



The State Pension Funding Gap: 2018

Overall debt at historic high after economic recovery, underscoring need to prepare for downturn

Overview

At \$1.24 trillion, the 50-state pension funding gap—the difference between a state retirement system’s assets and its liabilities—improved slightly in 2018 primarily due to strong investment performance. However, after a decade of economic recovery, the aggregate pension funding gap remains historically high and could increase by up to \$500 billion based on market returns through March 2020, including recent losses related to the COVID-19 pandemic. In addition, the disparity between well-funded and underfunded state retirement systems is greater than it has ever been.

As policymakers anticipate another recession and increased budget pressures, policies on pensions will play an important role in determining how well states are able to weather an economic downturn. In this brief, The Pew Charitable Trusts identifies and examines practices that can help public officials better prepare their retirement systems for a recession and help them manage through it, with particular attention to proven policies followed by the best-funded states. Specifically, Pew finds four pension management practices that contribute to strong fiscal position:

- Following funding policies that target debt reduction.
- Lowering investment return assumptions.
- Adopting cost-sharing policies and plan designs.
- Implementing pension stress testing.

This brief assesses the effectiveness of these practices using 50-state data from 230 state retirement systems covering teachers, public safety workers, and other state and local public employees. The findings are based on trends since before the Great Recession, as well as over the five-year period since 2014, when the Governmental Accounting Standards Board (GASB) implemented new reporting standards that allow for comparable analyses of funding and cash flow across state pension plans.¹

