Public Pension Plan Risk-Sharing: Options and Consequences

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Don Boyd*, Gang Chen**, and Yimeng Yin***

The State and Local Government Finance Project
Center for Policy Research, Rockefeller College, University at Albany

*Co-Director (dboyd@albany.edu);
** Co-Director and Assistant Professor (gchen3@albany.edu)
*** Economic Researcher (yyin@albany.edu)

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Introduction

The trend in adopting risk-sharing policies in the public sector

- Traditional DB plans: employers bear all/most risks - investment returns, longevity, inflation - during members' working and retirement years
- Some public pension plans incorporate risk sharing, under which the employer and plan members each bear some risks.
- More governments may seek risk sharing in the future as a way to reduce plan costs and risks.

Risk-sharing mechanisms

- Conversion of risks: employers ➜ workers and retirees
  - COLA adjustments ➜ benefit risk in retirement years
  - Employee contribution adjustments ➜ contribution risk in working years
- Common triggers of risk-sharing
  - Funded ratio
  - Investment return

Introduction

- Designing appropriate risk-sharing policies requires understanding how these policies affect costs and benefits.

- The impacts of risk-sharing policies depend upon uncertain future events, particularly investment returns. These impacts are best understood with models that take investment-return uncertainty and volatility into account.

- We examine a deterministic scenario with a severe adverse asset-shock similar to the one used in the Dodd-Frank stress test.

- We developed a stochastic simulation model for pension finances to examine impacts of selected risk-sharing policies on employers and plan members

Measuring the impact of risk-sharing policies

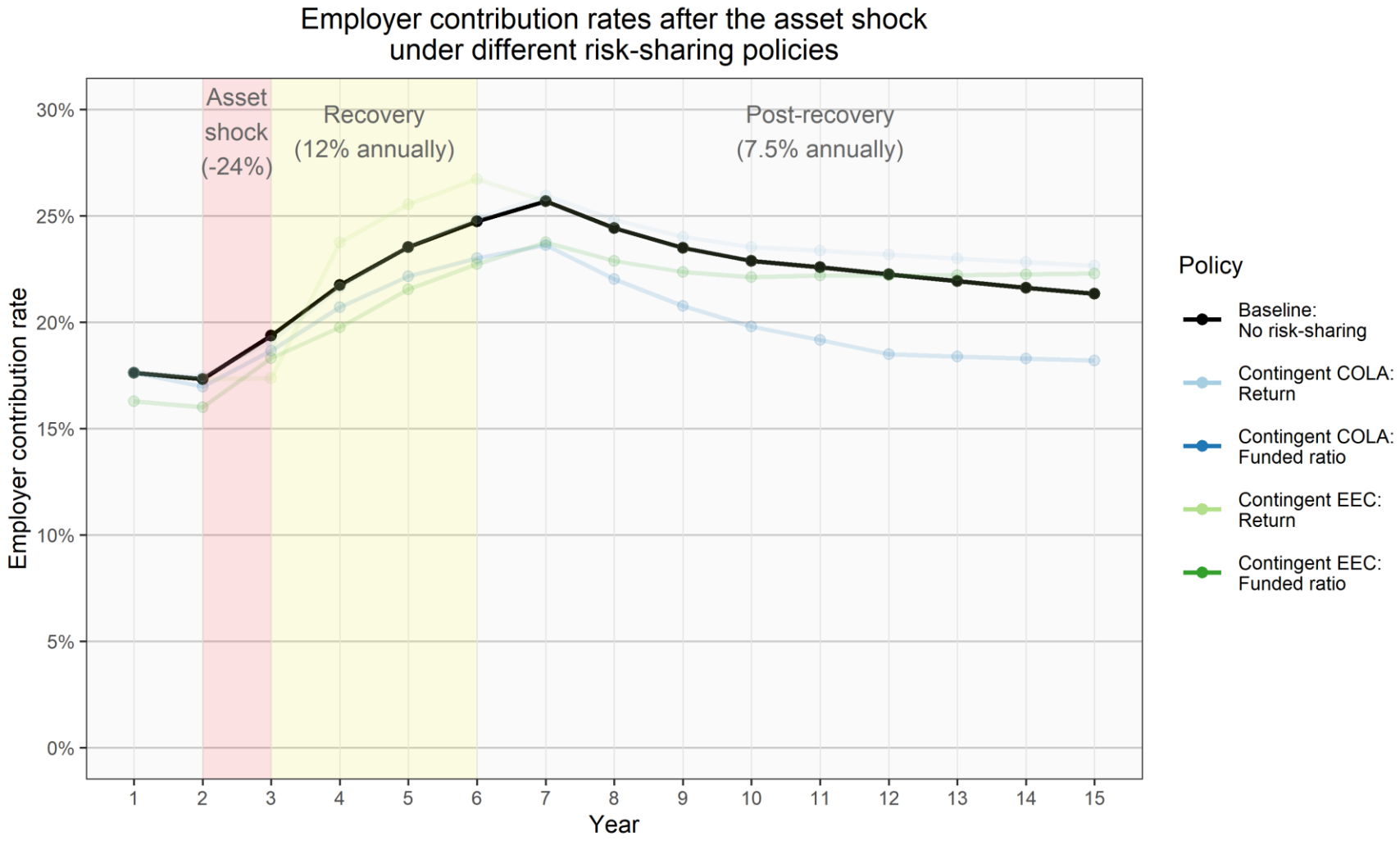
Impact on		Measure
Employer	Overall level of employer pension costs	Present value of total employer contributions over 40-year period
	Volatility of annual employer contributions	Max. 5-year increase in employer contribution rates over 40-year period
Plan members	Overall level of pension benefits	Present value of total pension benefits for a representative member
	Stability of annual pension benefit	Max. decrease in inflation-adjusted annual benefit a representative member may experience

