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The State University of New York

The Interplay Between Retirement Plan Funding Policies, Contribution Volatility, and Funding Risk

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Introduction

- **Poor funded status of defined-benefit public pension plans**
  - Public pension assets: $3.7 trillion (FRB)
  - Underfunded by approx. $1.95 trillion (FRB/BEA) despite contribution increases.

- **Investment return volatility and funding risks**
  - Governments make contributions, in combination with investment income, to secure future benefit payments
  - Governments face great uncertainty in contributions, a big source of which is investment return volatility
  - Extra contributions are need to shore up the fund when returns fall short

- **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

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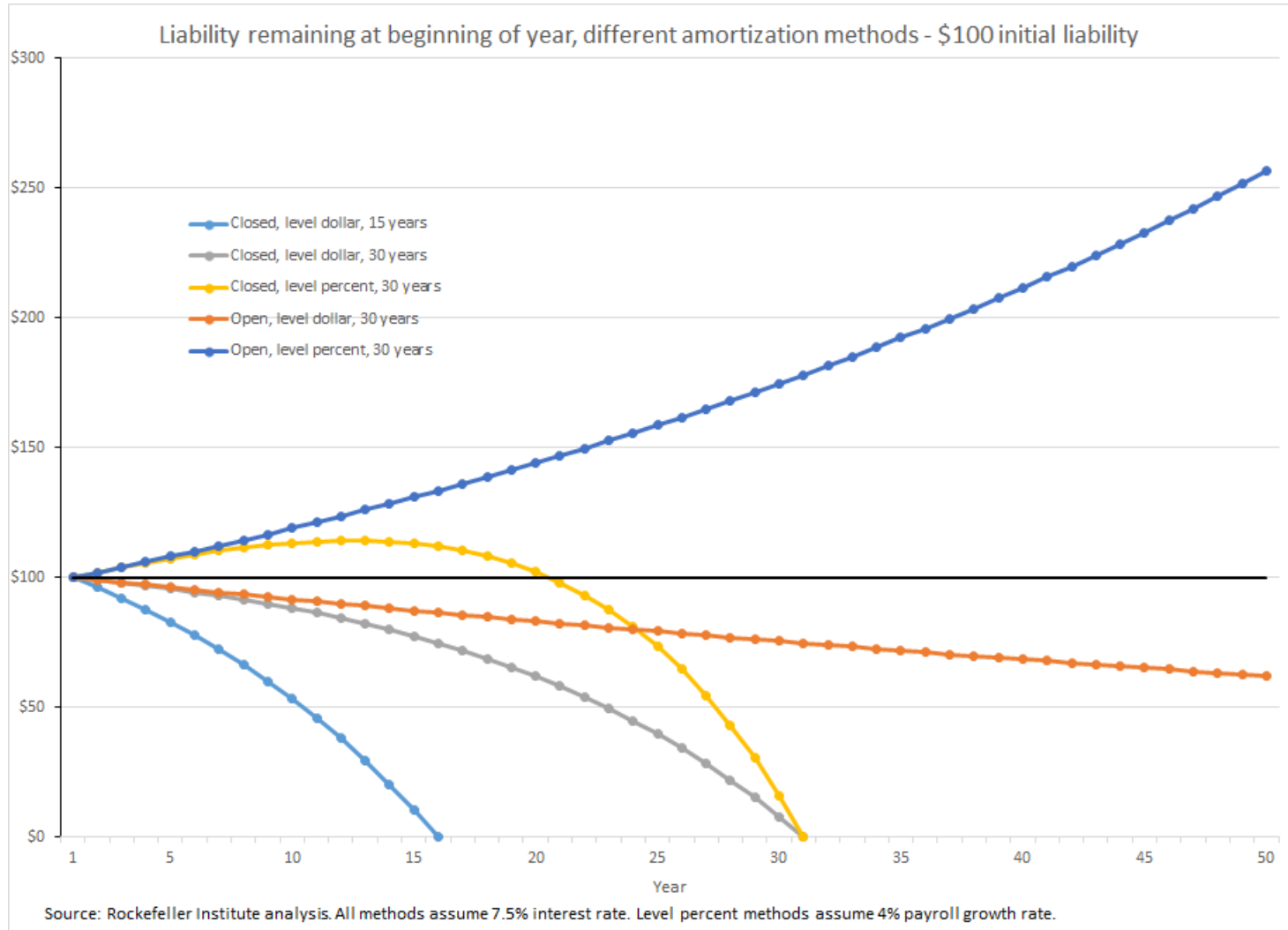*The public policy research arm of the State University of New York*

Introduction

- **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

- **This paper**

  - **Goal:** Evaluate and quantify risk of severe underfunding and of large increases in employer contributions (ERC) under different funding policies.

  - **Method:** stochastic simulation model

  - **Findings:**

    - Commonly used funding methods can exacerbate the risks of severe underfunding and of large increases in contributions by government employers.

    - No easy way out: de-risking almost certainly requires higher contributions.

Elements of funding policy

- **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)

- **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.

- **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.

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Open amortization pays down liabilities slowly. Open level percent: never fully paid.

Liability remaining at beginning of year, different amortization methods - $100 initial liability

Legend:
- Closed, level dollar, 15 years
- Closed, level dollar, 30 years
- Closed, level percent, 30 years
- Open, level dollar, 30 years
- Open, level percent, 30 years

Source: Rockefeller Institute analysis. All methods assume 7.5% interest rate. Level percent methods assume 4% payroll growth rate.