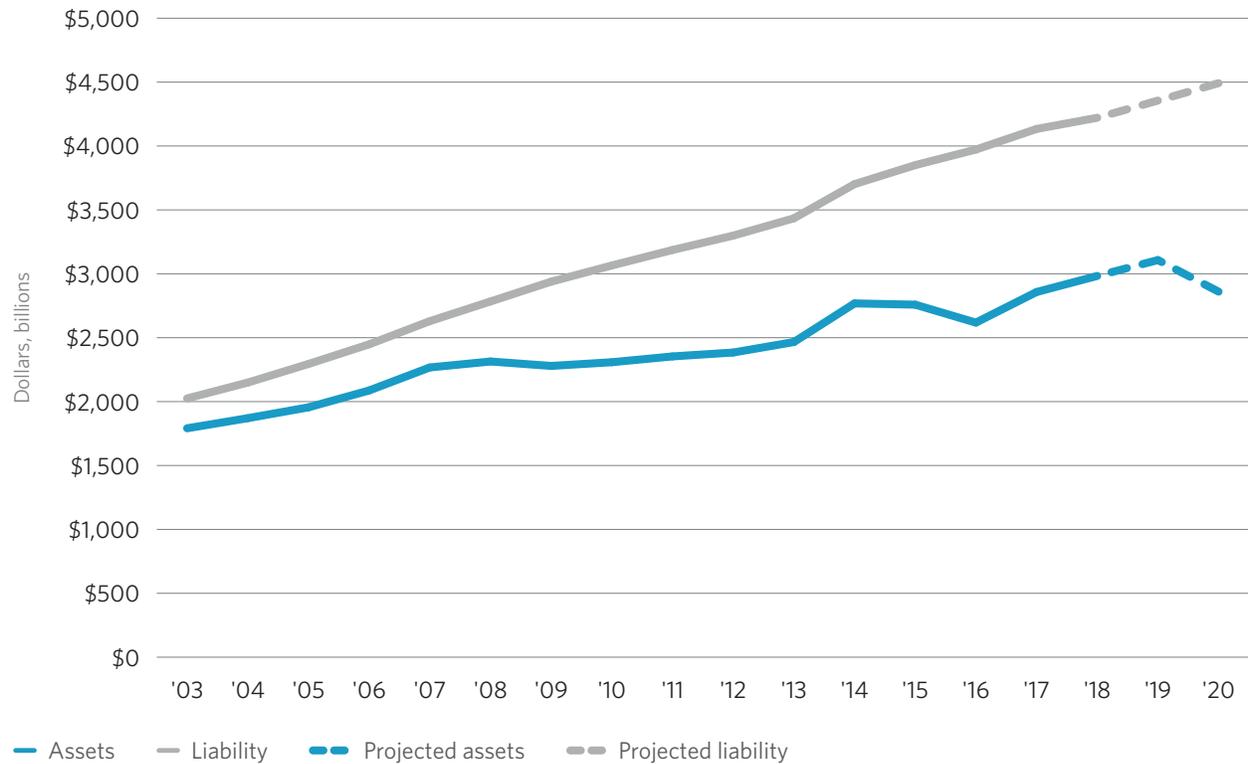
Key Terms and Concepts

- **Actuarial contribution:** Using a plan's own economic and demographic assumptions, the calculation of the actuarial contribution includes the expected cost of benefits earned for the current year and an amount to address the unfunded liability. Under prior accounting rules, the actuarially required contribution was a mandatory disclosure in governmental financial statements for all sponsors of public pension plans. But starting in 2014, states instead had the option of reporting the actuarially determined employer contribution.
- **Assumed rate of return:** The expected rate of return that a pension fund estimates its investments will deliver based on forecasts of economic growth, inflation, and interest rates.
- **Cost-sharing features:** Formal mechanisms that allocate risk and/or distribute unexpected costs between employers, employees, and retirees, typically through variable benefit or contribution arrangements.
- **Discount rate:** The discount rate is used to express future pension liabilities in today's dollars. Most state pension funds determine their discount rate based on their assumed rate of return. Decreasing a plan's discount rate leads to higher calculated liabilities.
- **Employer contribution:** State pension plans are typically funded by contributions from participating employers—which can include the state itself as well as local governments, public universities, school districts, and other government entities.
- **Employer contribution rate:** Employer contributions are often expressed as a percentage of covered payroll to allocate required contributions across different participating employers, and, in some cases, to determine the actuarial contribution. This calculation also allows for the comparison of the size of pension costs across state and local government employers of different sizes.
- **Funded ratio:** The value of a plan's assets, in proportion to the pension liability. This is an annual point-in-time measure as of the reporting date. Pew's analysis applies the market value of assets and the pension liability as reported by states under current government accounting standards.
- **Net amortization benchmark:** The amount of contributions from employers and plan sponsors that would be sufficient to keep unfunded liabilities from increasing if all actuarial assumptions—primarily investment expectations—were met for the year. The benchmark is calculated as the cost of new benefits earned in a given year plus the interest on the pension debt minus expected employee contributions.
- **Net pension liability:** Current-year pension debt calculated as the difference between the total value of pension benefits owed to current and retired employees or dependents and the plan assets on hand. Pension plans with assets greater than accrued liabilities show a surplus.

Figure 1

A Growing Gap Between Assets and Liabilities

In 2018, states had just 71% of the assets needed to fund promised benefits



Notes: Projections for 2019 and 2020 are based on past growth of service cost, benefit payments, and contributions as well as actual returns for FY 2019 and estimated returns for FY 2020.

Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials.

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Funding policies that target debt reduction are essential to plan resiliency

