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State & Local Government Pension Risks

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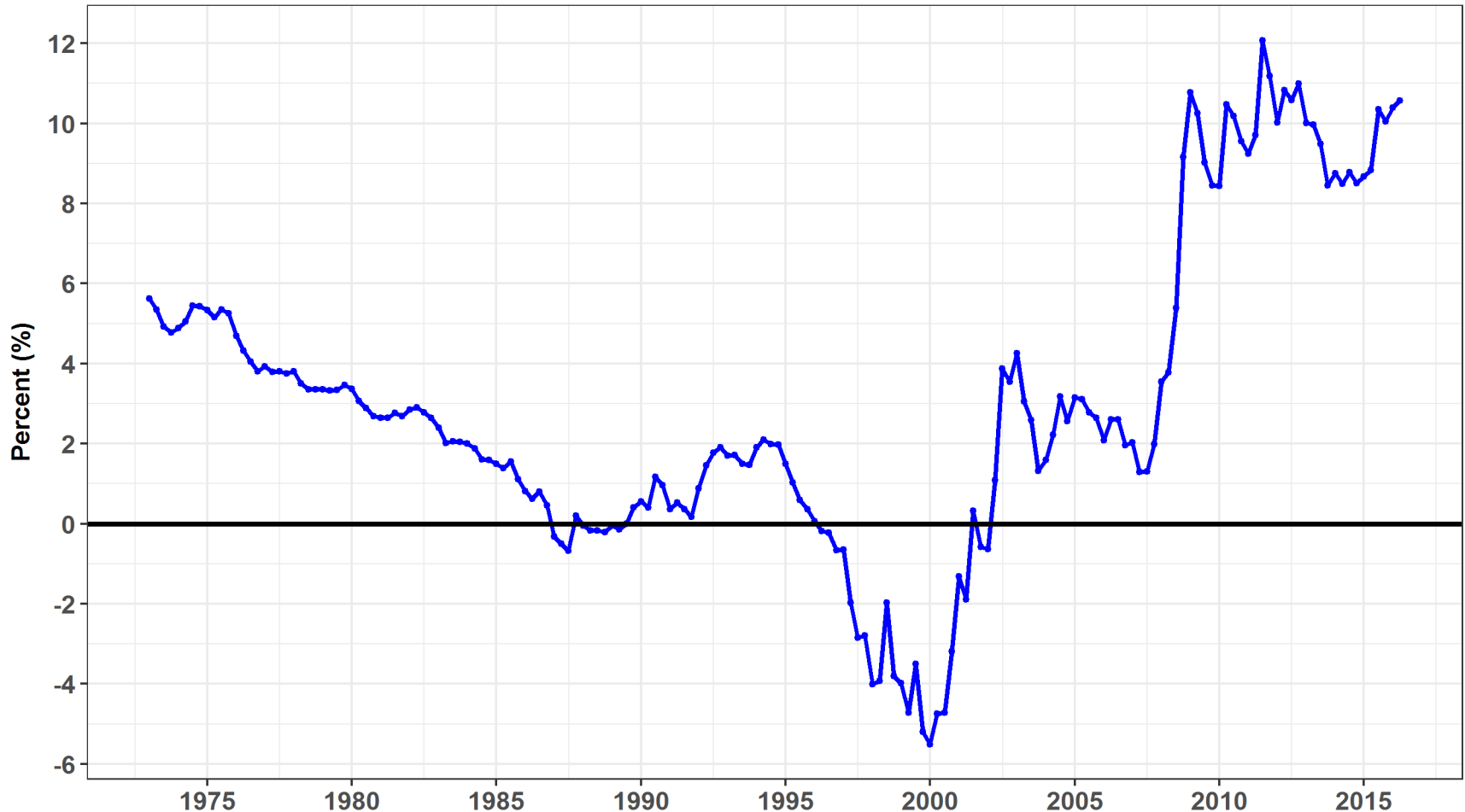
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Main points

- Despite large contribution increases and benefit cuts (primarily for new workers), U.S. public pension underfunding remains near record, almost as severe as at end of recession
- Underfunding varies greatly. Pensions in some states deeply underfunded.
- As interest rates fell and investing environment became more difficult, public pension plans maintained earnings assumptions and increased investment risk. Private plans and plans in other countries reduced earnings assumptions.
- Incentives & institutions encourage risk taking. Lowering earnings assumptions would require large contribution increases.
- Risk to taxpayers & stakeholders in govt is 3-4x greater than in 1990s. Creates roller coaster rides and difficult political choices even if earnings assumptions achieved in the long run.
- As investment-return volatility increases, the likelihood of crisis-level funding or dramatic increases in employer contributions rises.
- Common funding policies stretch out repayments of losses and fail to reach full funding. Smoothing contributions cannot make risk go away. Mature plans tend to have greater risk. Shared-risk provisions might slightly dampen incentives that favor risk taking.
- Most states need risk-taking to work out well or else contributions will rise significantly. Already public pension plans generally have bad news in the bank for FY 2015 and 2016 that will drive contributions up. Plans and govts should evaluate risk carefully, with an eye toward possibly reducing risk.

Despite reforms and cuts, unfunded liability is near record relative to GDP

Unfunded liability of state and local government defined benefit pension plans
As percentage of Gross Domestic Product