Stochastic simulation method

Model structure and goals: Mimic the behavior of real-world plans and simulate alternative funding policies and return scenarios.
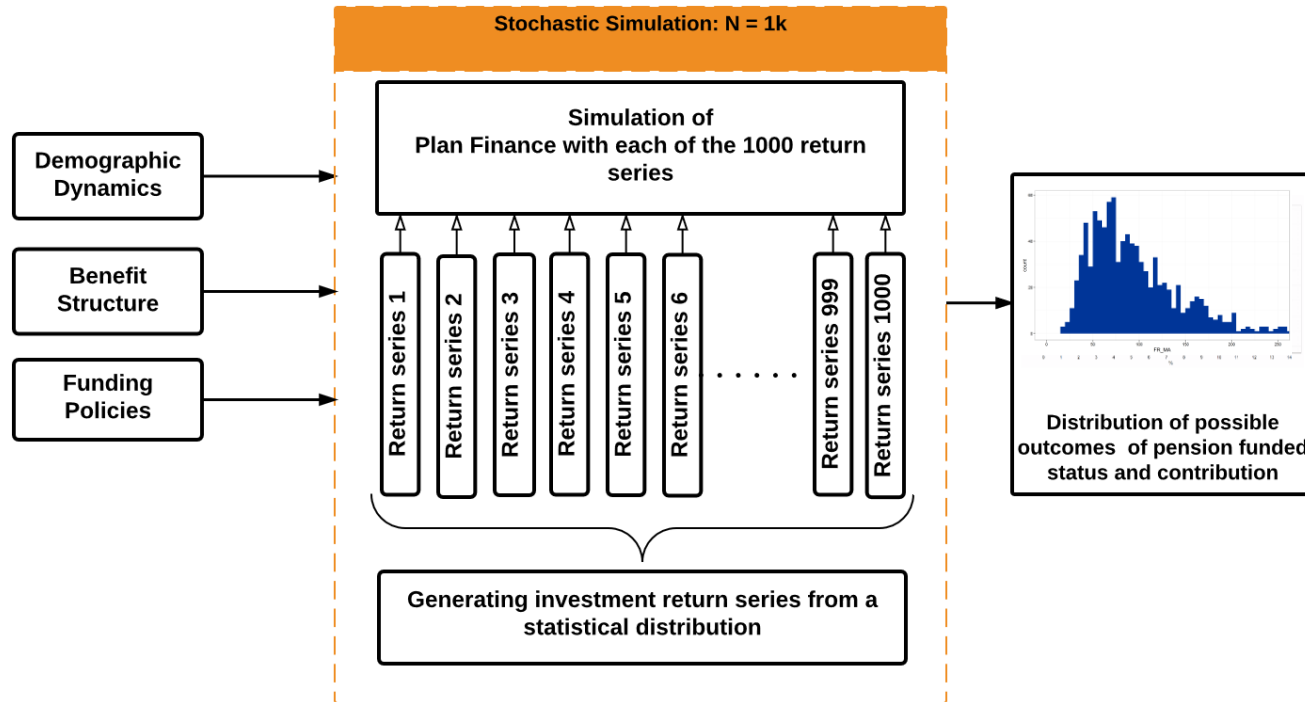
A prototypical fund that resembles real-world pension plans in important ways:

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

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Stochastic simulation method

Assumptions on investment returns

- returns are independent year to year and follow normal distribution
- mean 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%.

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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.

Results: Illustrative simulations

Employer contributions and funded ratio can be highly variable even if earnings assumption is met on average.

Three individual simulations, all with 7.5% compound annual returns
- Deterministic run: constant returns
- Stochastic run   : high returns in early years
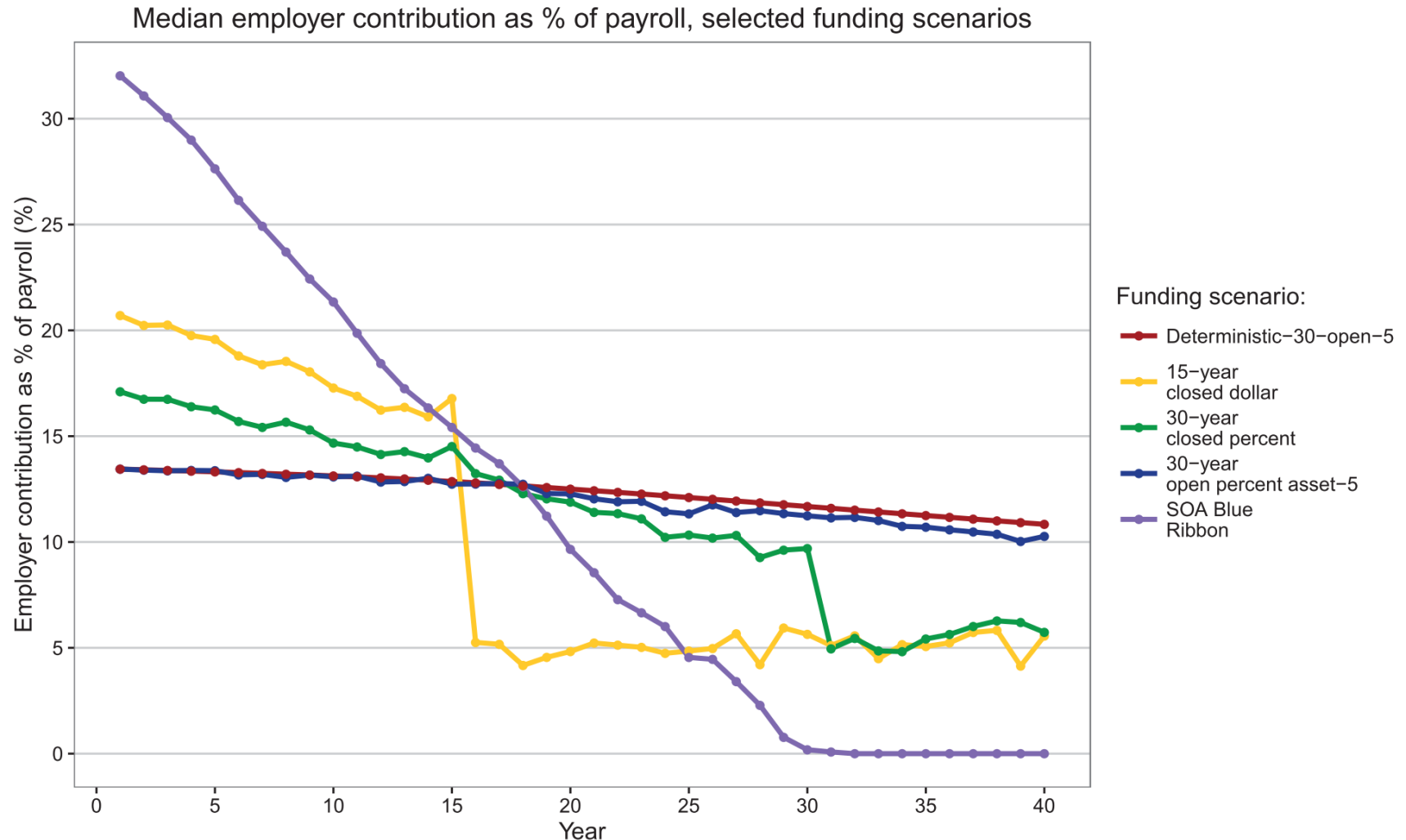- Stochastic run   : low returns in early years

