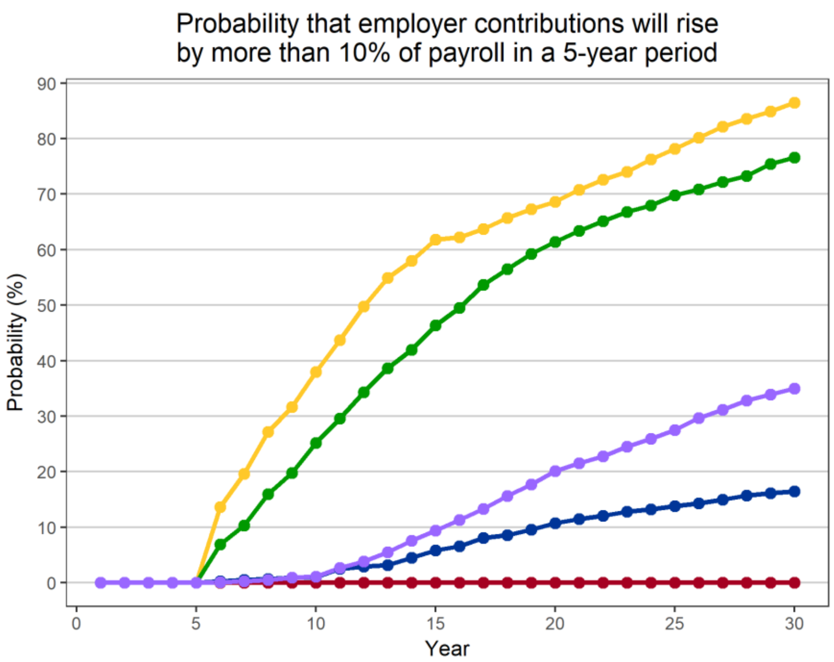
Risks under different funding policies

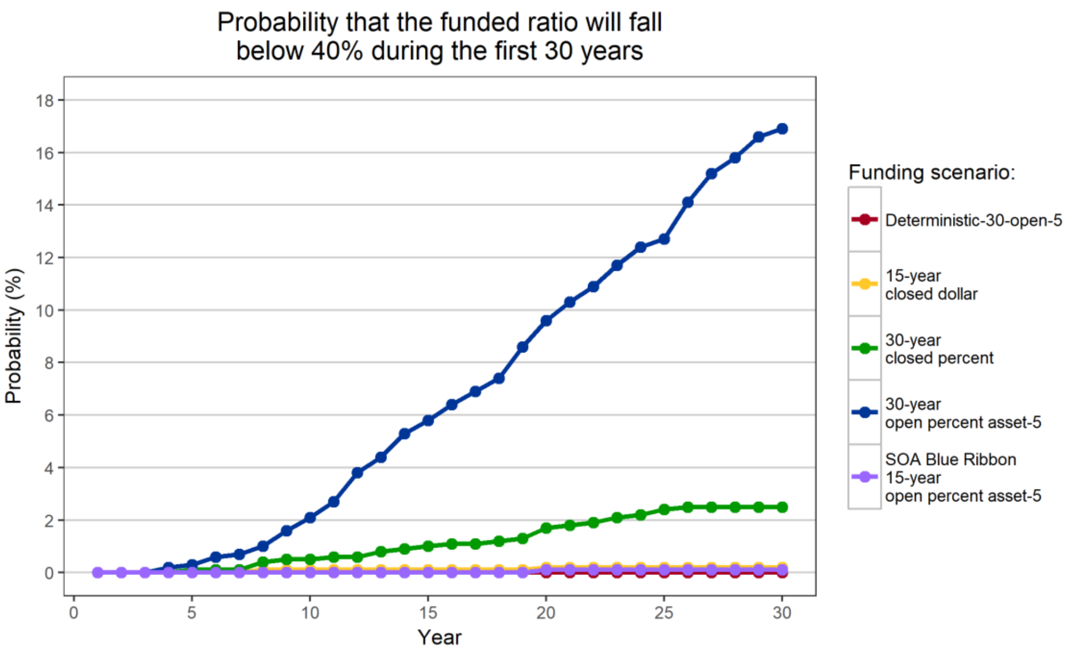
Risk measures

- **Contribution volatility**: Probability of sharp increase in any 5-year period of employer contribution rate
- **Risk of severe underfunding**: Probability of funded ratio falling below 40% during first 30 years