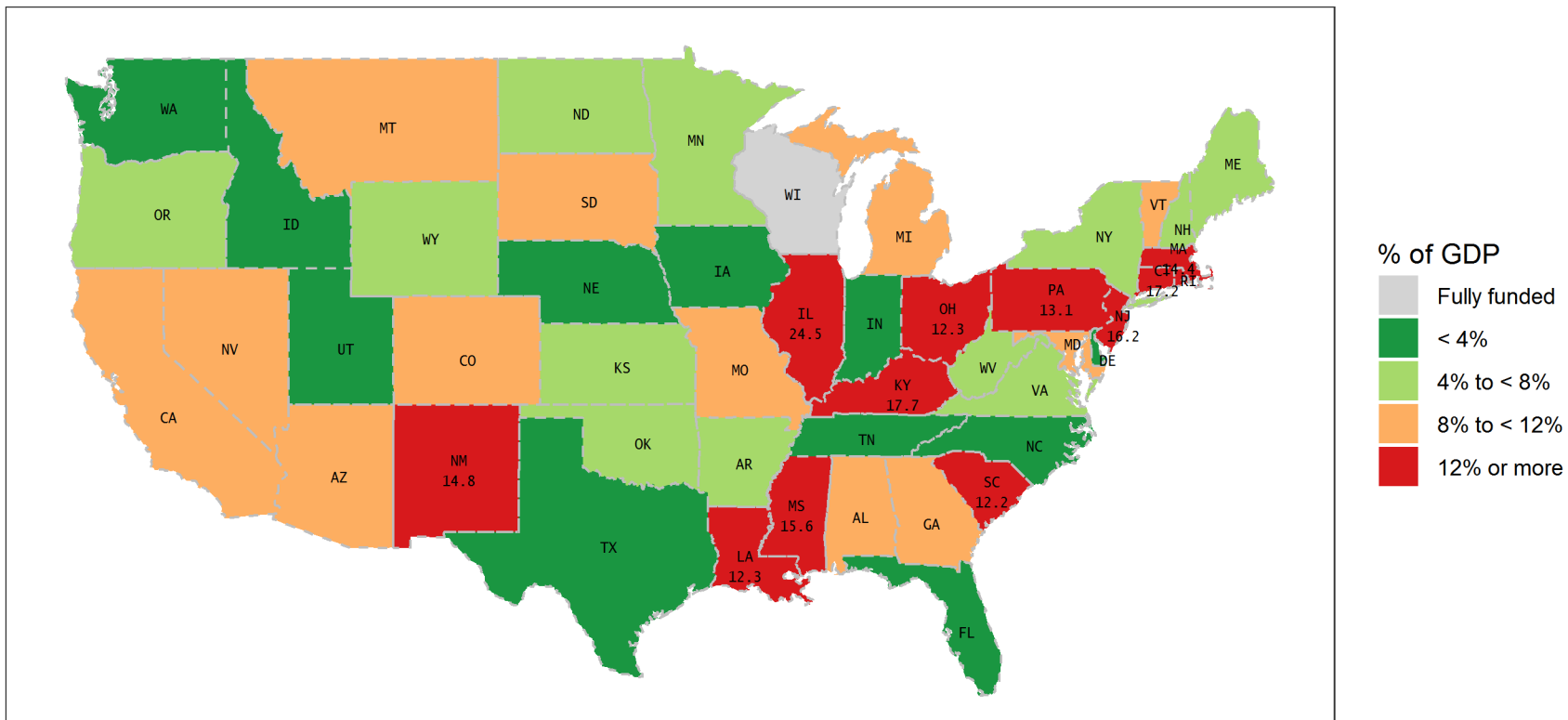


Source: Federal Reserve Board, Financial Accounts of the United States, Tables L.120.b and F.2
Note: Liabilities are as valued by the Bureau of Economic Analysis, not actuaries.

Great variation in the extent of underfunding

Unfunded liability as % of state gross domestic product, 2013

State & locally administered plans combined



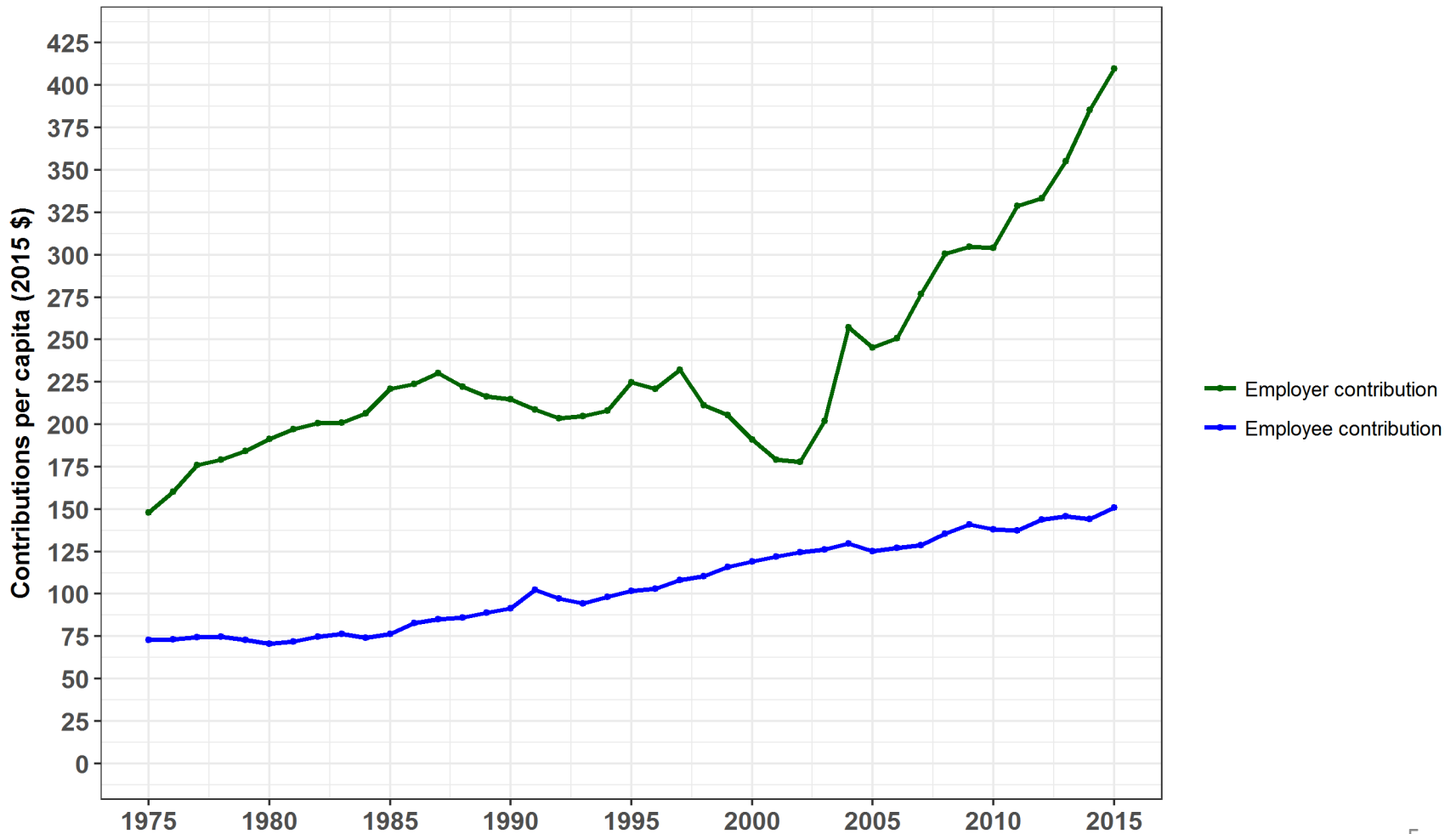
Source: Federal Reserve Board Enhanced Financial Accounts

<https://www.federalreserve.gov/apps/fof/efa/efa-project-state-local-government-defined-benefit-pension-plans.htm>

These numbers differ from actuaries' estimates, and reflect discounting at 5%.

Employer contributions have increased substantially

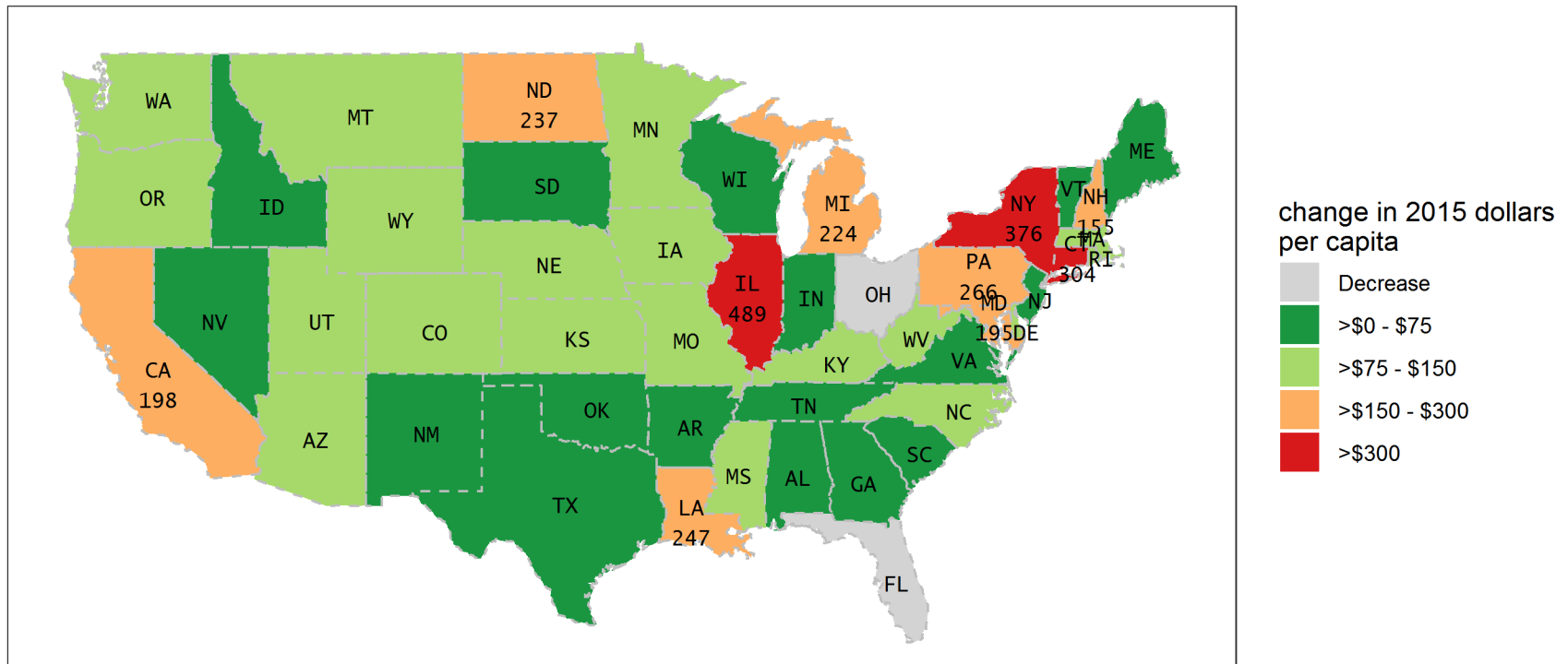
Real per-capita employer and employee pension contributions
State and locally administered plans combined, U.S. as a whole