Employer contribution rate
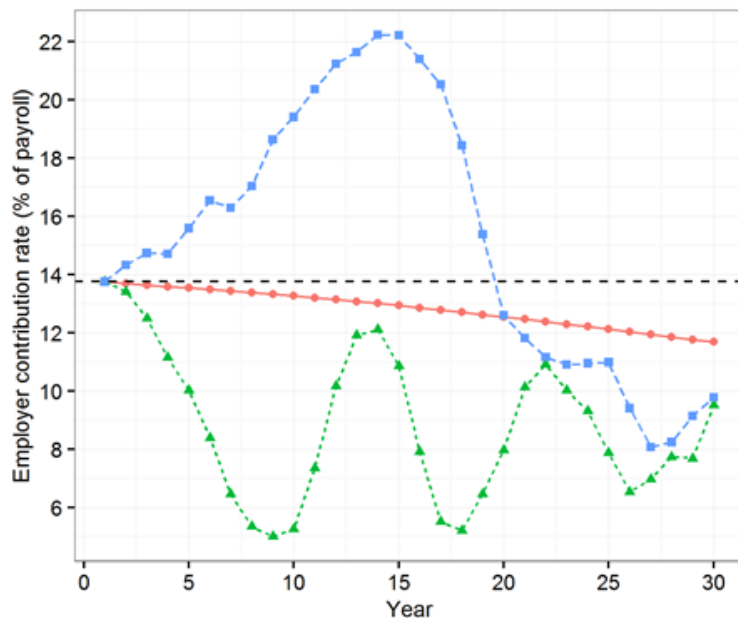
Funded ratio
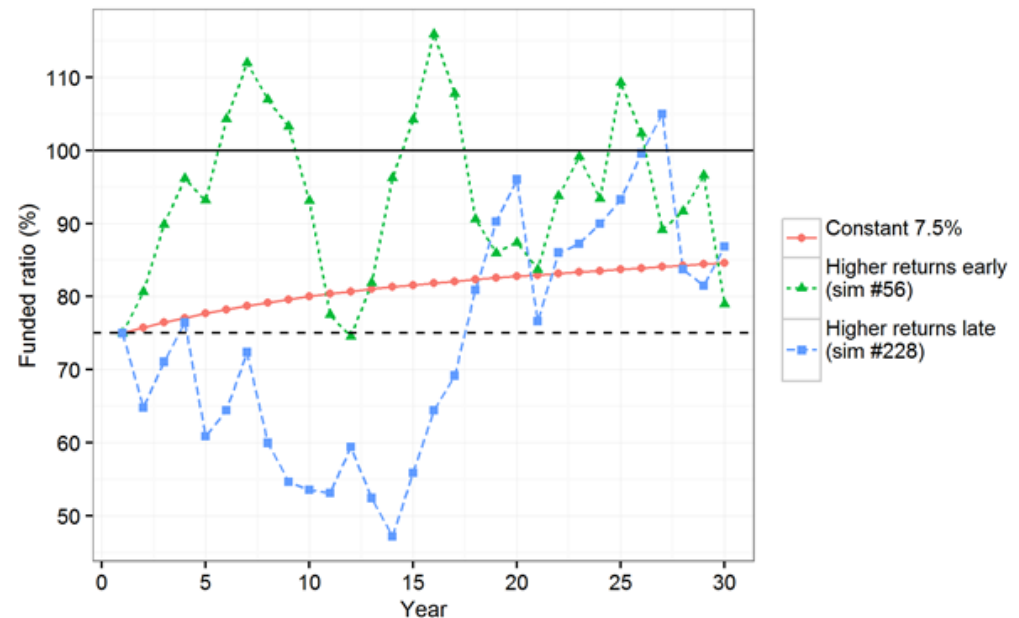
Funding policy: 30-year level pct open with 5-year asset smoothing

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.
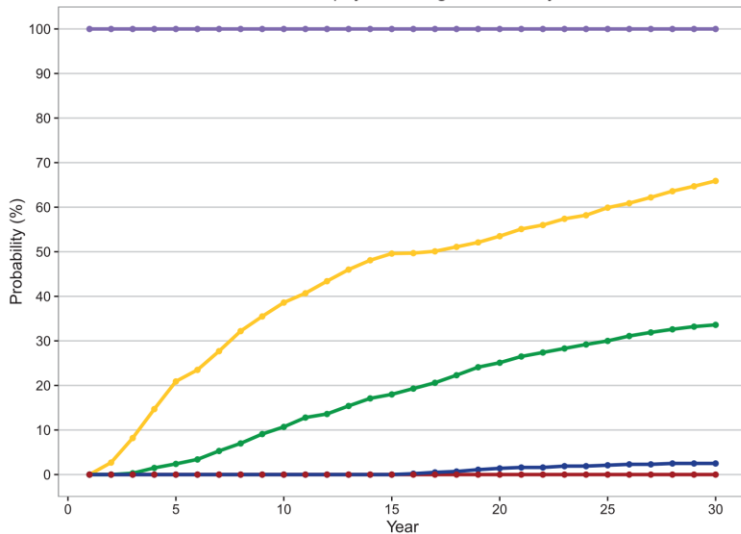

Median employer contribution as % of payroll, selected funding scenarios

Funding scenario:
- Deterministic−30−open−5
- 15−year closed dollar
- 30−year closed percent
- 30−year open percent asset−5
- SOA Blue Ribbon

Employer contribution:
Probability of high ERC / sharp increase in ERC

The very stretched-out policy of 30-year level percent amortization is attractive to employer:

- Near-zero chance of employer contribution rising above 30% of payroll
- Very low probability that contribution will rise above 10% in a 5-year period

Probability that employer contributions will rise above 30% of payroll during the first 30 years

Probability that employer contributions will rise by more than 10% of payroll in a 5-year period

Impact on funded ratio:
Median funded ratio

- Plans with more stretched-out policy progress toward full funding more slowly than plans with less stretched-out policy

- Under the very stretched-out common policy, median funded ratio only rises to 87% from 75% after 30 years.