The very stretched-out policy of 30-year level percent amortization:

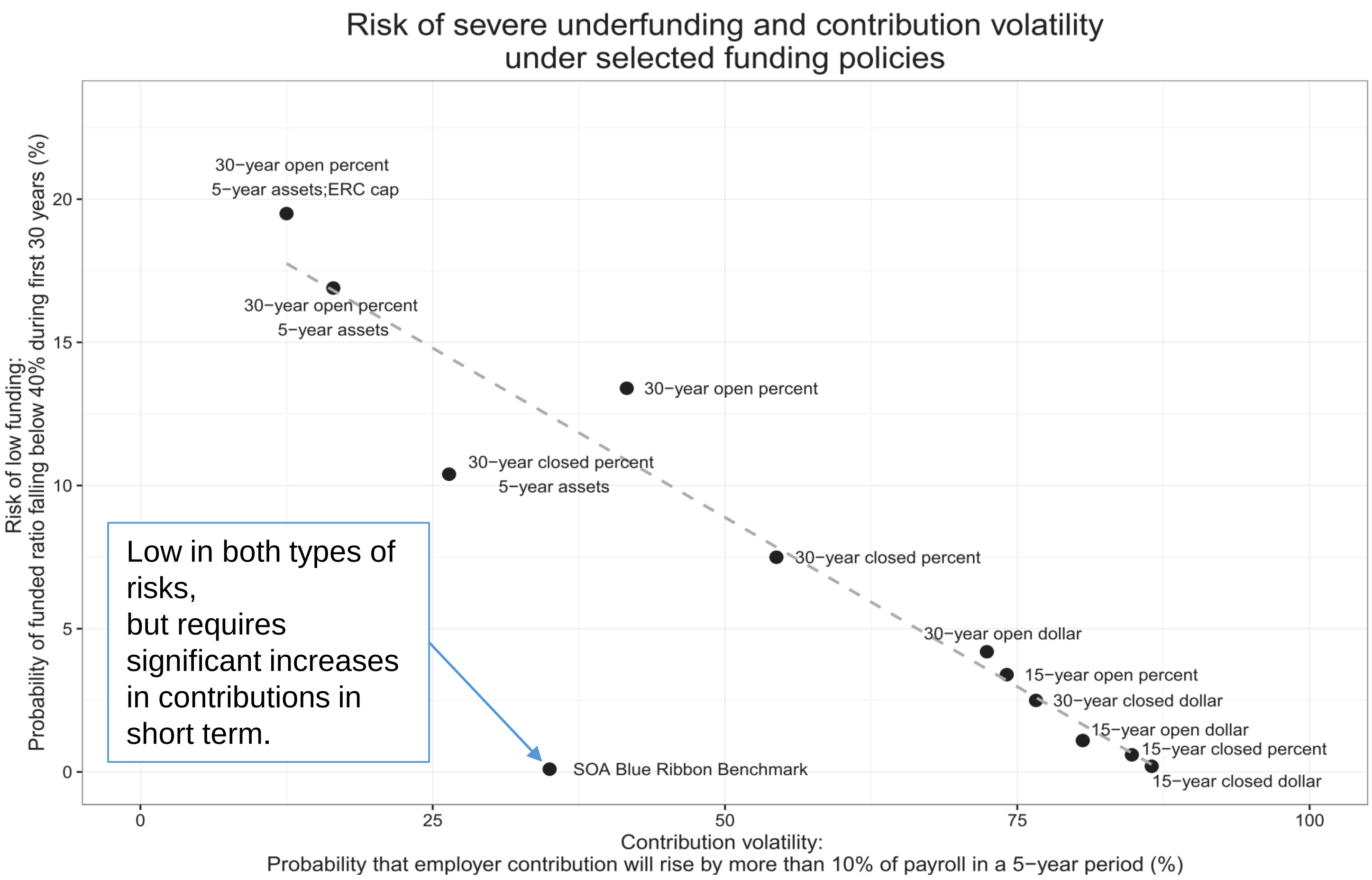
- Attractive to employer：Very low probability that contribution will rise above 10% in a 5-year period
- has a far greater risk of severe underfunding than other policies.