Stylized risk-sharing policies examined

Policy type		How COLA or employee contribution (EEC) rate is determined	Example Plan
Baseline		1.5% fixed COLA 5% fixed EEC rate	
Contingent COLA policy	**Contingent on *investment return***	COLA: 2% if return >= 7.5%; 0% otherwise	Maryland MSRPS
	Contingent on *funded ratio*	COLA: 2% if funded ratio >= 90% 0% otherwise	Arizona SRS
Contingent employee contribution policy	**Contingent on *investment return***	EEC rate: 3% to 7% depending on return	Pennsylvania SERS and PSERS
	Contingent on *funded ratio*	EEC rate: 3% to 7% depending on return	Detroit General Retirement System (GRS)

COLA rate used in the actuarial valuations of all policies: 1.5%

Asset-shock Scenario – Impact on employer contributions



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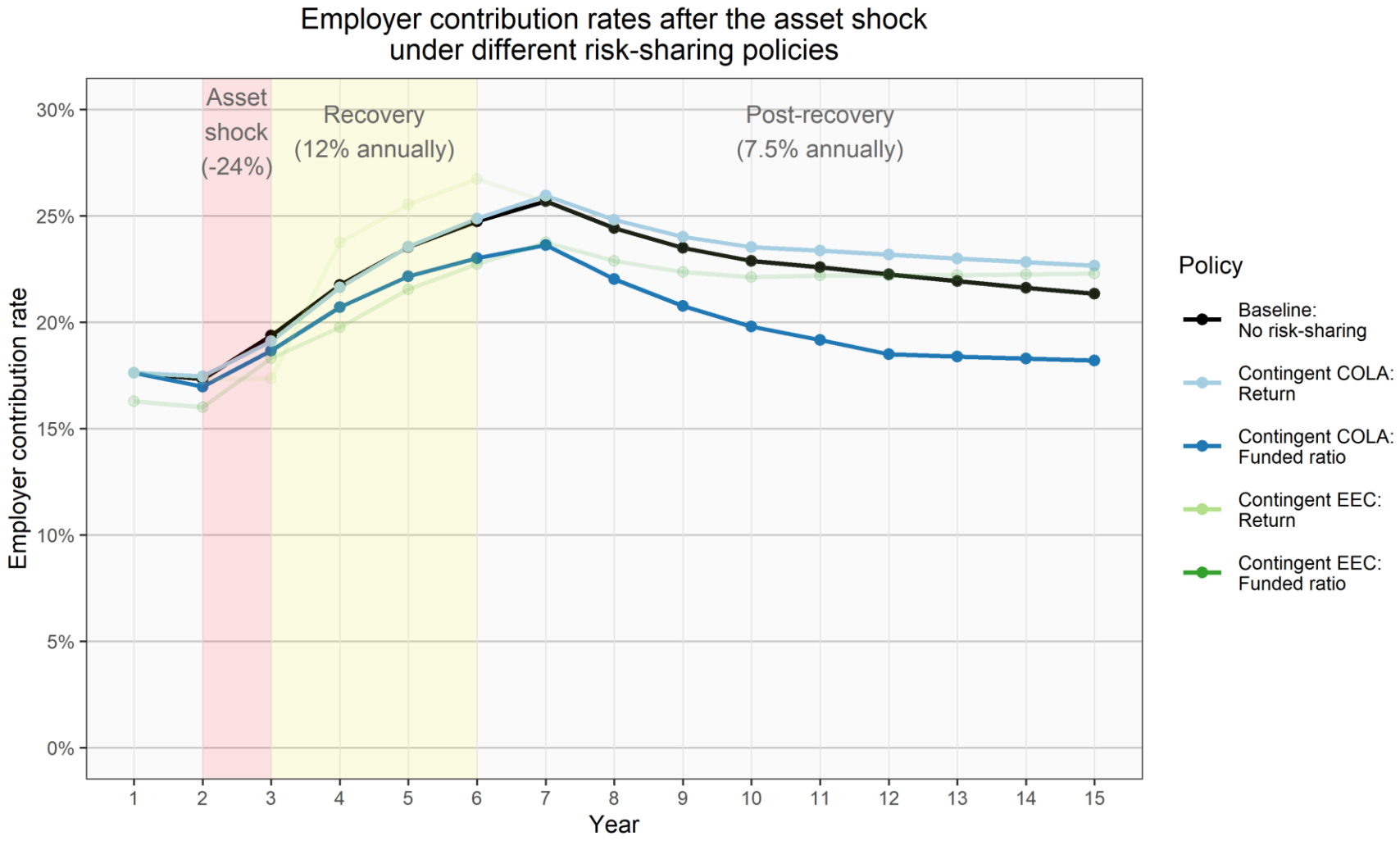