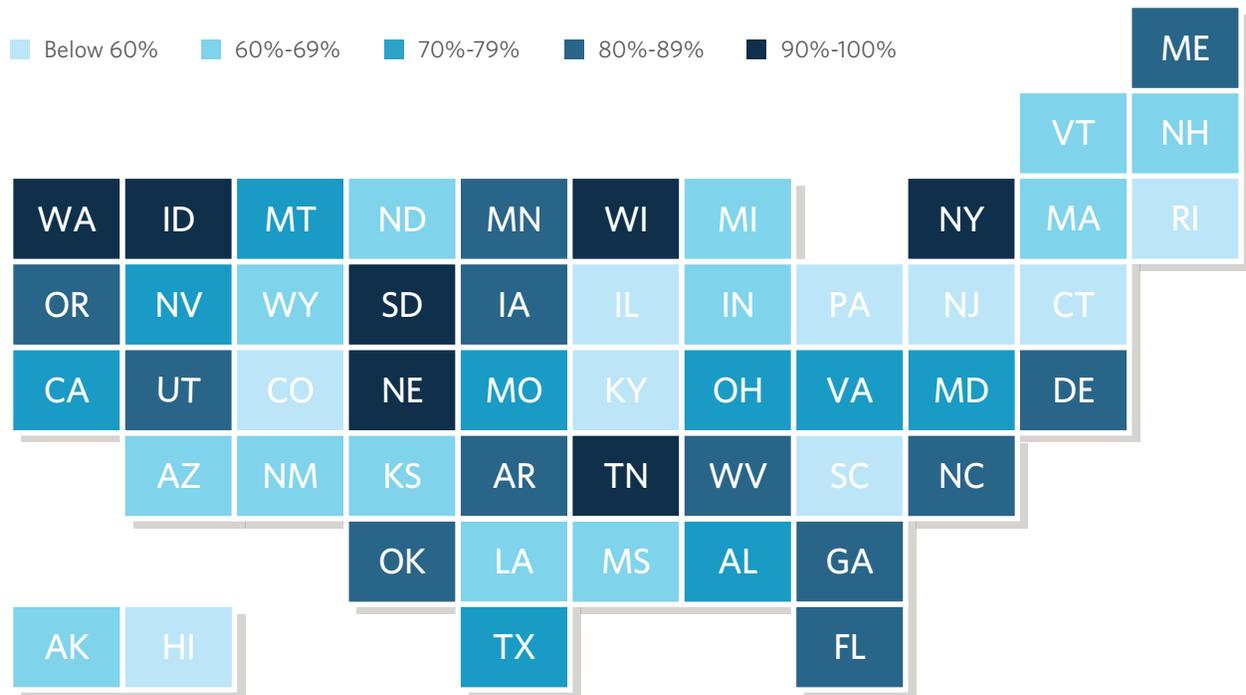
Simple as it may sound, the path to improving the fiscal health of public pension plans starts with making contributions that are sufficient to reduce unfunded pension liabilities over time. And although funding policies and their application vary widely across the states—some make contributions each year based on a fixed percentage of workforce payroll while others follow actuarial funding policies that regularly adjust contribution levels based on experience—plans that pay down a portion of debt each year are among the most robust.

Pew's net amortization metric measures whether plans are making sufficient contribution levels to reduce debt if plan assumptions are met. It provides a simple and consistent benchmark to assess the effectiveness of different funding policies to improve funding levels and promote resiliency in an economic downturn. The seven states with funded ratios of at least 90% in 2018 all adhered to consistent and sufficient funding policies, in stark contrast to the nine states with funded ratios of less than 60%.

Figure 2

State Pension Funding in 2018

Just seven states were 90% funded, while nine states were less than 60% funded



Note: Numbers reflect the Governmental Accounting Standards Board reporting standards as of 2018.

Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

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Analysis of the 2018 net amortization metric shows meaningful improvement, with the number of states achieving positive amortization increasing from 16 to 25. This means that if plans achieve their investment return targets—currently averaging 7.2%—half of states will continue to reduce pension debt and improve funding levels. And although funds are likely to post investment shortfalls for the current fiscal year, states that have been reducing pension debt are better positioned to weather economic uncertainty. For the 25 states whose pension debt continues to rise, the slowdown in the economy—combining lower investment returns or losses with lower state revenues—will make catching up that much more difficult.

And when examined through the lens of five-year data, the importance of meeting funding requirements is clear. The 20 states that have exhibited positive amortization from 2014 to 2018 (that is, contributed enough to pay down at least one dollar of pension debt) have lowered their unfunded liability collectively by \$11 billion. Conversely, the remaining 30 states have reported an increase in unfunded liabilities of \$281 billion.

Because growing pension debt leads to higher costs, states with poorly funded plans have had to increase their pension contributions. And the higher cost of paying for benefits may affect the states' ability to fund other core government services and crowd out other important public investments.

In contrast, states such as Maine and West Virginia that were severely underfunded historically but subsequently adopted strong funding policies kept costs stable and pension debt shrinking through the Great Recession.