Contributions from U.S. Bureau of the Census Annual Retirement Systems Survey
Adjusted for inflation with GDP price index (BEA)

Gov't contribution increases since the last market drop

Change in state & local government pension contributions Inflation-adjusted dollars per capita, 2007 to 2015



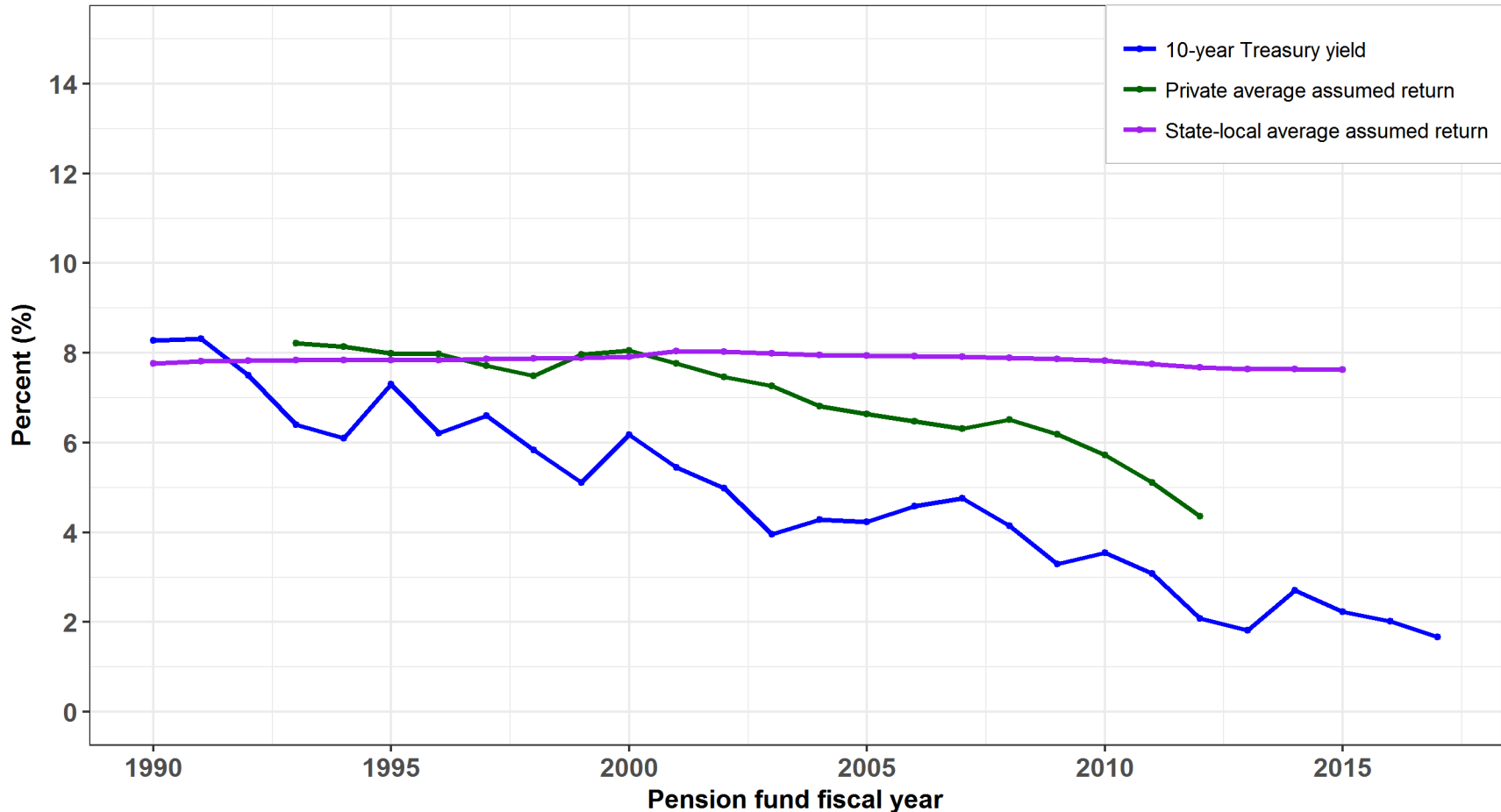
Source: Rockefeller Institute analysis of Annual Survey of Public Pensions, U.S. Bureau of the Census
Note: Due to extraordinary contributions in West Virginia in 2007 and Alaska in 2015, contributions for 2008 and 2014 were used for these states and years, respectively

The rise of risk-taking

As Treasuries fell, private plans reduced earnings assumptions; public plans did not