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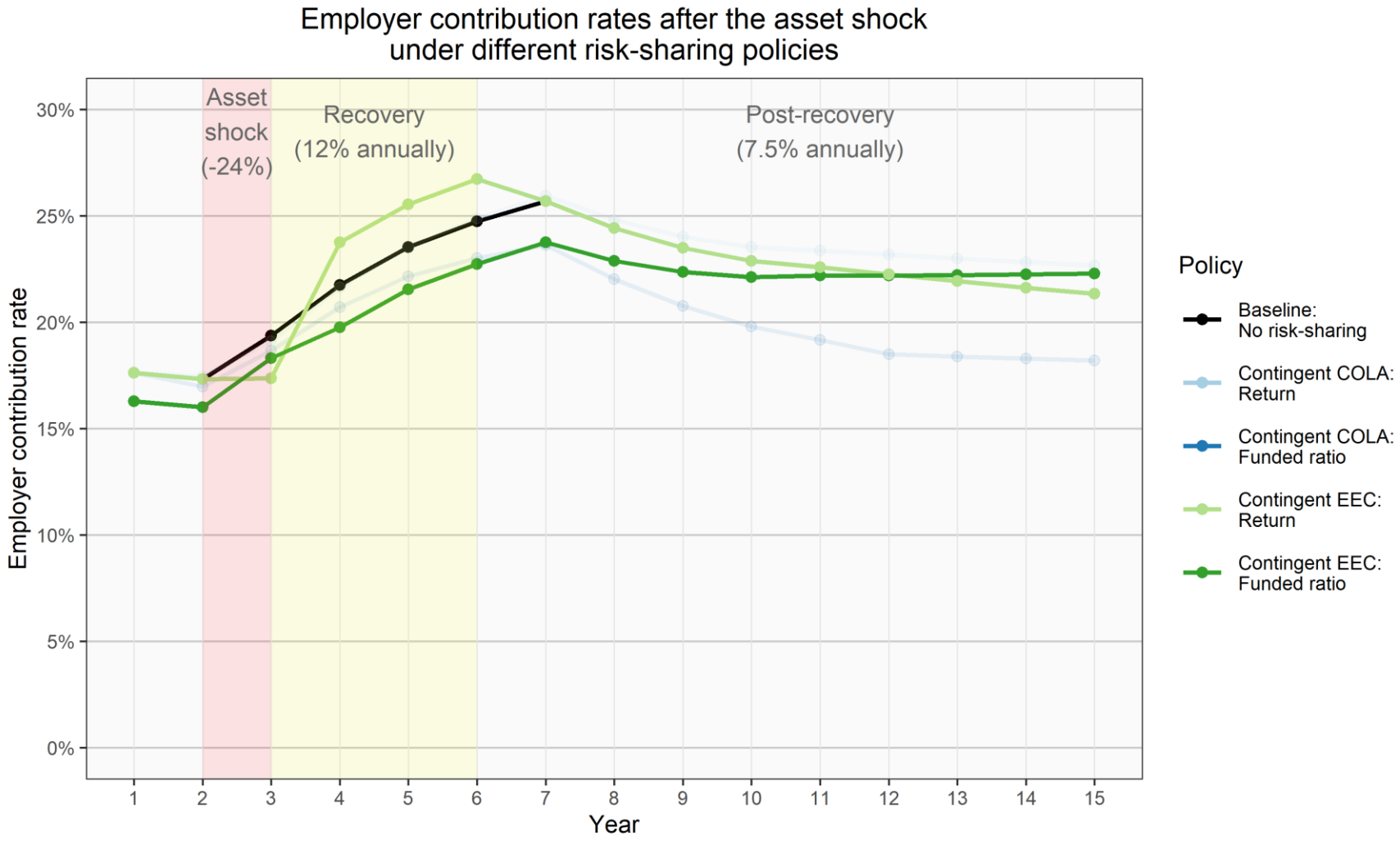
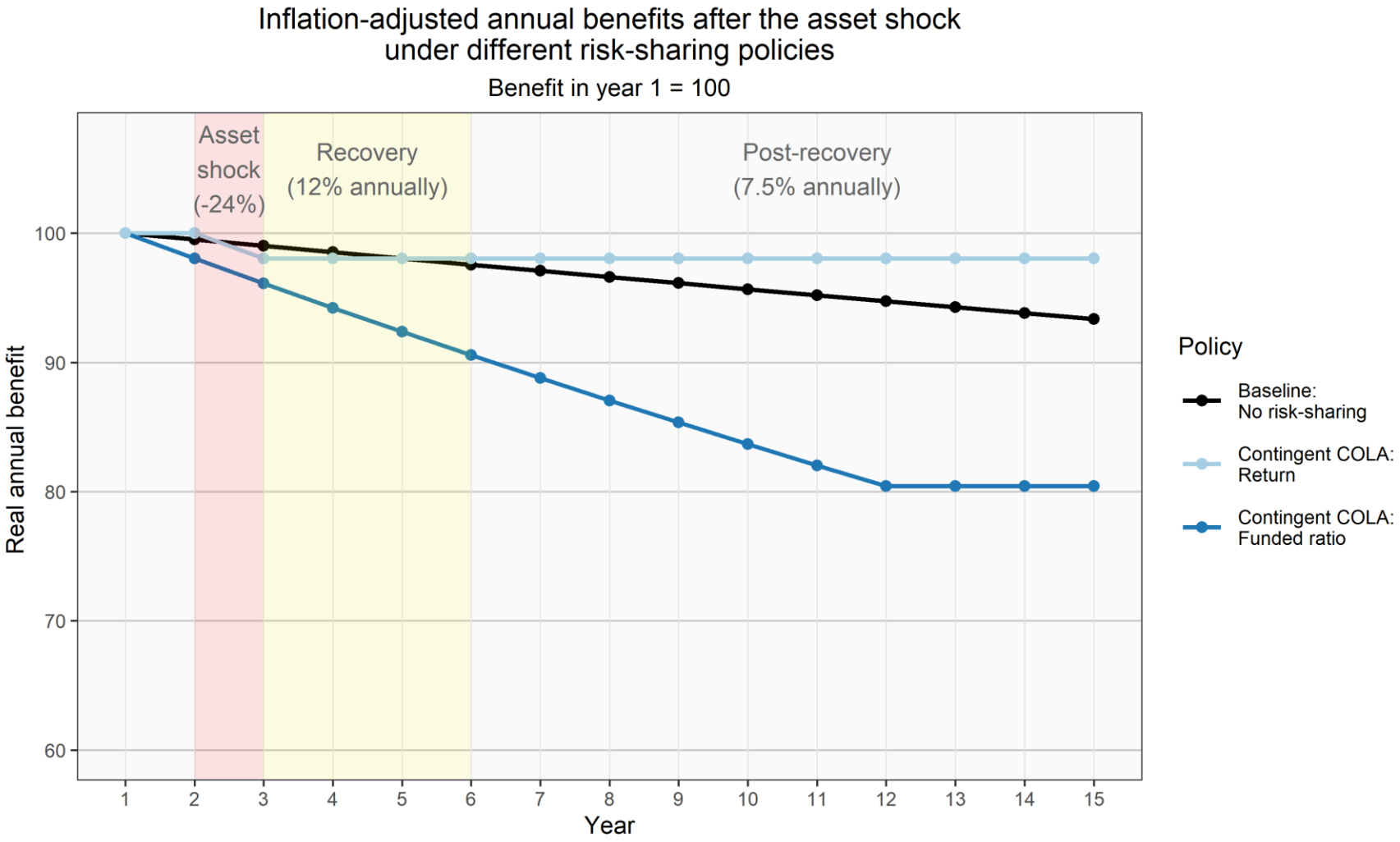