Median funded ratio, selected funding scenarios
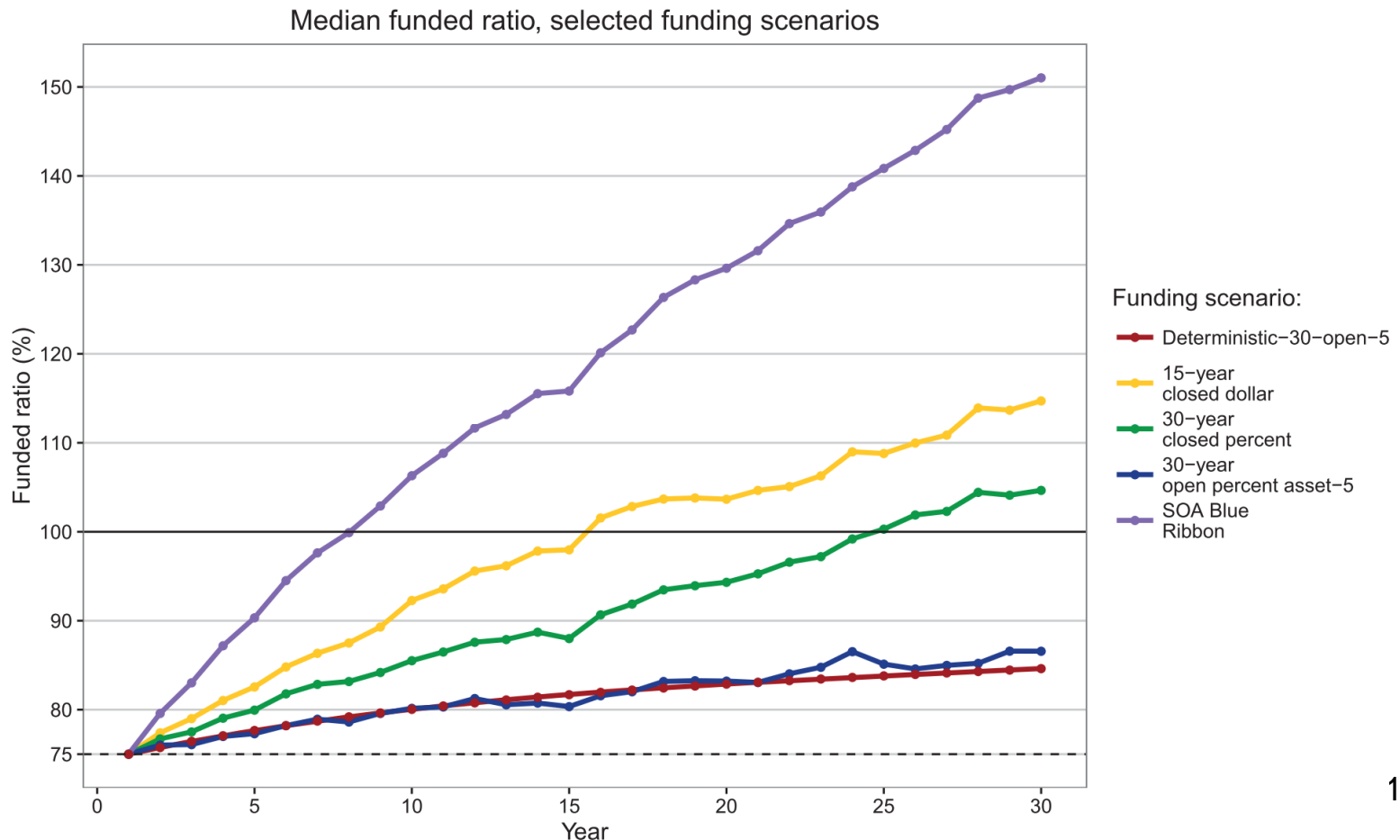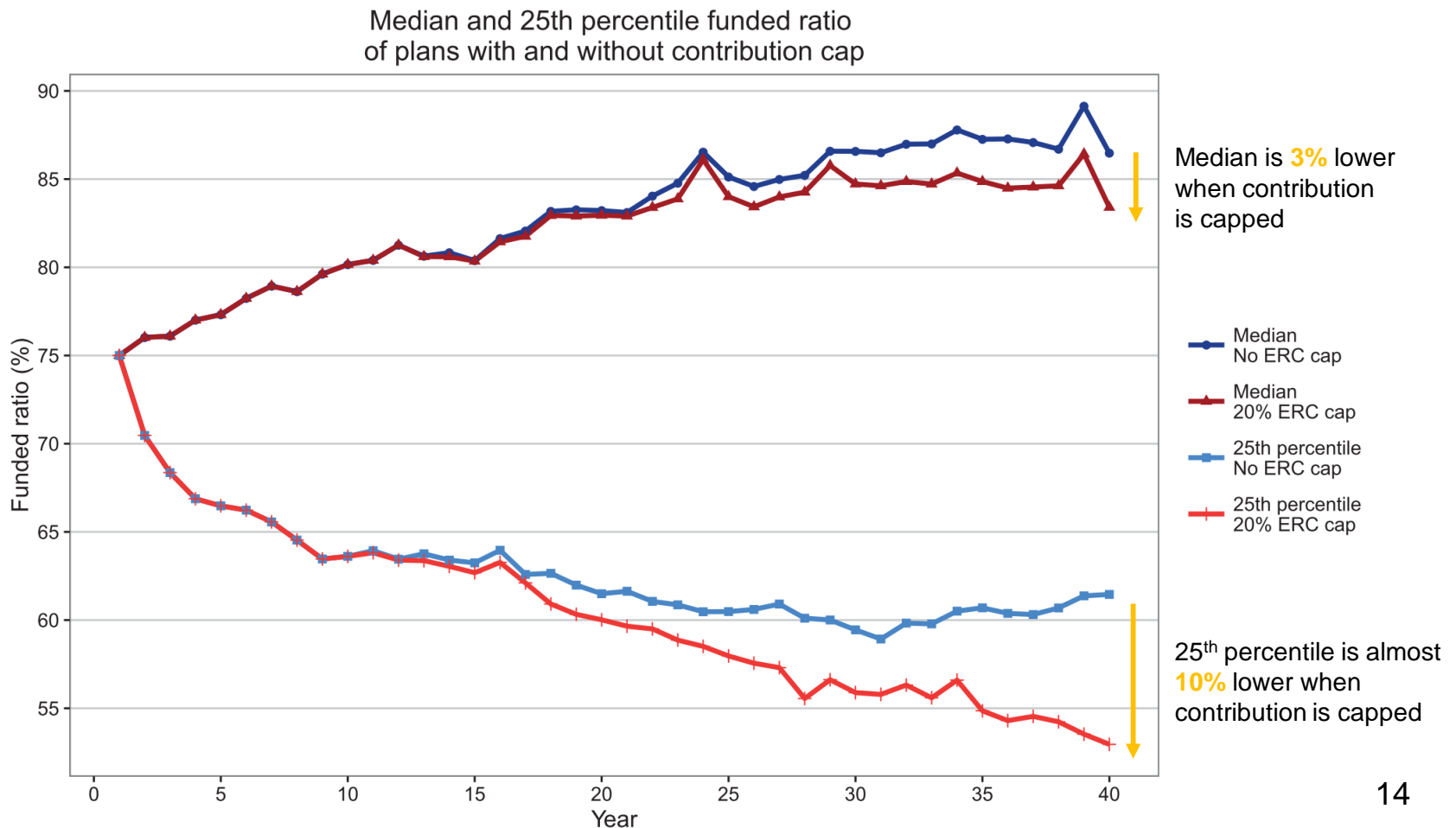
Impact on Funded ratio:
Probability of severe underfunding

The very stretched-out common policy of 30-year level pct open amortization with 5-year asset smoothing has a far greater risk of severe underfunding than other policies.