Assumed investment returns and risk-free returns

Public and private retirement systems



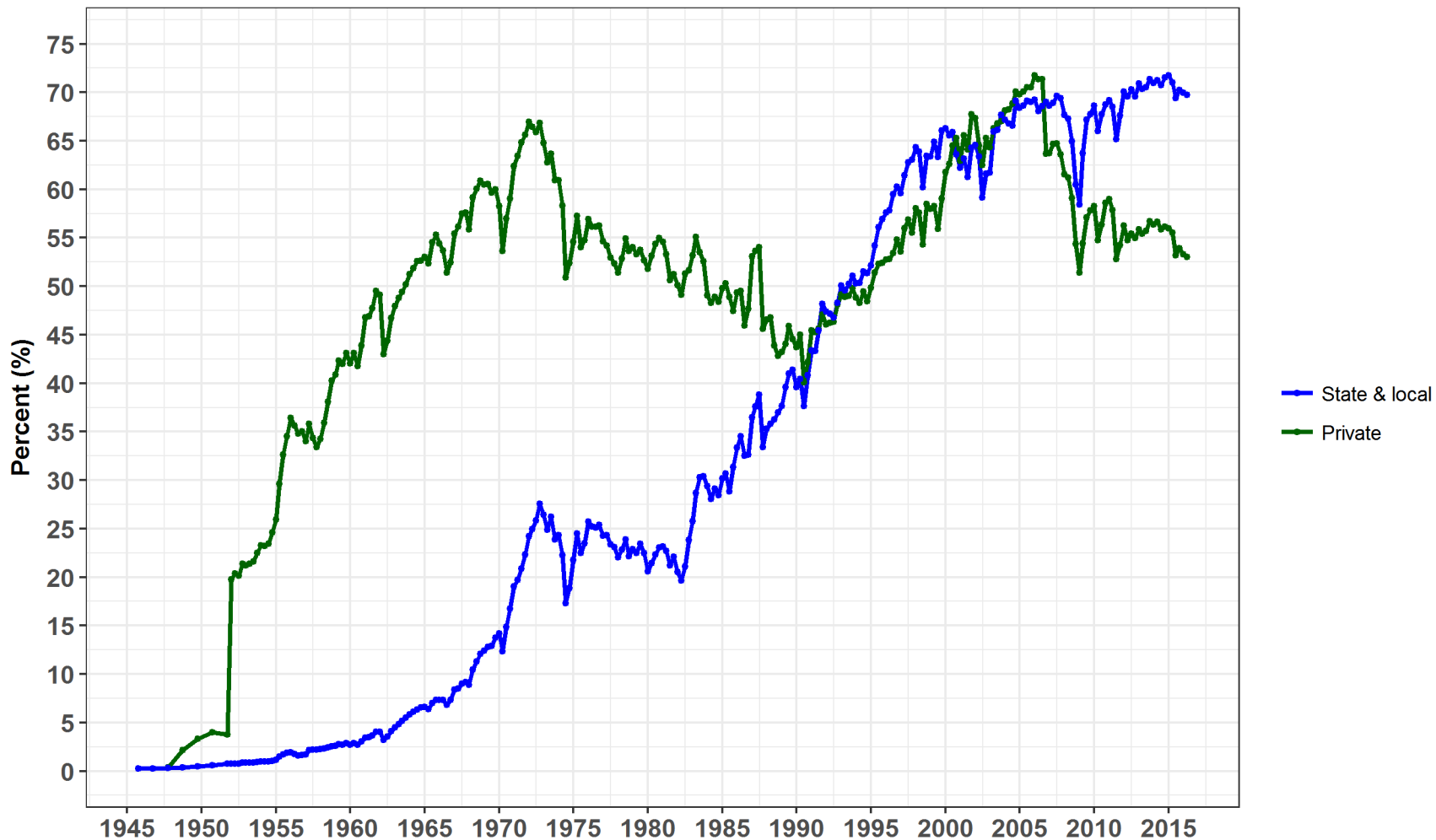
Notes:

- Public plan assumptions for 2001+ from Public Plans Database, Center for Retirement Research. Earlier years from multiple sources.
- Private plan assumptions provided via correspondence with authors of:
Andonov, Aleksandar and Bauer, Rob and Cremers, Martijn, Pension Fund Asset Allocation and Liability Discount Rates (March 3, 2016). <http://ssrn.com/abstract=2070054>
- 10-Year Treasury yield from Federal Reserve Bank of St. Louis (FRED)

Public plans have increased exposure to equity-like assets.
Private plans recently have moved the other way.

Equity-like investments as percentage of invested assets

State and local government and private sector defined benefit pension plans



“...gradually, U.S. public funds have become the biggest risk-takers among pension funds internationally.”

Aleksandar Andonov, Rob Bauer, and Martijn Cremers, “Pension Fund Asset Allocation and Liability Discount Rates,” *Available at SSRN 2070054*, March 2016, http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2070054.

Institutions and incentives encourage risk taking

- U.S. public plans calculate liabilities and contributions using earnings assumption based on plan portfolio rather than market rates (unlike U.S. private plans, generally unlike other countries). Higher earnings assumption:
 - Keeps contributions lower in the short run, attractive of course
 - Keeps reported liabilities lower, also attractive
 - Riskier assets needed to support higher assumptions
- Investment risk is taken by pension plans but borne by stakeholders in govt (moral hazard).
- Investment risk is taken now but largely borne in the future, often by different people: Asset smoothing and long, open amortization periods protect officials from risk in the short run, but cannot avoid risk over longer run, and potentially encourage it.
- Govts often have ability to underpay actuarial contributions, at least for a while, which can encourage risk taking.

Consequences of a one standard deviation shortfall are 3-4x as great as in 1995, 10x vs 1985

- Typical plan has about a 1 in 6 chance of a single-year shortfall of at least 1 “standard deviation”
- For U.S. as a whole, today, that’s about \$427 billion. About 27% of all state-local taxes, up from 7.6% in 1995, 2.7% in 1985
- Even if amortized slowly* it is a lot:
 - increased contributions of about \$24 billion now, rising 3% annually for 30 years (after which it is paid off)
 - **roughly equivalent to a 25 percent cut in all U.S. state-local highway capital spending, for 30 years**
 - *the result of a single year of moderately bad investment returns*
- Risks borne by current and future taxpayers and stakeholders in govt services, infrastructure. Also potentially borne by workers, retirees.
- Why the increase?
 1. Greater investment in risky assets
 2. Plans much larger now relative to economy and state-local budgets than 10-20 years ago
- **Details are in the appendix**

* 30-year closed-period level percentage of pay, 7.5% interest, 3% growth

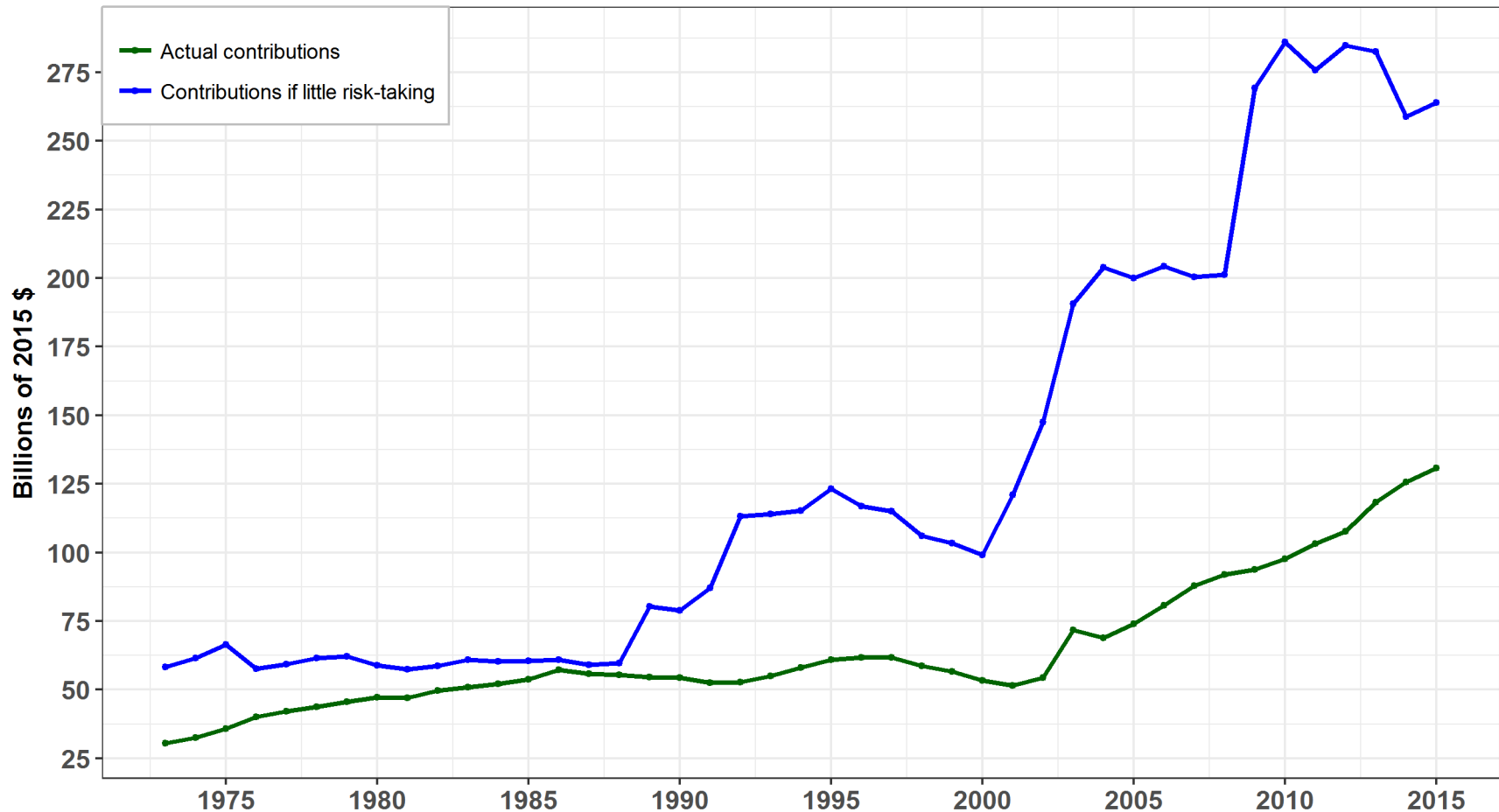
Is risk lower for long-term investors?