Lowering return targets and discount rates reduces risk

Over the past five years, the average assumed rate of return for state pension fund investments has declined from 7.6% in 2014 to 7.2% in 2018. This adjustment is based on the expectation that lower economic growth will result in lower future investment performance.² In the 20 years prior to the Great Recession, for example, many plans averaged returns of 8%; however, most experts now forecast long-term returns of around 6.5% for the typical public plan portfolio. Recognizing this new economic landscape, 42 states have reduced their discount rates—the figure used to express future liabilities in today's dollars—since 2014, including 23 that did so in 2018.

Lowering assumed rates of return can help plans reduce the risk of missing return targets and incurring unexpected costs during market downturns. However, because the present value of future liabilities is typically calculated using the assumed rate of return as the discount rate, lowering the discount rate also has the immediate effect of raising calculated liabilities and contributions required from state budgets. But there is evidence that plans can adopt more reasonable return assumptions without harming credit ratings or breaking the bank.

For example, Connecticut reduced the assumed rates of return (and discount rates) for its State Employees Retirement System and Teachers' Retirement System from 8% to 6.9% in 2017 and 2019, respectively, but the state concurrently adopted funding and amortization policies that would stabilize long-term contribution rates.³ Collectively, these policies help to mitigate the impact of market volatility on plan financials and the state's budget, while also factoring positively in rating agency scoring.⁴

Setting realistic return assumptions is critical to plan fiscal health given the importance of investment returns—they make up more than 60% of public pension plan revenue.⁵ However, adjusting return assumptions is not the only tool at policymakers' disposal for mitigating economic risk. Another strategy is to adopt a formal cost-sharing policy that distributes unexpected cost increases—costs that result from short- or long-term deviations from plan expectations—between employers and plan members.

Ensuring cost predictability through cost-sharing

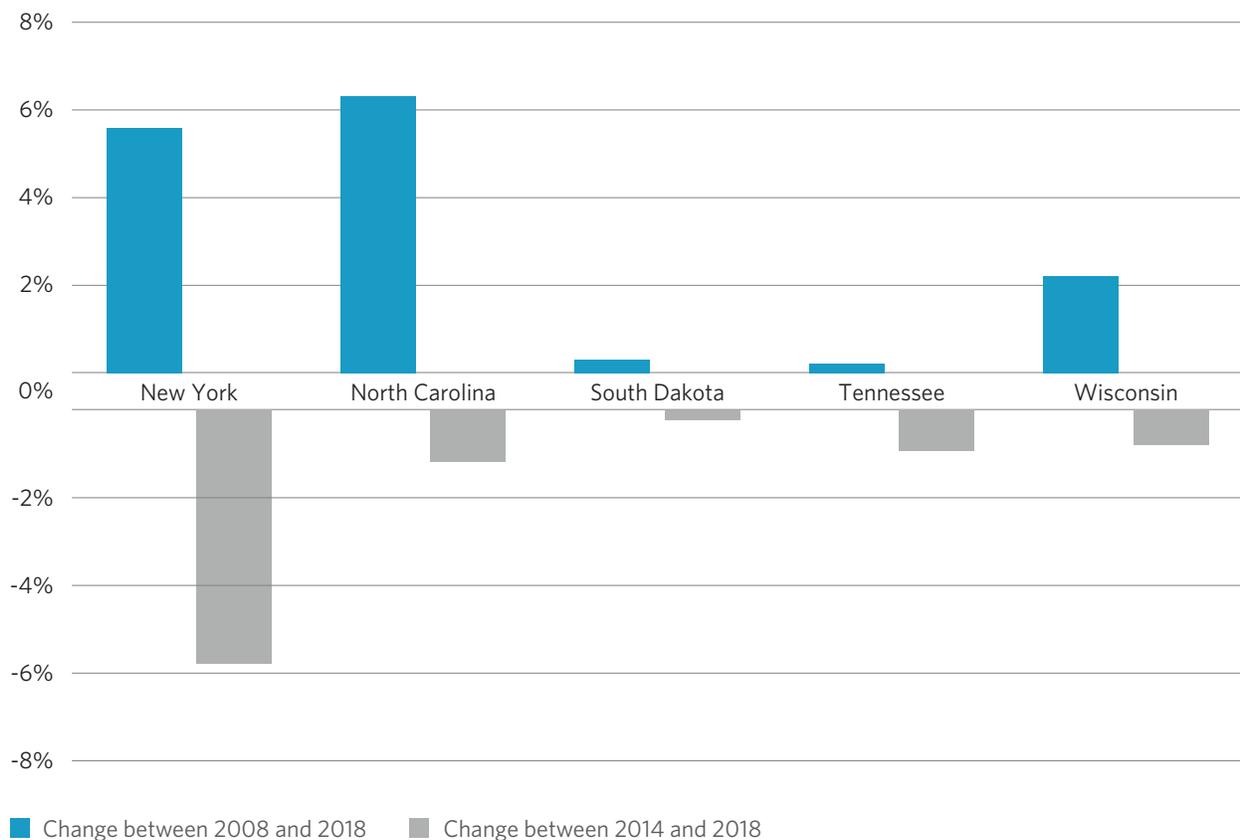
The five years of data also demonstrate the role that cost-sharing plan provisions can play in supporting cost predictability. In particular, Tennessee, Wisconsin, and South Dakota report steady and consistent budget costs over the five-year time horizon while remaining at or near full funded status. In fact, these three states are the only ones in which funded status remained above 90% while pension contribution rates varied by less than 1% of payroll over the five years ending in 2018.