Probability that the funded ratio will fall
below 40% during the first 30 years
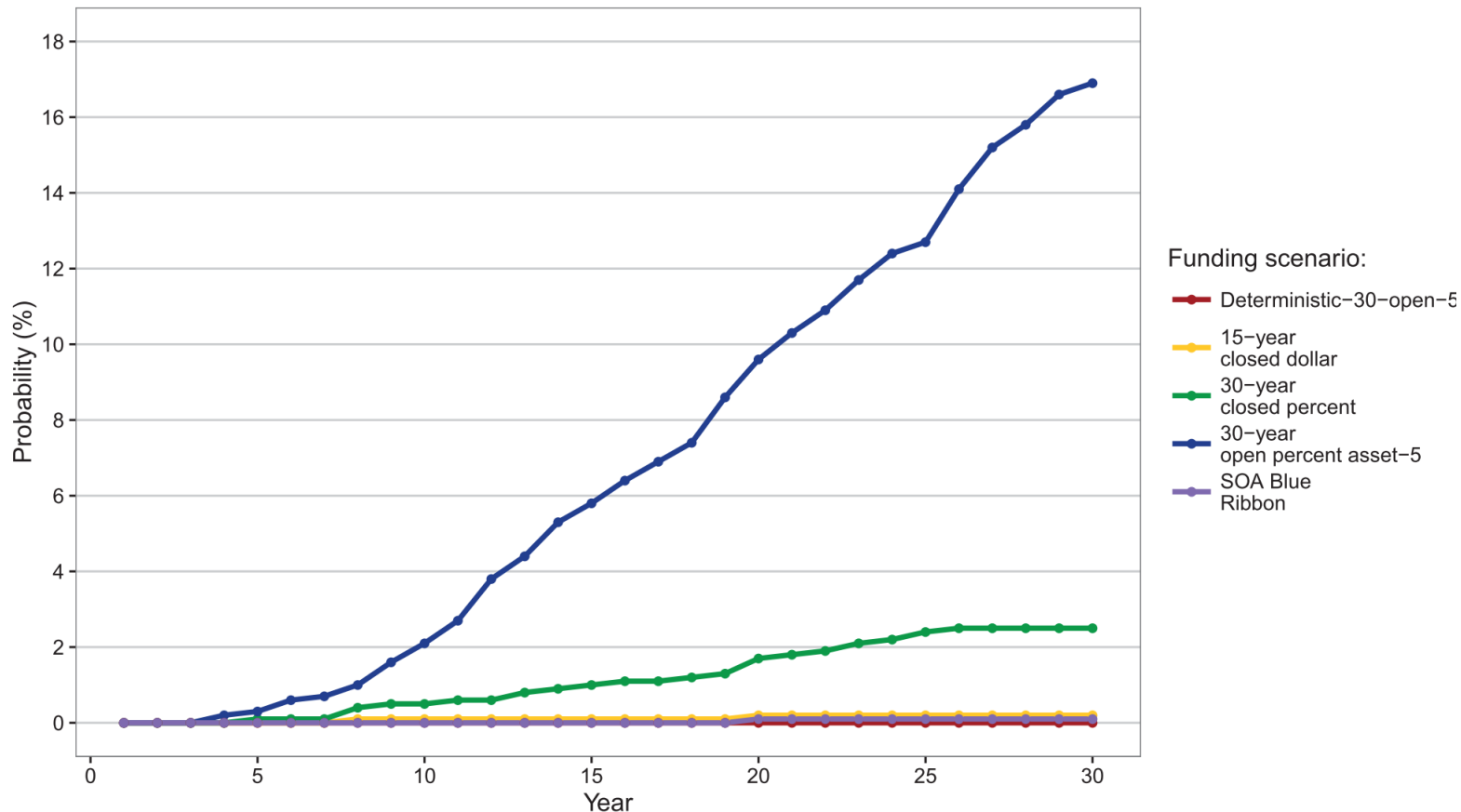
# What happens to the funded ratio if contributions are less than actuarially determined contributions?

- 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 and 25th percentile funded ratio
of plans with and without contribution cap