- Pension funds are long-term investors, they can wait out ups and downs, we can count on future good returns compensating for recent bad returns and vice versa, right?
- No. The uncertainty around expected compound returns narrows as the horizon increases, but uncertainty around assets – what plans need to pay benefits – actually increases with time, because returns are compounded over more years.*
- While pension plans are long-term investors in the sense that they don't need much liquidity in the short term, their funders – governments – care very much about the short term. Investment-shortfall-driven contribution increases require govts to cut current services or raise taxes, to pay for services delivered in the past.

* Uncertainty around assets could increase more slowly – but still increase with time - if portfolio returns are “mean reverting” over the long term. But academic and practitioner research provides little support for this.

Governments hope that successful (but risky) investing will keep contributions low

State and local government inflation-adjusted pension contributions
Versus contributions needed to keep unfunded liabilities from growing, if little risk taken

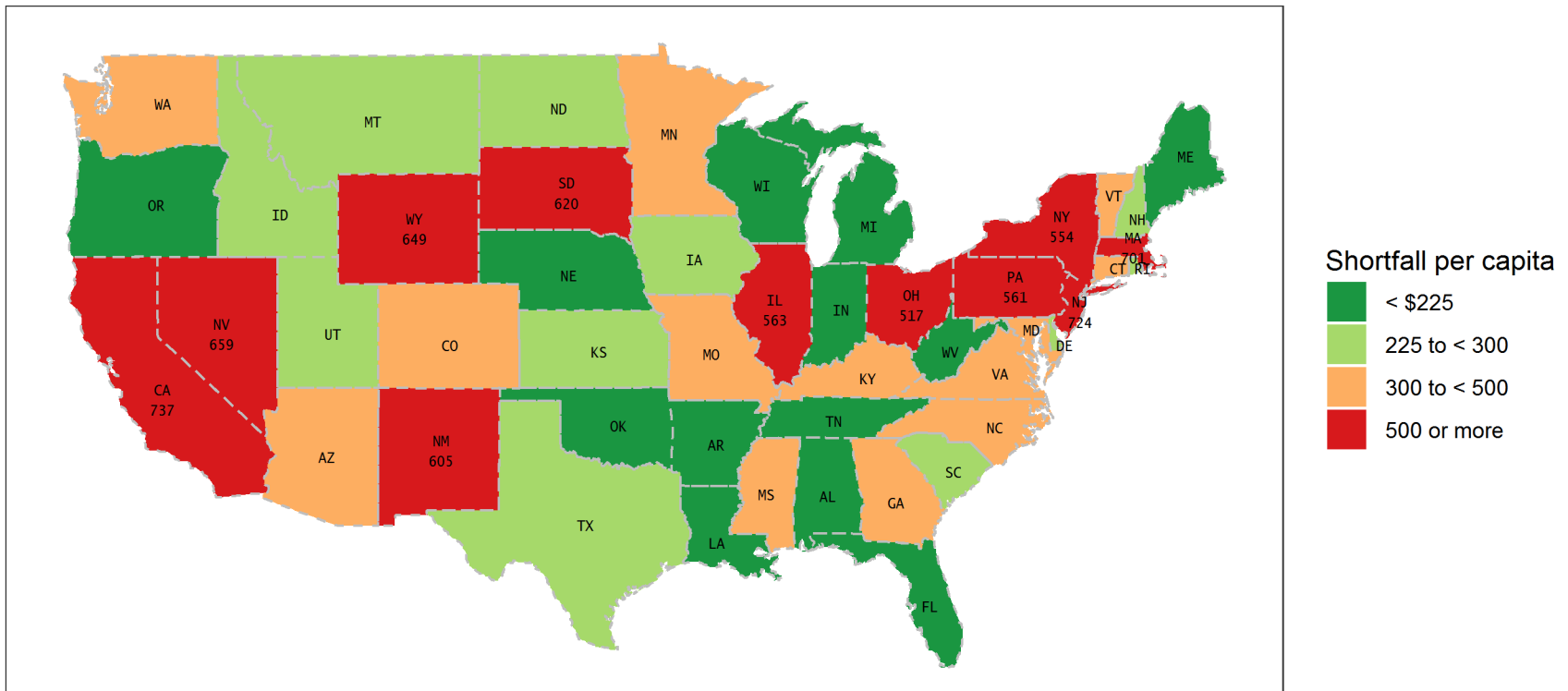


- 'Little-risk' contributions: Employer normal cost + interest on unfunded liability, as valued by U.S. Bureau of Economic Analysis (NIPA Table 7.24)
- Actual contributions also NIPA Table 7.24
- Adjusted for inflation with gross domestic product price index

All states would have to increase contributions if they reduce risk-taking

Employer contributions shortfall relative to normal cost plus interest, 2014

Per capita, state & locally administered plans combined



Author's analysis and estimates based upon:

- Employer contributions from Census Bureau Annual Retirement System Survey (<https://www.census.gov/govs/retire>)
- Employer normal costs from Bureau of Economic Analysis (<http://www.bea.gov/regional/xls/PensionEstimatesByState.xlsx>)
- Unfunded liabilities from Federal Reserve Board (<https://www.federalreserve.gov/apps/fof/efa/efa-project-state-local-government-defined-benefit-pension-plans.htm>)

These numbers differ from actuaries' estimates, and reflect discounting at 5%.

How we are analyzing risk

We model pension plan finances, allowing investment returns to vary*, and examine the likelihood of undesirable outcomes

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

Results: Illustrative simulations

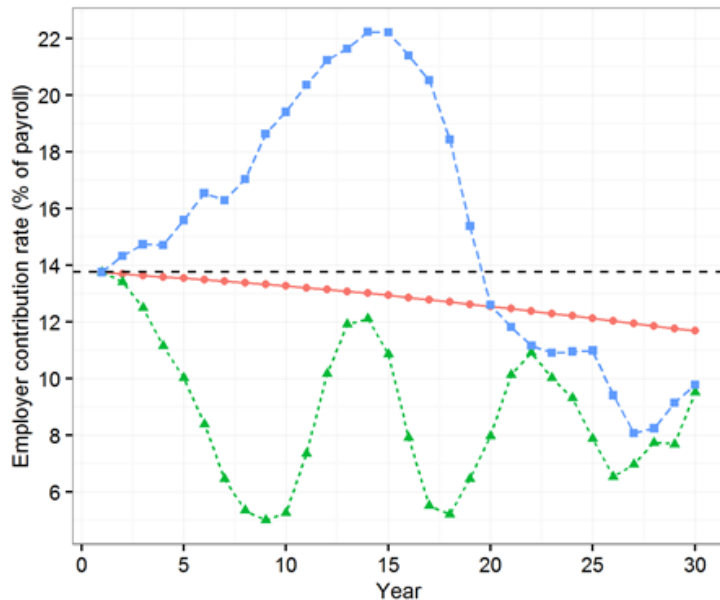
Employer contributions and funded ratio can be highly variable even if earnings assumption is met on average.