This high level of cost predictability reflects the impact of the different cost-sharing features each state employs as part of plan benefit design, in addition to consistently making full actuarial contributions each year. South Dakota and Wisconsin have a long track record of using variable employee contributions or retiree cost of living adjustments (COLAs) to share the costs of investment shortfalls—or the benefits of strong financial markets—with employees and retirees. Tennessee adopted a hybrid plan with cost-sharing policies after weathering the Great Recession.

In comparison, well-funded plans without cost-sharing features struggled to achieve both consistent costs and maintenance of funding levels over the five-year period ending in 2018. For example, New York maintained a funded ratio in the high 90s between 2014 and 2018 but experienced fluctuations in employer costs as a percent of payroll of nearly 6 percentage points. Data going back to 2008 show even more volatility in costs, in which employer contribution rates in the state ranged from 8% to almost 22% of payroll. North Carolina, a well-funded state without cost-sharing, had costs increase significantly over longer time periods, about 6 percentage points during the 10-year period, and the system’s funded ratio fell by 10 percentage points—from 99% in 2014 to 89% in 2018.

The graphic below illustrates how both New York and North Carolina, two good examples of well-funded plans without cost-sharing features, have experienced greater long-term volatility in costs compared with the three cost-sharing states: Wisconsin, Tennessee, and South Dakota. These states were chosen because all five are among the eight best-funded states, so the differences we see here are primarily due to differences in cost-sharing features, as opposed to differences in payments to address unfunded liabilities.

Figure 3
Change in Employer Contribution Rates Since the Great Recession
 States with cost-sharing policies managed to minimize volatility in employer contributions



Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

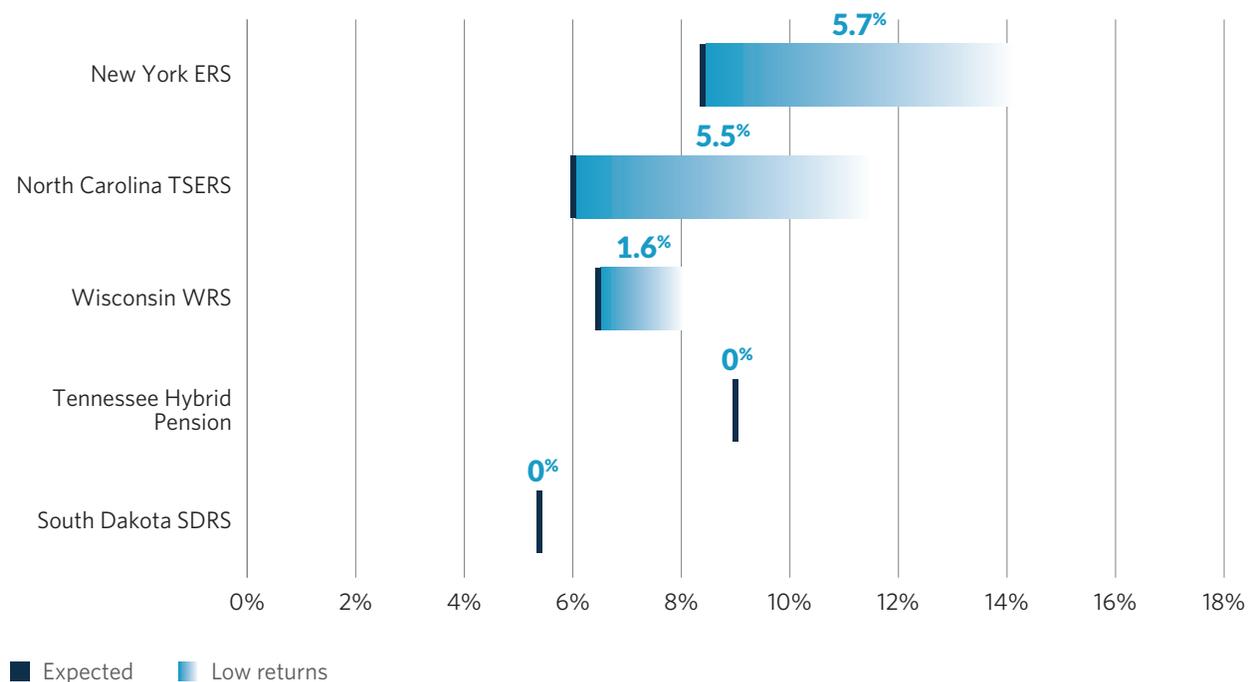
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Pew also looks at expected employer cost going forward to determine if cost-sharing measures can further protect state budgets. For example, Figure 4 illustrates the employer cost variability metric—how the employer cost, as a percent of payroll, is projected to change under a low return scenario—for the five states.⁶ Well-funded plans with cost-sharing features tend to fare better: South Dakota, Wisconsin, and Tennessee would see zero or small changes in employer costs, while North Carolina and New York experience much larger increases under the same low return scenario.

Figure 4

Projected Employer Cost of New Hire Benefits as a Percentage of Pay

States vary in how much cost uncertainty they face from the plan design offered to new employees



Notes: Under the low return scenario, the analysis assumes a 5% return. The projected cost of new benefits includes contributions to the defined contribution component of the hybrid in the case of Tennessee's hybrid plan. The analysis for each state is based on specific retirement systems, including New York Employees' Retirement System, Teachers' and State Employees' Retirement System of North Carolina, South Dakota Retirement System, Tennessee Hybrid Pension Plan, and the Wisconsin Retirement System.

Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

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Although cost-sharing features are not required for full funding, many states have adopted variable employee contributions or variable COLAs in an effort to reduce the volatility of employer costs and limit ad hoc benefit changes. Following the Great Recession, many states elected to retroactively share retirement plan risk with members, including in some cases reducing COLAs for retirees or increasing contributions for current workers. Making cost-sharing part of the benefit design can reduce instances in which workers realize they were bearing risk after an economic downturn or other negative event had already transpired.⁷

Stress testing is emerging as an effective risk management tool

Many states may not be prepared for how an economic downturn could affect the costs of their retirement systems. The 2014 changes to GASB reporting requirements included a requirement that plans report sensitivity analysis related to investment returns. But the requirement is limited to reporting liabilities within a narrow range of alternative investment returns of +/- 1% at a single point in time. Furthermore, it does not require forward-looking projections that account for wider swings in investment returns or the risk of contributions falling short of the levels required by a state's own policies.⁸

The experience of the past 20 years shows that states need to consider both of these risk factors more fully. To better understand the risks facing state pension plans, and ultimately state budgets, policymakers are turning to stress testing—and the adoption of new actuarial standards that promote its use—to assess and manage investment and contribution risk.

Stress testing involves the simulation of a range of economic scenarios and investment returns to determine their potential impact on future pension costs and liabilities. Building on existing actuarial projections, comprehensive stress testing can be a powerful tool for policymakers to understand how pension balance sheets and government budgets will fare during an economic downturn, or over a period of lower-than-expected growth. It also allows states to evaluate the impact of reform proposals or policy changes.