Median is **3%** lower when contribution is capped

Median
No ERC cap

Median
20% ERC cap

25th percentile
No ERC cap

25th percentile
20% ERC cap

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

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

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

Risk of severe underfunding and contribution volatility under selected funding policies
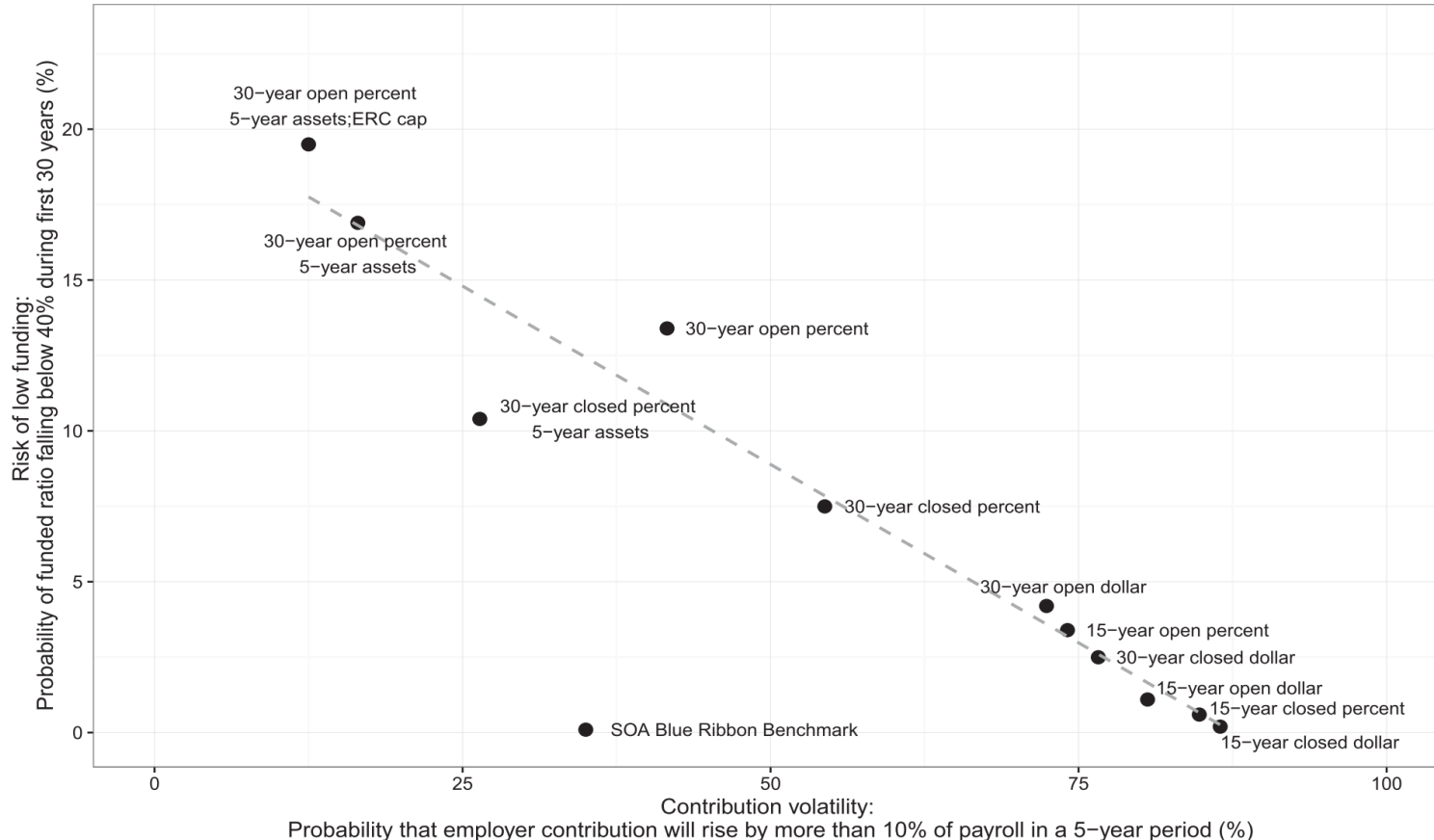
Key conclusions

- Common smoothing methods → great risk of underfunding. Ex: 75% funded plan using 30-year level-percent amortization & 5-year asset smoothing, & employer makes full contributions. After 30 years:

    - reaches only 85% funding even if it earns 7.5% **every** year

    - if expected return is correct but returns vary (12% SD), substantial risk of crisis -- 1:6 chance of falling below 40% funding in 30 year period

- Plans face **significant contribution volatility** despite smoothing policies, as a result of volatile investment earnings from risky assets.

- **Dampening contribution volatility** through smoothing methods comes at the expense of **greater risk** of severe underfunding and politically untenable contribution increases

- 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.

Appendix

Risk-free interest rate and
earnings assumptions of public and private sector pension funds

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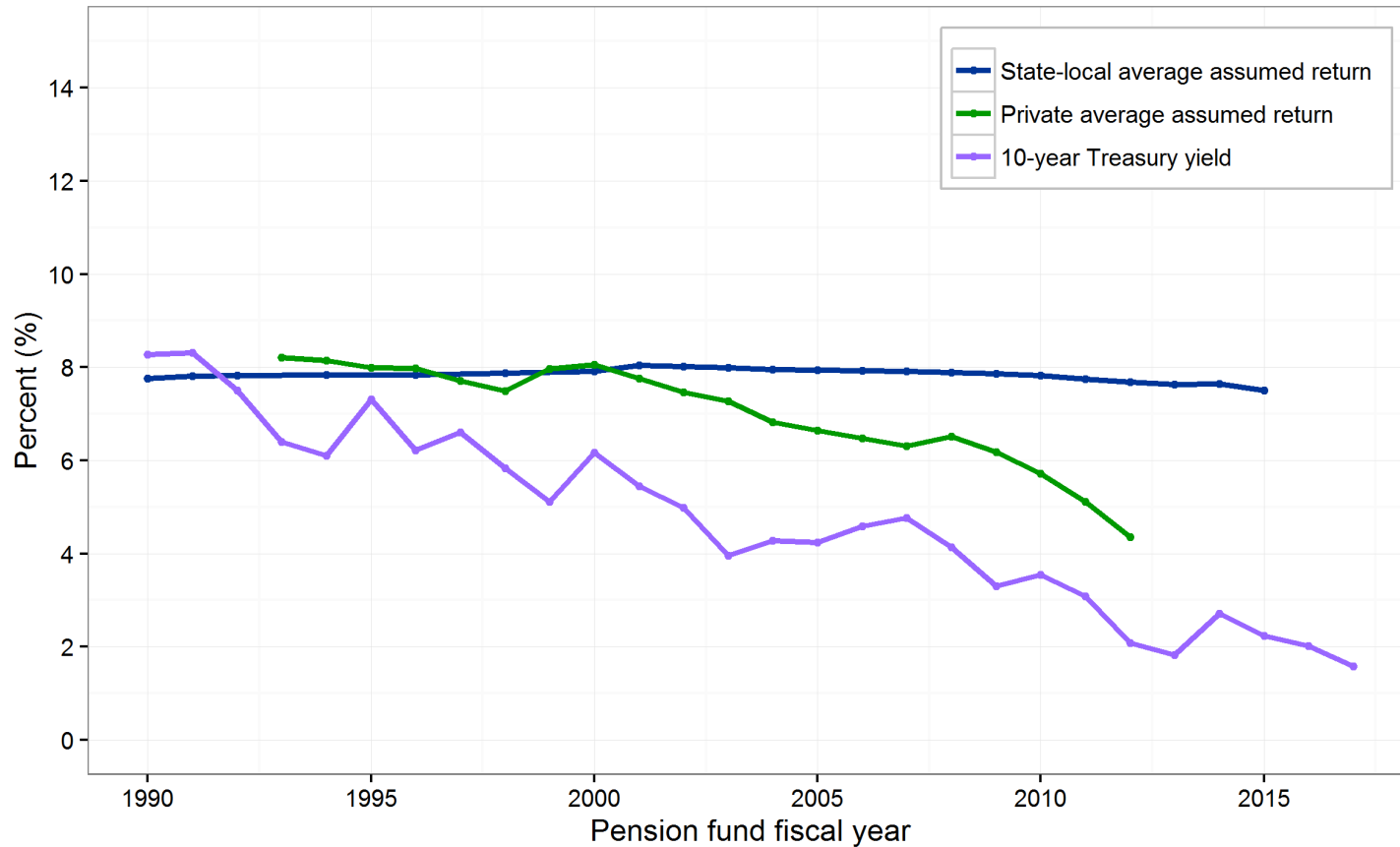
Sources:
   State-local assumed return from Public Plans Database
   Private assumed returns provided by Andonov, Bauer, and Cremers
   10-Year Treasury yield from Federal Reserve Bank of St. Louis (FRED)