Three individual simulations, all with 7.5% compound annual return at 30 years

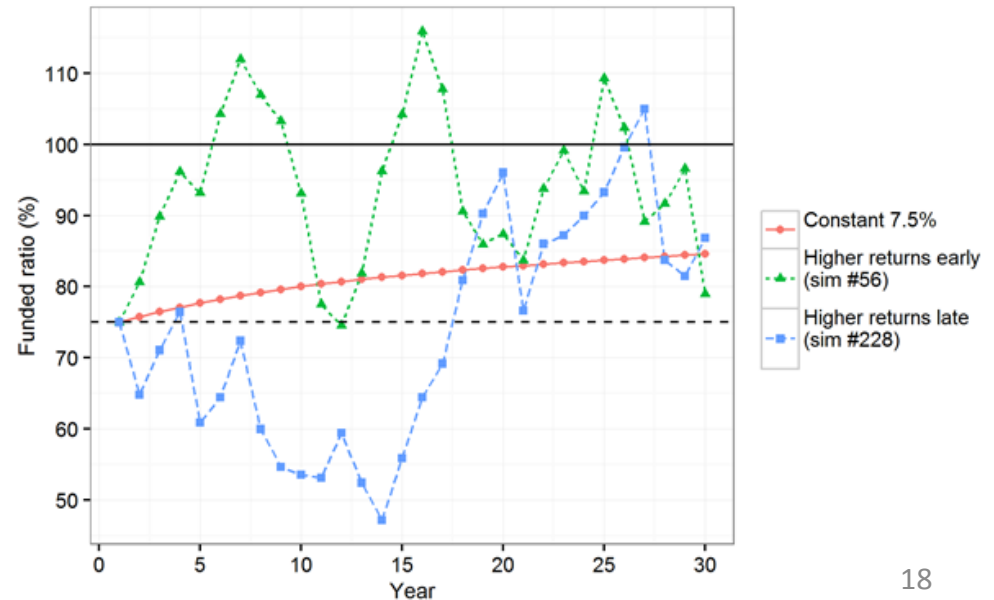
- **Deterministic run: constant returns**
- **Stochastic run : high returns in early years**
- **Stochastic run : low returns in early years**