The trade-off between contribution volatility and the risk of underfunding

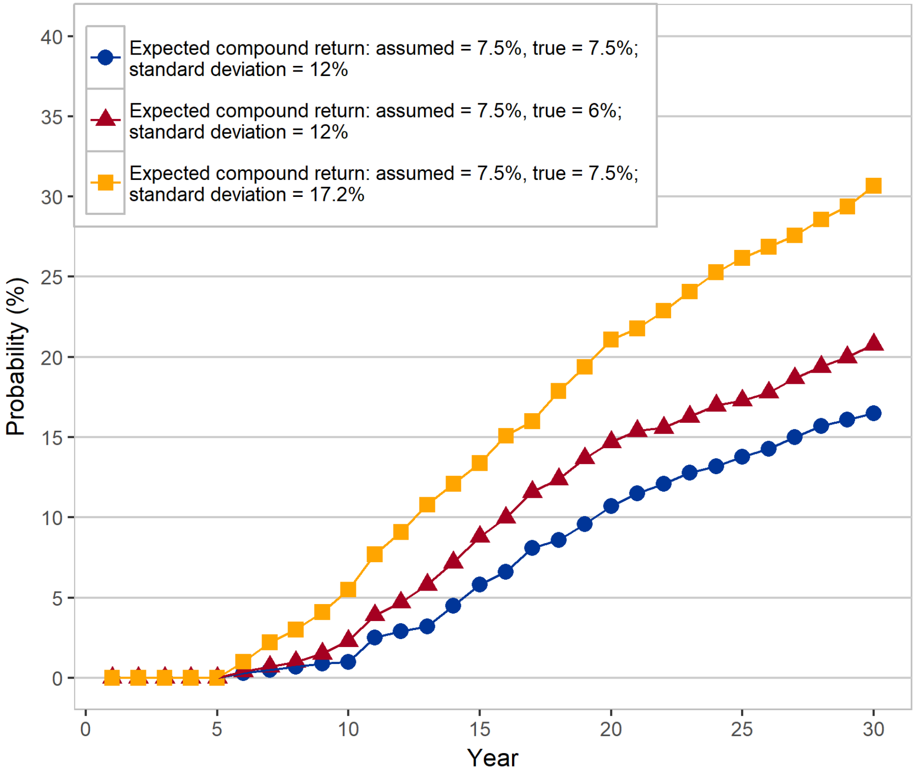
- Contribution volatility: Probability of sharp increase in any 5-year period of employer contribution rate
- Risk of underfunding: Probability of funded ratio falling below 40% during first 30 years