Asset-shock Scenario – Impact on benefits



Impact on employers: Overall employer pension cost

Percentage differences in PV employer contribution from baseline by long-term return quintile (Median values within groups)

Return quintile	Range of 40-year compound return	PV employer cost in Baseline	Contingent COLA: Return	Contingent COLA: Funded ratio	Contingent EEC: Return	Contingent EEC: Funded ratio
1	< 6.5%	134.0	-6.5%	-10.0%	-0.6%	-2.4%
3	7.2%~7.9%	101.6	-6.1%	-8.1%	0.4%	-0.1%
5	> 8.6%	70.2	-4.7%	-6.1%	2.0%	2.0%

Note: The over all simulations median result under the baseline is normalized to 100.

Impact on employers: Contribution Volatility

Measure:

- Maximum increase in employer contribution as a percentage of payroll within any 5-year period over 40-years.

Results:

- None of stylized risk-sharing policies examined exhibits strong contribution-volatility-dampening effects under this volatility measure.
- The return-based employer contribution policy even leads to greater volatility in employer contributions.

(See result table in appendix)

Impact on plan member: Overall level of pension benefit

Percentage differences in PV benefit from baseline by long-term return quintile (Median values within groups)

Return quintile	Range of 40-year compound return	PV benefit in Baseline	Contingent COLA: return	Contingent COLA: Funded ratio Year-1 funded ratio 75%	Contingent COLA: Funded ratio Year-1 funded ratio 100%
1	< 6.5%	1,328	-5.1%	-8.7%	-2.5%
3	7.2%~7.9%	1,328	-4.1%	-6.1%	0.5%
5	> 8.6%	1,328	-3.2%	-3.7%	3.5%

Note: The benefit payment in year 1 is normalized to $100.

Impact on plan member: Stability of pension benefit

Individuals prefer a smooth and predictable path of consumption. Sharp declines in benefits or low benefits in certain time periods may cause welfare.

Inflation adjusted benefits would decrease when the granted COLA rate falls short of inflation.

Measure:

- the maximum decrease in inflation-adjusted benefit within 5 years during the 41-year retirement period of the cohort.

Results:

- Under the baseline policy, the real annual benefit decreases by 2.4 percent every 5 years.
- Under the contingent COLA policies,
  - **Starting with 75% funded ratio**: the maximum 5-year real benefit decreases can be 3~4 times as large as the baseline.
  - **Starting with full funding:** the maximum 5-year decreases of real benefits are substantially lower in the two high-return

(See result table in appendix)

Conclusions

- The contingent COLA policies we examined – which are based on policies we have observed in use - can moderately reduce employer pension costs in the long term and they can provide meaningful cost-reducing effects in persistent low return environments. The contingent employee contribution policies we examined have a very small impact on total employer pension costs.

- The contingent COLA and contingent employee contribution policies we examined reduce the volatility of employer contributions only marginally.