Summary results:
How uncertainty changes over time

- The likely range around the funded ratio increases over time (under the assumption of serially independent returns)

Funded ratio quartiles with common funding policy
30−year level−percent open, 5−year asset smoothing
(Initial funded ratio of 75%)
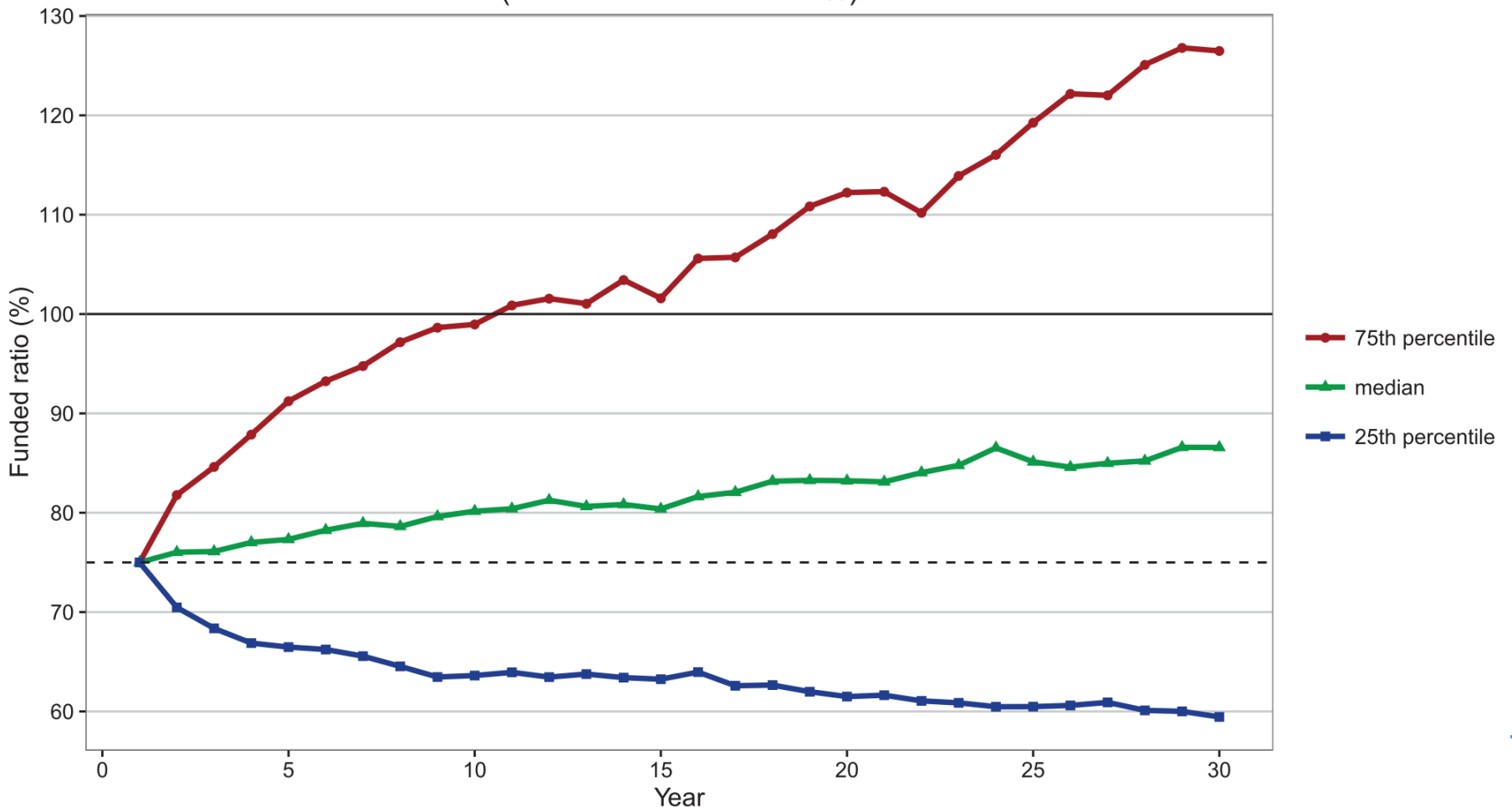
Summary results:
Likelihood of achieving full funding

Likelihood of achieving full funding (95% or better) over 1000 simulations:
- High chances for SOA benchmark and 15-year level-dollar closed amortization
- Relatively low chances for 30-year level-pct amortization methods, especially open amortization.

Probability of 95% or better funding as of a given year
Under alternative funding policies
(Initial funded ratio of 75%)