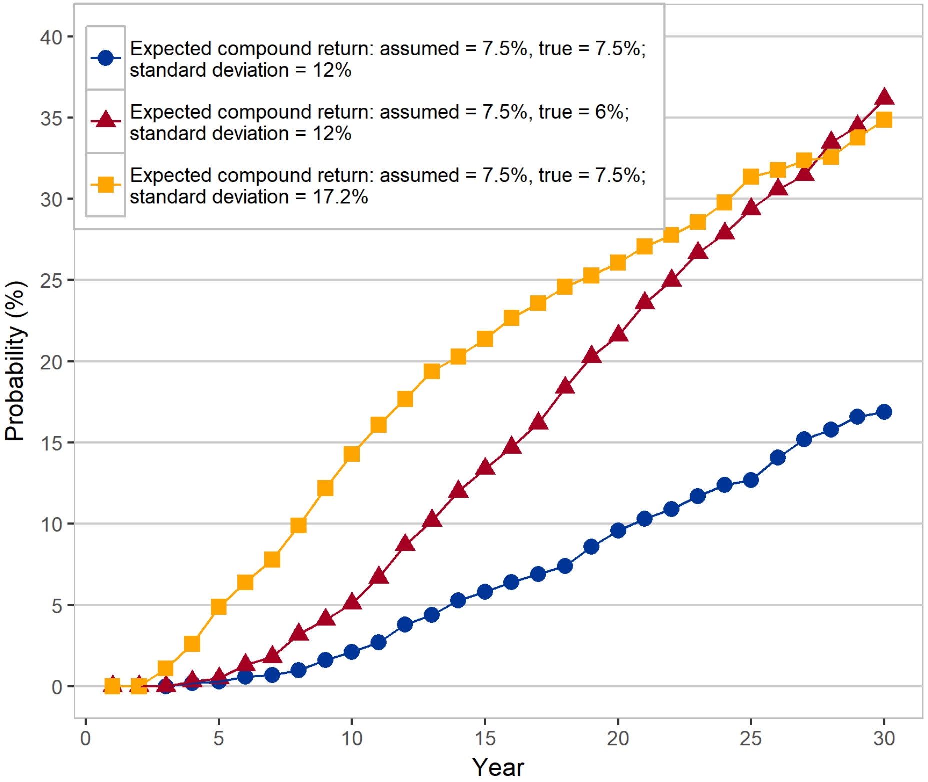
Scenario in which the true expected rate of return is less than the assumed return

- Some current market forecasts suggest that it can be very difficult for public pension funds to achieve their assumed returns in the current market environment. To achieve the assumed return of 7.5%, the pension funds may need to invest in even riskier portfolios.
- Scenarios examined:
  - True expected returns lower than earnings assumption: **assumed 7.5% vs true 6%.**
  - Investing in more volatile portfolio to achieve earnings assumption: **assumed = true (7.5%), higher standard deviation (17.2%)** (not in the submitted paper)

Probability of employer contribution rising by more than 10% of payroll in any 5-year period up to the given year



Probability of funded ratio falling below 40% at any time prior to and including the given year



Key conclusions

- The choice by most public pension plans to increase investment portfolio risk in the face of falling risk-free returns, helping them to maintain investment return assumptions, has kept governmental contributions much lower than they otherwise would have been, but also has created greater risk to pension plan funding.
- There are important trade-offs between risks to the finances of public pension plans, and risks to their sponsoring governments. The most-common funding policies and practices reduce contribution volatility at the same time that they increase the likelihood of severe underfunding.
- These policies are unlikely to bring underfunded plans to full funding within 30 years, even if investment-return assumptions are met every single year and employers make full actuarially determined contributions.
- No easy way out. Plans can de-risk to reduce volatility. But that almost certainly will require lowering earnings assumptions, in turn requiring higher contributions, albeit more stable ones.
- Need better analysis, reporting and communication of risk

Appendix

Stochastic simulation method

How we evaluate risks

Types of funding risk	Measures of risks: Probability that, anytime in 30 years,
Extremely low funded ratio	funded ratio will fall below 40%
Extremely high contributions	employer contribution will rise above 30% of payroll
Large increases in contributions in short periods of time	employer contribution will rise by more than 10% of payroll in a 5-year period

There usually are trade-offs between these risks.

Stochastic simulation method

Assumptions on investment returns

- returns are independent year to year and follow normal distribution
- expected long-run compound return of 7.5% and standard deviation of 12%