- The risk-sharing policies we examined could create a substantial benefit risk for retirees. Retirees would face sizable variations in total benefit they can expect to receive and could experience low benefits during retirement in low-return environments.

- The design of a risk-sharing policy will have large effects on its impact. For example, the impacts of the funded-ratio based risk-sharing policies vary to a greater extent across different long-term return environments and heavily depend on the plan funded status when these policies are adopted.

- If employers wish to achieve significant risk reduction through risk-sharing policies, these policies would **have to transfer far more risk to employees** than the contingent COLA and employee contribution policies examined here, which are representative of many policies currently in place.

Next steps

We plan to expand our simulation model in several directions.

- Examine the full spectrum of risk-sharing policy options, including DB-DC hybrid plans and cash-balance plans.
- Develop risk measures that reflect intergenerational equity. That is, how do risk-sharing policies affect employees who join the systems at different times, or taxpayers paying receiving services at different times?
- Develop risk measures for a pension plan’s solvency.
- Develop measures that describe the trade-offs between protecting employers from risk and protecting plan members from risk.
- Develop a clear, concise policy guidebook on alternative risk-sharing policies and their potential impacts and trade-offs, which will help policymakers make well-informed choices.

Thanks!

Don Boyd (dboyd@albany.edu)
Gang Chen (gchen3@albany.edu)
Yimeng Yin (yyin@albany.edu)

Appendix

Key model assumptions

Demographic data and important actuarial assumptions

Initial demographics of active members and retirees	Based on Arizona SRS
Decrement tables	RP-2014 mortality tables Termination rates and disability rates based averages of 5 large public plans
Salary table	Based on salary table of Arizona SRS
Annual growth in starting salary of new employees	1.5%
Age distribution of new employees	Based on the age distribution of low year-of-service employees in Arizona SRS
Benefit provisions	- Only service retirement benefit and deferred retirement benefit are modeled - Single retirement age of 60 - Benefit factor: 2.1% - Final average salary: 3 years with the highest salaries
Range of age	20-100
Starting funded ratio	75% or 100%
Valuation method	Entry Age Normal
Asset-smoothing*	5 years
Amortization*	15-year level dollar closed amortization
Employee contribution rate	Base rate: 5% of salary*
Employer contribution rate	No negative contributions (withdrawals)

* Employee contribution rates under contingent employee contribution policies can deviate from the base rate.