Fourteen states have enacted or are considering adopting stress testing requirements. And the results of stress test analyses in Colorado, Connecticut, and Hawaii demonstrate that this is not an academic exercise.

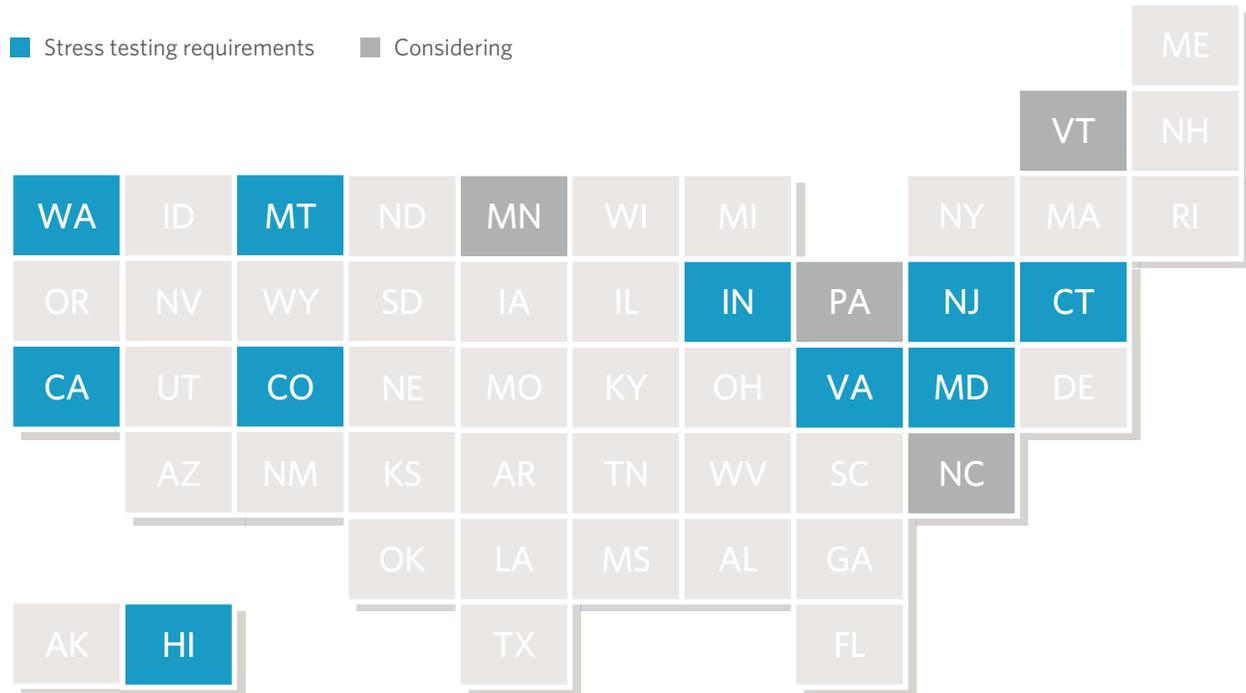
In Colorado, a 2015 stress test analysis concluded that the state faced a 1 in 4 chance that the assets in the Public Employees' Retirement Association's main fund would be depleted within 25 to 30 years. The finding led to reforms that were found—through further stress testing—to mitigate the risk of insolvency. In Connecticut, a stress test analysis in 2018 found that although reforms to the State Employees Retirement System had improved the system's fiscal health, additional changes to the teachers' system were needed to avoid substantial cost increases. As a result, policymakers made reforms to address these risks as well. And in Hawaii—which has issued annual stress test reports since 2017—policymakers have used the analysis to demonstrate that recent reforms to the state's contribution policy have improved the plan's fiscal position.

We expect the trend of adopting public risk reporting and stress testing to continue as state retirement systems implement the Actuarial Standard of Practice No. 51, adopted by the Actuarial Standards Board in September 2017. The new standards require plan actuaries to regularly conduct an assessment of investment, contribution, and other risks.