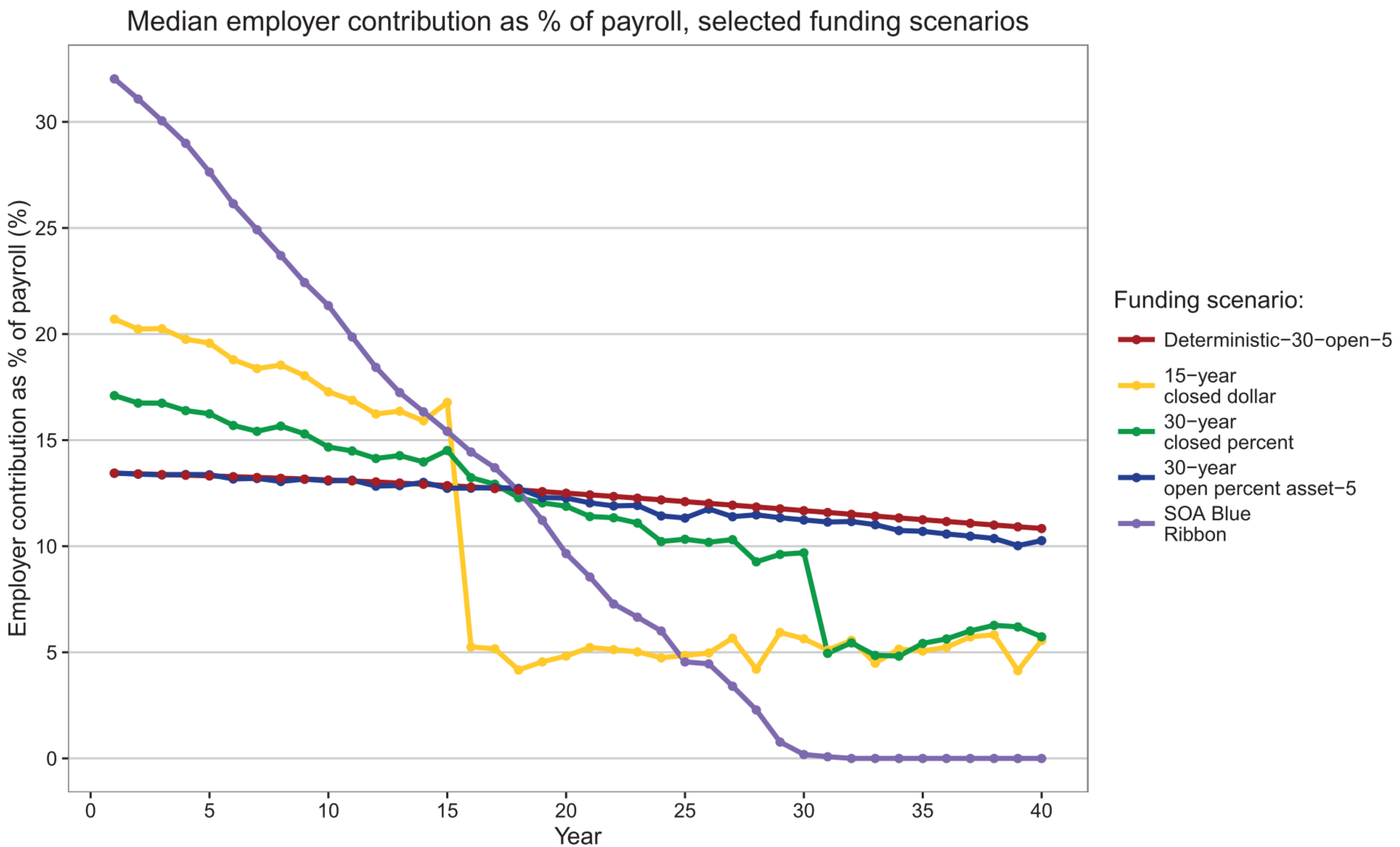
Funding policies examined

Amotization	Asset smoothing	Discount rate
15-year closed/open; level dollar/level percent	No	7.5%
30-year closed/open; level dollar/level percent	No	7.5%
30-year closed/open; level percent	5-year	7.5%
SOA Blue Ribbon Panel's Standardized Contribution Benchmark:		
15-year open; level percent	5-year	5.9%*

* Long-run expected compound return is 7.5% as in other scenarios, even though the actuarial assumption is 5.9%.