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

Employer contribution rate

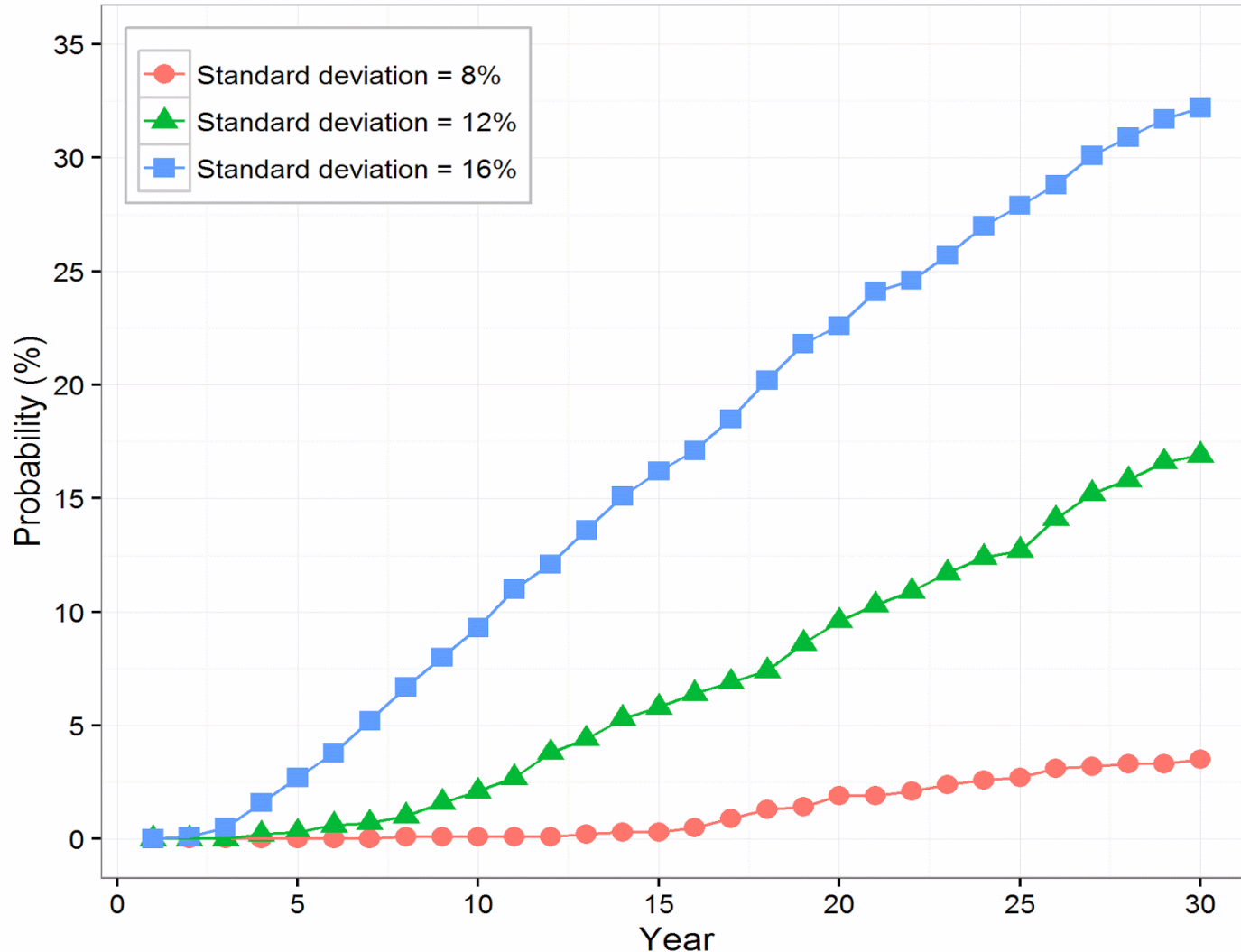


Funded ratio



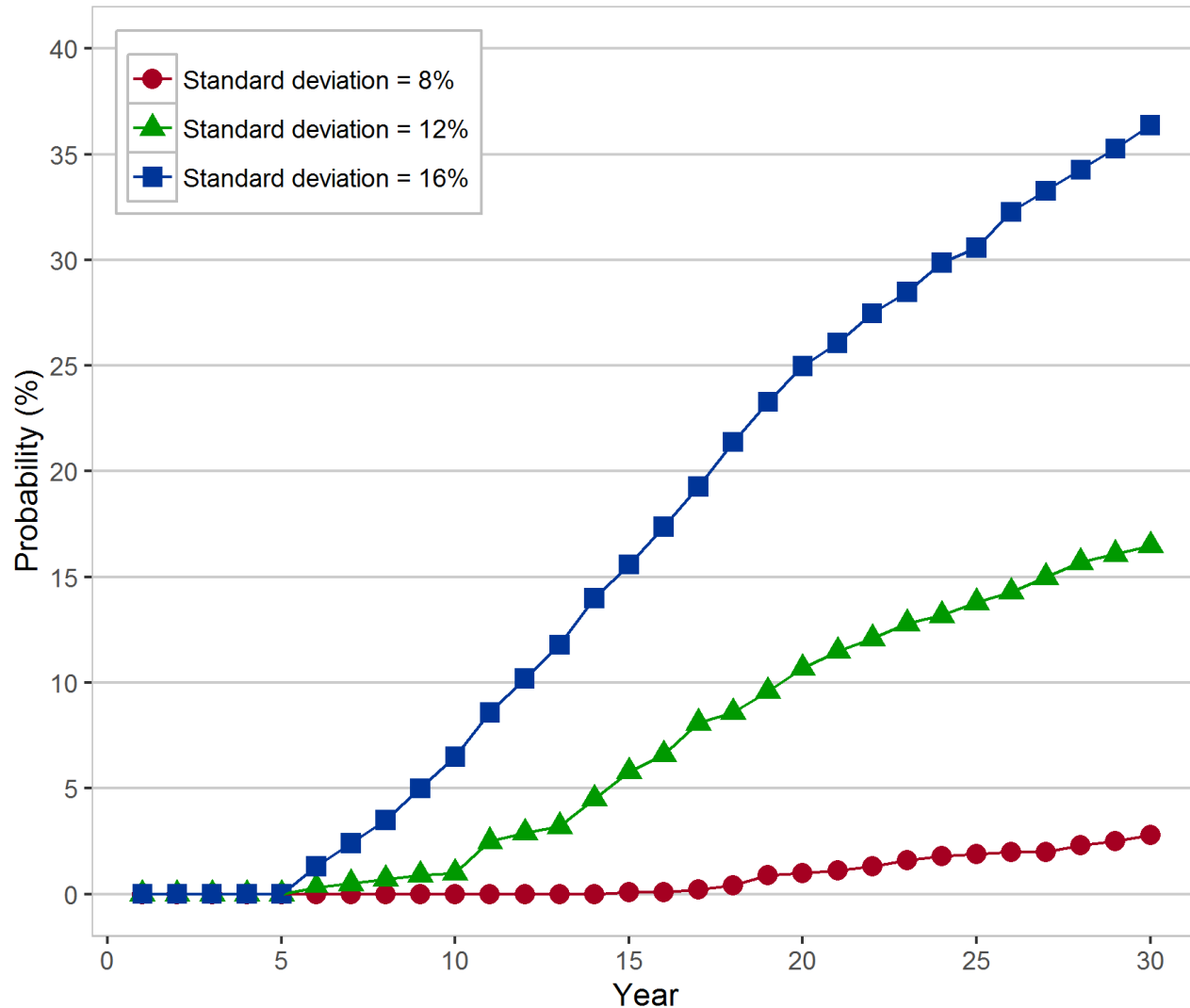
Risk of funding crisis rises as investment-return volatility rises (holding expected returns constant)

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



Risk of significant contribution increases rises as investment-return volatility rises (holding expected returns constant)

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



We modeled 3 investment-return scenarios

- Good old days: Nominal interest rates were high, risk was low. Not terribly different from what was possible 20 years ago. *Not possible now*. (Expected compound return 7.5%, SD 1.8%)
- Invest in riskier assets: Not terribly different from what plans have done. (Expected compound return 7.5%, SD 12%)
- Reduce expected return, maintain risk profile: An unpleasant but safe alternative to investing in riskier assets. (Expected compound return 3.5%, SD 1.8%)

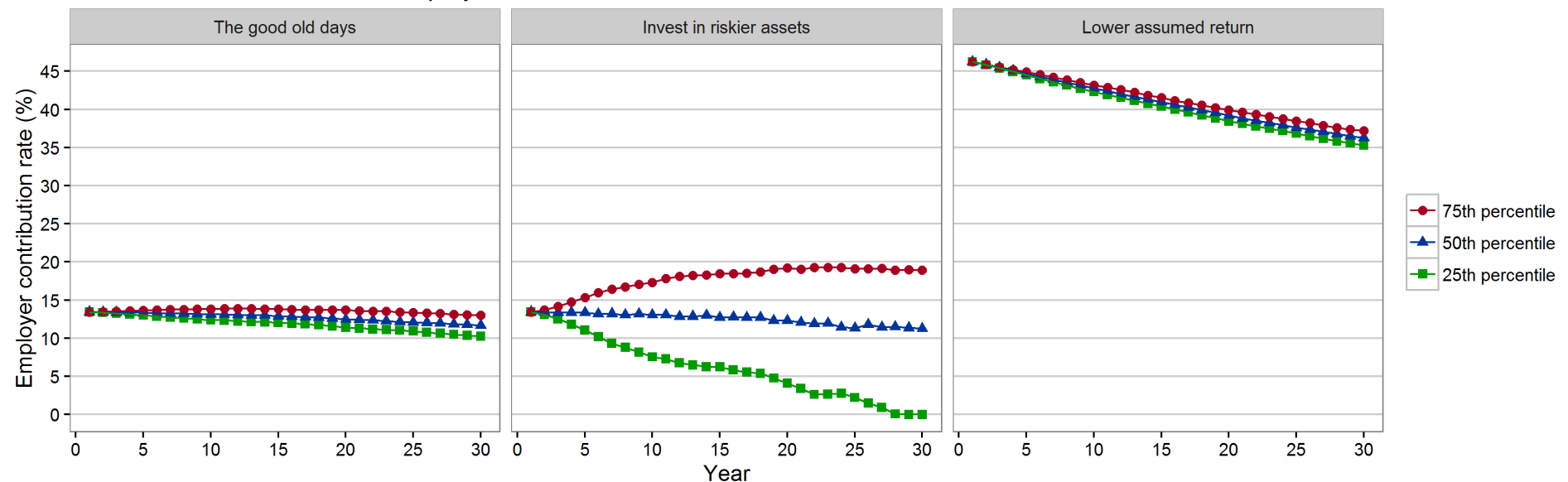
The scenarios share a common risk-return trade-off (Sharpe ratio).

Our standard plan: Average demographic characteristics, 30-year level-percent-open funding policy, 75% initial funded ratio.

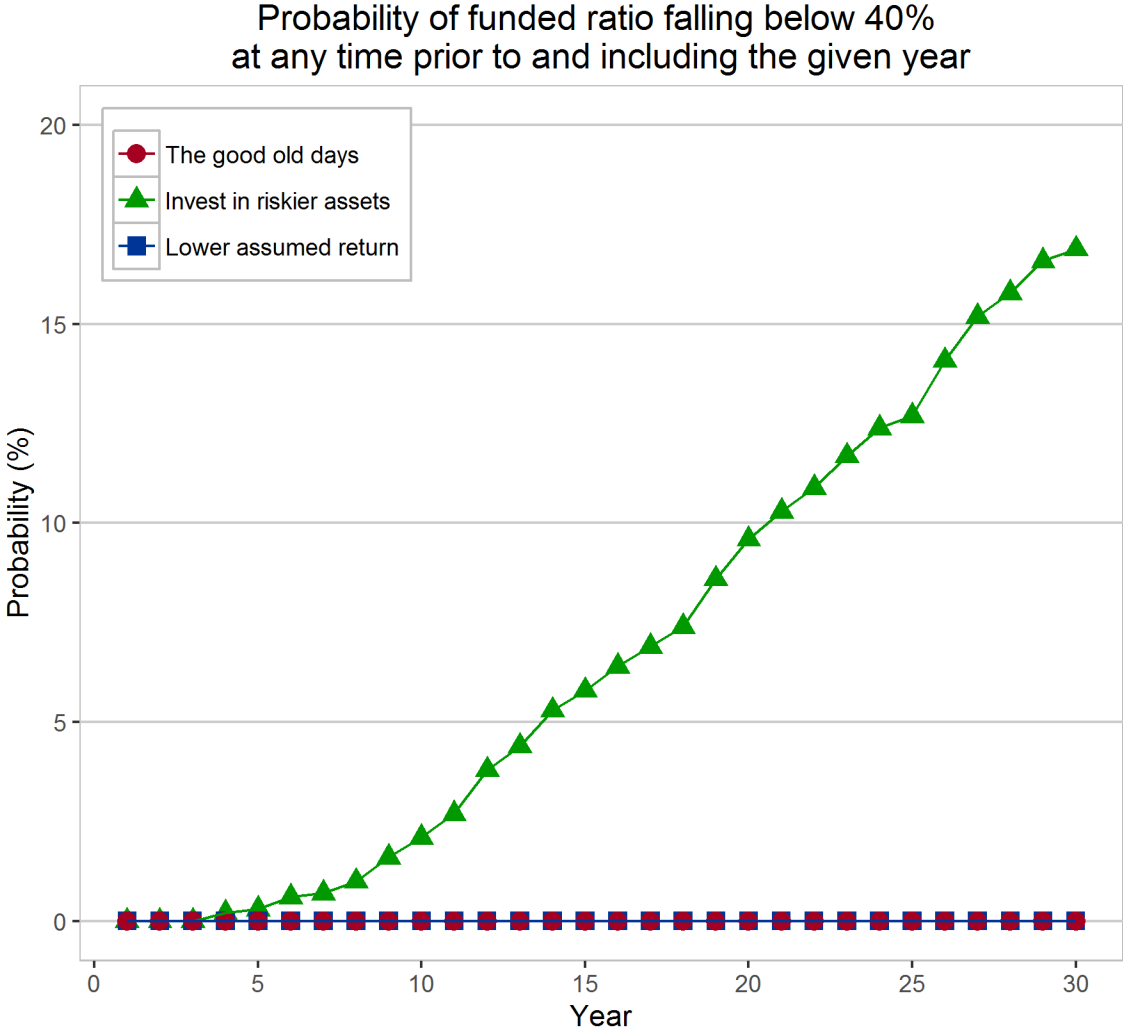
The scenarios require dramatically different employer contributions