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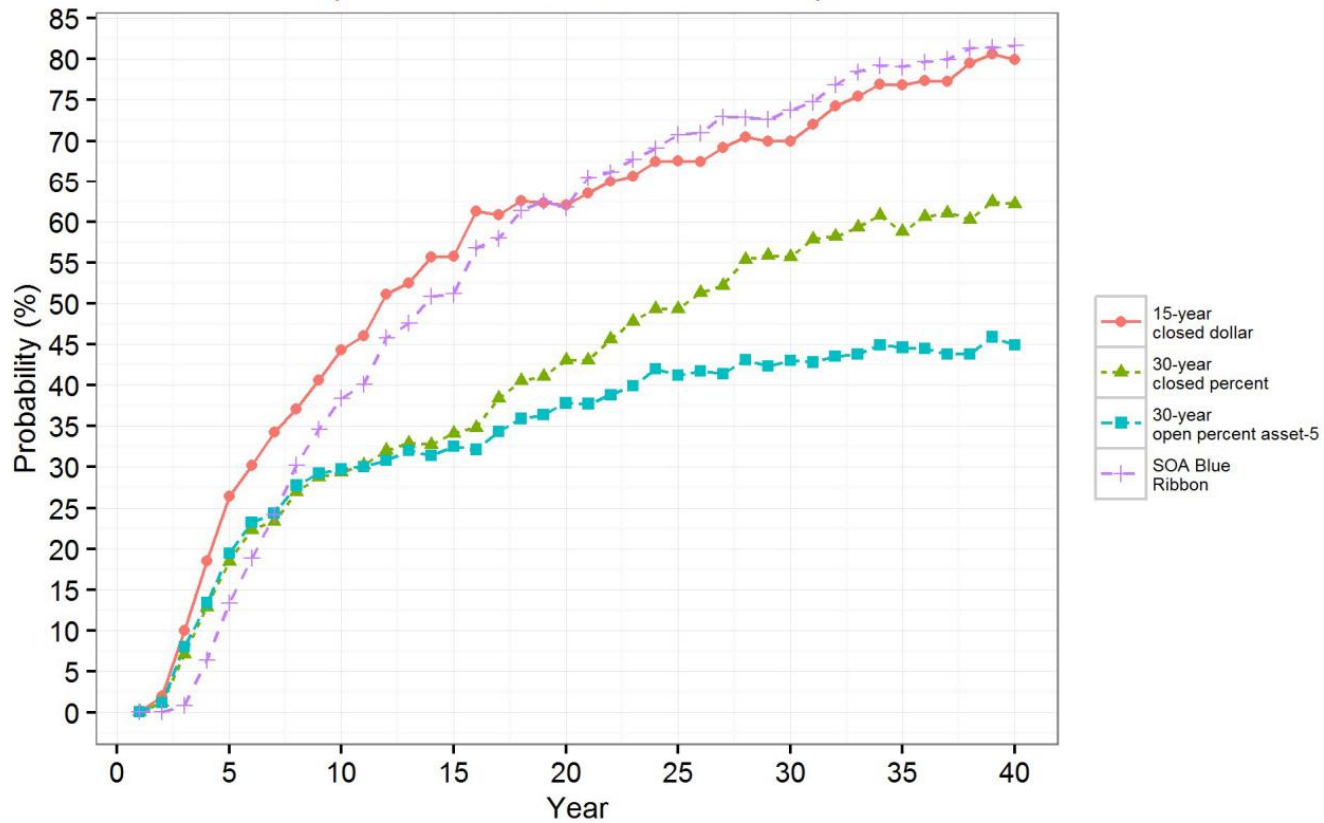
Summary results:
Alternative thresholds of low funding

Probability that the funded ratio will fall below a given threshold during the first 30 years under 30−year open level−percent funding, with 5−year asset smoothing
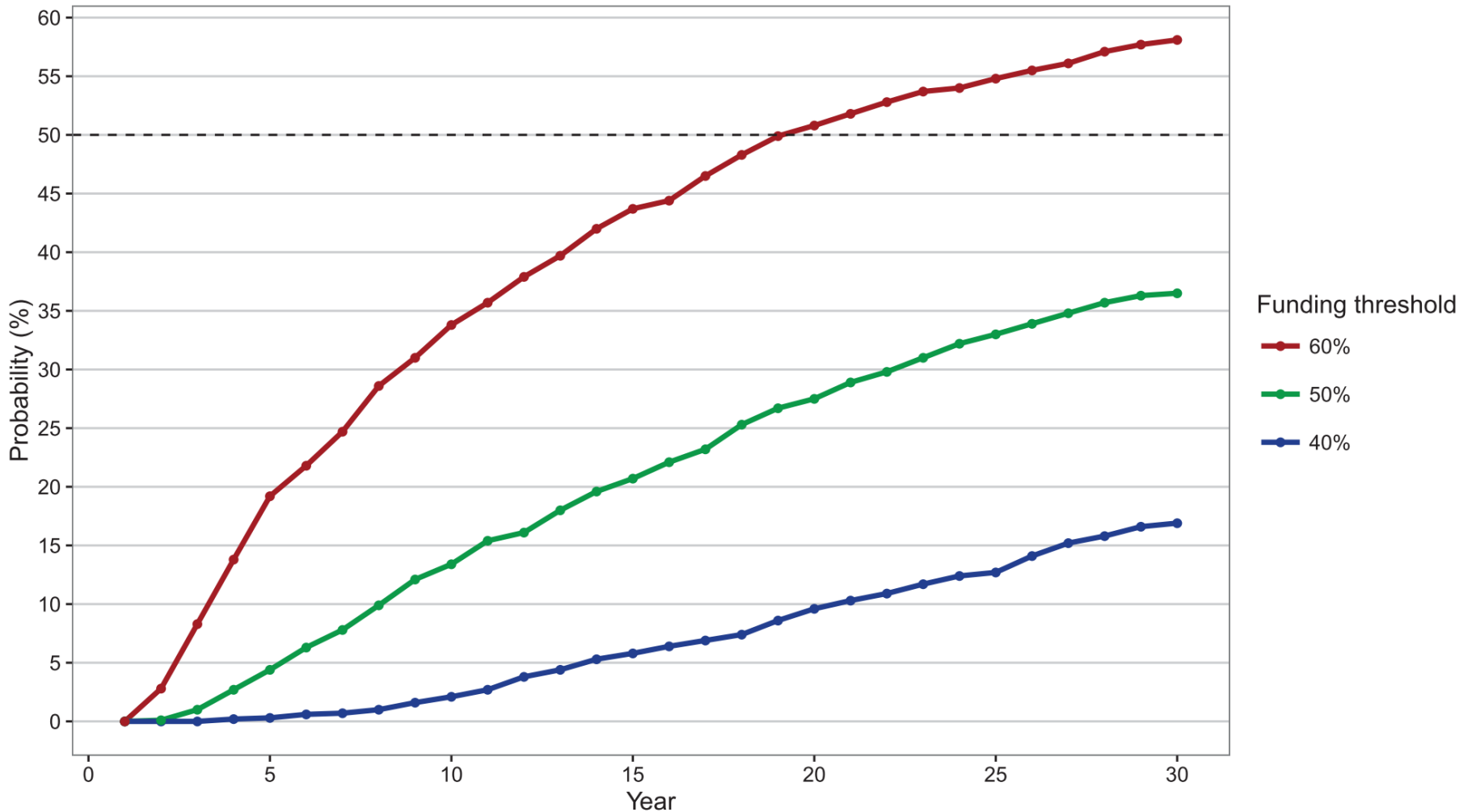
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