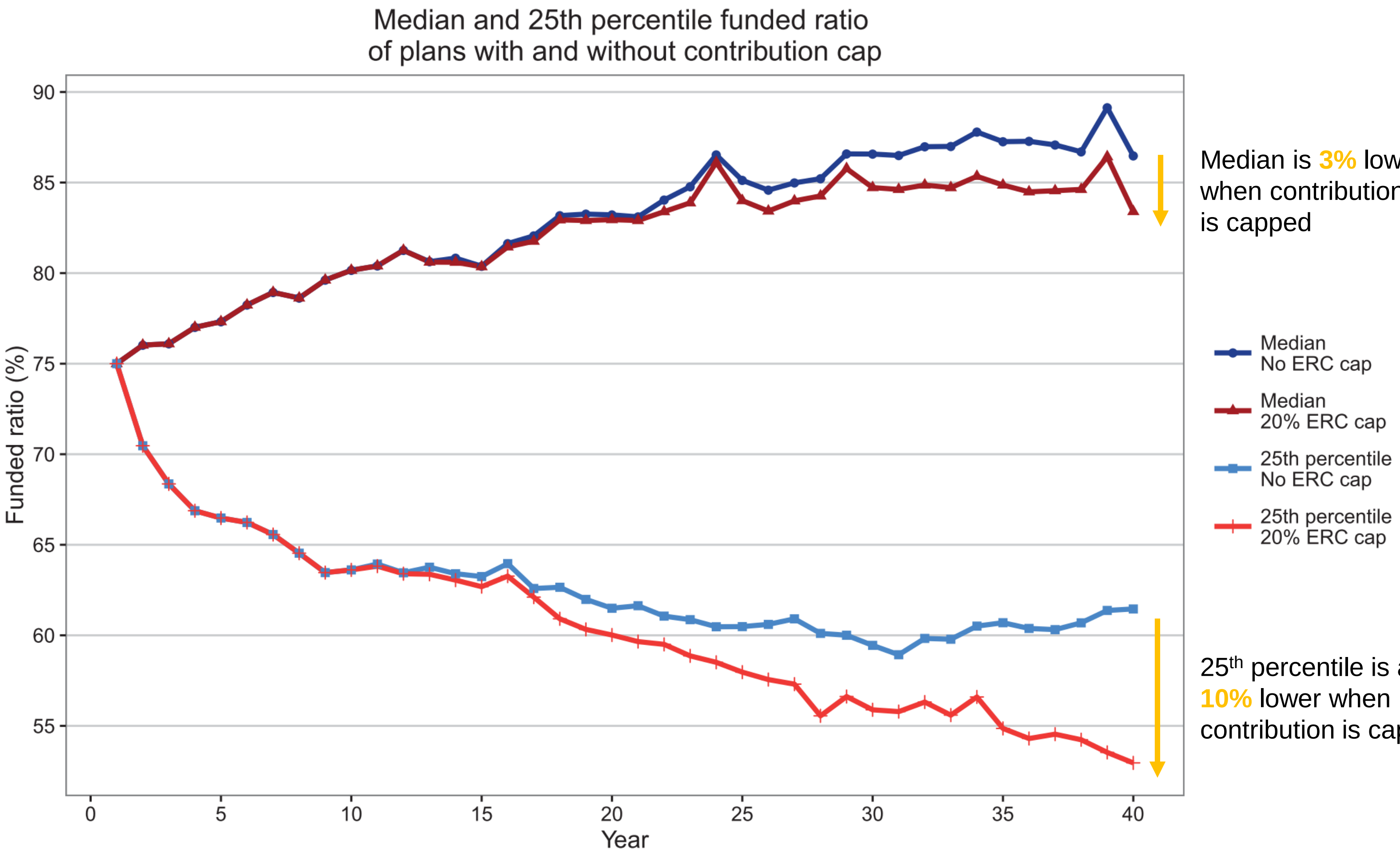
Employer contribution:
Median employer contribution rate

- Employer contributions in runs with highly stretched-out funding policies are lower in early years but higher in later years.



What happens to the funded ratio if contributions are less than actuarially determined contributions?

- Model the consequences of a shortfall in paying the actuarially determined contribution by imposing a cap on the employer contribution as 20% of payroll.
- The effect of the contribution cap is more prominent when the plan faces bad return scenarios (25th percentile) and the contribution cap is therefore triggered more frequently.



Median is 3% lower when contribution is capped

25th percentile is almost 10% lower when contribution is capped

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