- Investing in riskier assets kept the median employer contribution about the same, but the likely range of contributions is much greater than in the good old days (the 25th and 75th percentiles are much farther apart).
- Lowering the assumed return, which keeps risk low, required a tripling of employer contributions right away

Distribution of employer contribution rates across simulations under different scenarios



The low contributions that investing in riskier assets allowed came at the price of much greater risk of a funding crisis



Selected other results from our work

- Pension plan funding methods involve a trade-off: aggressive funding methods that repay liabilities quickly protect the pension fund and future generations, at greater cost to current taxpayers.
- Commonly used funding methods that stretch out repayments of liabilities:
 - May never achieve full funding
 - Protect elected officials from near-term consequences of risk-taking (therefore encouraging it)
 - Create greater risks to plan funding, and
 - May shift the cost of current and past compensation to future generations
- Mature plans (e.g., with many workers relative to retirees) face greater risk – they have high cash outflows and their assets (and therefore investment risk) are large relative to their payroll. Most plans are maturing.
- Caps on employer contributions and other methods of underpaying full actuarial contributions can increase the risk of a funding crisis very substantially.

Conclusions

- U.S. public pension underfunding remains near record, although it varies widely across states.
- Incentives & institutions encourage risk taking
- Risk to taxpayers & stakeholders in govt is 3-4x greater than in 1990s. Creates roller coaster rides and difficult political choices even if earnings assumptions achieved in the long run.
- As investment-return volatility increases, the likelihood of crisis-level funding or dramatic increases in employer contributions rises. Common funding policies that stretch out repayments of losses generally fail to reach full funding, and cannot make risk go away.
- Most states need risk-taking to work out well or else contributions will rise significantly. Already public pension plans generally have bad news in the bank for FY 2015 and 2016 that will drive contributions up.
- Plans and govts should evaluate risk carefully, with an eye toward possibly reducing risk.

Latest revenue news (with Lucy Dadayan)

Widespread Declines in State Tax Revenues in 2016 Q2

State and Local Government Tax Revenue Growth					
Year-Over-Year Change					
(Dollar amounts in millions)					
	2015 Q2	2016 Q2	\$ change	% change	Prior 4 quarters /2
State and Local Government					
Total, major taxes /1	\$339,548	\$337,822	(\$1,725)	-0.5%	5.0%
State Government					
Total state taxes	\$277,053	\$271,264	(\$5,790)	-2.1%	3.7%
Total major taxes	\$214,557	\$209,817	(\$4,740)	-2.2%	4.6%
Sales tax	80,036	80,680	644	0.8%	2.9%
Personal income tax	112,111	108,273	(3,838)	-3.4%	6.9%
Corporate income tax	18,400	16,669	(1,731)	-9.4%	-2.3%
Property tax	4,010	4,195	185	4.6%	5.4%
Total, other state taxes	\$62,497	\$61,447	(\$1,050)	-1.7%	1.0%
Local Government					
Total major taxes	\$124,991	\$128,005	\$3,014	2.4%	5.2%
Sales tax	20,355	20,652	297	1.5%	6.6%
Personal income tax	10,182	9,964	(218)	-2.1%	14.1%
Corporate income tax	3,053	2,169	(884)	-29.0%	4.5%
Property tax	91,401	95,221	3,820	4.2%	4.1%
Source: U.S. Census Bureau (tax revenue).					
Notes: 1/ The Census Bureau only reports on major taxes of local government (sales, personal income, corporate income, and property tax). 2/ Average of four prior year-over-year percent changes.					

Federal Tax Reform: A New State Budget Uncertainty

- Potential effects of tax reform – or of debate about tax reform:
 1. Impact on the economy (FY 2018+)
 2. Direct impact on state government tax bases (FY 2018+)
 3. Indirect impact on state tax revenue as taxpayers change their behavior in anticipation (could be happening even now)
- President-elect Trump's tax proposals:
 - Significant cuts in top income tax rates
 - Elimination of the ACA's investment income tax
 - Substantial increases in the standard deduction
- Potential impacts of #3 (anticipatory behavioral responses):
 - High-income taxpayers likely will push income from wages, interest, & other sources out of 2016 into 2017 & accelerate deductions into 2016
 - High-income taxpayers likely will push capital gains out of 2016 into 2017 when the ACA investment tax would not be in effect
 - Middle-income taxpayers likely will accelerate itemized deductions into 2016 when these deductions will be most useful
 - Federal taxpayers may accelerate state-local tax *payments* into 2016 to get benefit of deductions at (presumed) higher 2016 tax rates even as they push *taxable income* out of 2016, into 2017, making tax collections hard to interpret.
- Anticipatory behavioral responses can be large, hard to estimate, and hard to interpret as the numbers come in

Appendix

Consequences of a one standard deviation shortfall are 3-4x as great as in 1995, 10x as great as in 1985

Potential magnitude of public pension fund investment risk as % of taxes

Pension fund fiscal year	Invested assets, (billions of 2016 \$) (A)	Volatility (risk) for a portfolio with 8% expected return (Standard Deviation) (B)	One standard-deviation risk, (billions of 2016 \$) (C = A x B)	State & local government taxes, (billions of 2016 \$) (D)	One standard-deviation risk, as % of taxes (E = C ÷ D)
1975	\$ 335	3.7%	\$ 12.4	\$ 516.6	2.4%
1985	698	2.7%	18.8	685.3	2.7%
1995	1,719	4.3%	73.9	978.3	7.6%
2016	3,554	12.0%	426.5	1,576.8	27.0%
2016 / 1985	5.1	4.4	22.6	2.3	9.8
2016 / 1995	2.1	2.8	5.8	1.6	3.6

Sources and notes:

- Volatility estimates for 1975, 1985, 1995 are from Biggs (2013); 2016 is authors' assumption. There is about a 1 in 6 chance of a shortfall of 1 standard deviation or larger in a single year, under plausible assumptions.
- Invested assets from Federal Reserve Board, Financial Accounts of the United States.
- Taxes from Bureau of Economic Analysis, NIPA Table 3.3.
- Taxes and assets are in fiscal year 2016 dollars, adjusted using GDP price index.
- Risk measure is for a single year. Longer-term investment risks are larger.