Investment return

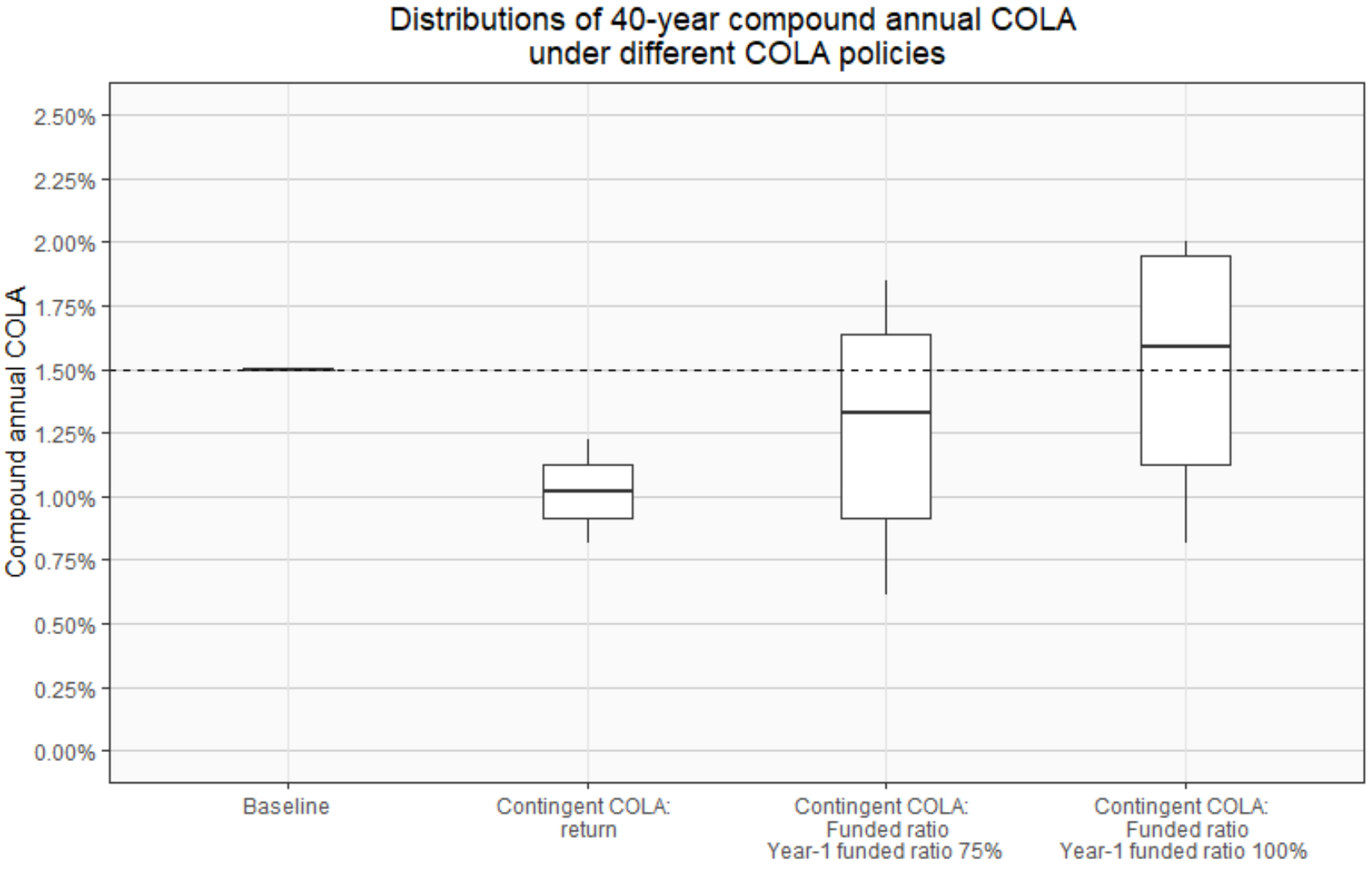
- **Stochastic scenario:** This scenario assumes that the expected long-run compound return is equal to the assumed return of 7.5 percent, with a standard deviation of 12 percent throughout the 40-year simulation period (an arithmetic mean return of 8.22% is used to achieve this). This is consistent with capital market assumptions we have examined.

- **Deterministic asset-shock scenario:** This scenario incorporates a severe adverse shock to investment returns in the second simulation year followed by a short recovery period and then returns equal to the earnings assumption over the long run. It is assumed that there is a 24 percent investment loss in year 2 followed by a three-year recovery period with annual returns of 12 percent, after which returns would stay constant at 7.5 percent.

Actuarial valuation with contingent COLAs

When conducting actuarial valuations for plans with contingent COLA policies, actuaries in practice typically use a single deterministic COLA rate that is “actuarially equivalent” to the variable future COLA, which differs across policies. In this paper, we value plan liabilities every year using the same deterministic COLA rate across all contingent COLA policies to make comparison across policies more straightforward.

Distribution of 40-year compound annual COLA



Impact on employers: Contribution Volatility

Maximum increase in employer contribution rate in 5 years by long-term return quintile
(Median values within groups)

Return quintile	Range of 40-year compound return	Baseline	Contingent COLA: Return	Contingent COLA: Funded ratio	Contingent EEC: Return	Contingent EEC: Funded ratio
1	< 6.5%	20.0%	18.9%	19.2%	21.8%	19.0%
3	7.2%~7.9%	17.6%	16.2%	17.1%	19.5%	17.1%
5	> 8.6%	10.9%	9.7%	10.9%	13.4%	11.5%

Impact on plan member: Stability of pension benefit

Maximum 5-year decreases in real benefit by long-term return quintile
(Median values within groups)

Return quintile	Range of 40-year compound return	Baseline	Contingent COLA: return	Contingent COLA: Funded ratio Year-1 funded ratio 75%	Contingent COLA: Funded ratio Year-1 funded ratio 100%
1	< 6.5%	-2.4%	-7.6%	-9.4%	-9.2%
3	7.2%~7.9%	-2.4%	-7.5%	-9.4%	-8.7%
5	> 8.6%	-2.4%	-7.3%	-8.5%	-2.0%