Figure 5

States That Have Enacted or Are Considering Adopting Stress Testing Requirements

Ten states require stress testing or risk reporting; eight have adopted it since 2017



Note: Of the states that have adopted stress testing requirements by statute, at least four (Washington, California, Virginia, and Hawaii) have produced at least two stress testing reports as of January 2020. Map is as of April 2020.

Source: State public documents or as provided by state officials

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These actuarial studies can provide a comprehensive assessment of a range of risk factors, including investment, contribution, and longevity risk. But the reports are designed primarily for plan fiduciaries, as opposed to a broader set of stakeholders. Pew’s “Foundation for Public Pensions Risk Reporting,” released in November 2018 in collaboration with the Harvard Kennedy School’s Mossavar-Rahmani Center for Business and Government, was designed to leverage these data in a standard form that is focused on impacts to taxpayers and government budget officials.⁹ And with the impact of COVID-19 on financial markets and pension balance sheets, states are already applying Pew and the center’s principles of risk reporting.

For example, in Montana, a stress test report focusing on an asset shock scenario, with a significant loss on plan investments similar to the recent downturn beginning in March 2020, was used to assess the sufficiency of the state’s funding policy entering a recession. The results suggest that policymakers will face difficult decisions in terms of strengthening pension funding while revenue is projected to decline. Although these decisions are challenging, the stress test has provided policymakers with a clear understanding of the goals for pension reform.

Risk reporting for public pensions should be accessible to all stakeholders and designed to inform planning and decision-making, and to assist government officials and others as they assess the potential impact of the next recession. It can be used to quantify the potential cost of investment risk on government budgets, evaluate the

impact of contribution risk on pension system financial position, and provide a framework to evaluate policy proposals to strengthen state fiscal health.

Conclusion

Although many state and local pension plans are still vulnerable to market volatility and recession, others have weathered past economic downturns well. In the near-term, state and local officials will continue to focus on the COVID-19 pandemic while navigating a host of budget challenges, including declining revenue and an increased need for safety net programs. As decision-makers confront these challenges, a careful evaluation of successful systems' policies reveals common practices that can serve as a toolkit for policymakers to strengthen their states' pension plans over the long-term. All states should consider:

- **Funding at levels that target debt reduction.** Plans that consistently make annual payments sufficient to pay for current benefits as well as reduce a portion of pension debt are more likely to recover quickly from economic downturns and better weather recessions.
- **Decreasing assumed returns and discount rates.** Forecasts of lower-than-historical economic growth and bond yields over the next 10 to 20 years drive the growing consensus that pension funds should plan for lower long-term investment returns than those of the past.
- **Ensuring cost predictability.** Plans with cost-sharing features were the ones most likely to recover quickly from the downturns of the first decade of the 2000s and to maintain a strong financial position throughout the recovery.
- **Employing stress testing and public risk reporting.** States that regularly assess whether current pension policies are sustainable throughout the economic cycle and over time have the information necessary to ensure that pension plans will be resilient during downturns.

There is no one-size-fits-all solution when it comes to plan structure and design. However, the practices of well-funded plans of all types indicate that these four policy prescriptions can help achieve and maintain fiscal sustainability for pension balance sheets and sponsoring government balance sheets, as well as ensure that benefits will be paid to the workers and retirees who depend on them.

Appendix A: Methodology

All figures presented are as reported in public documents or as provided by plan officials. The main data sources used were the comprehensive annual financial reports produced by each state and pension plan, actuarial reports and valuations, and other state documents that disclose financial details about public employment retirement systems. Pew collected data for more than 230 pension plans.

Pew shared the collected data with plan officials to give them an opportunity to review them and to provide additional information. This feedback was incorporated into the data presented in this brief.

Because of lags in valuation for many state pension plans, only partial 2019 data were available, and fiscal 2018 is the most recent year for which comprehensive data were available for all 50 states. Data on Tennessee aggregate political subdivisions were not available for fiscal 2018, so data were rolled forward from 2017. Data on a subset of California local governments participating in the California Public Employees' Retirement System were not available in aggregate and were not included in our data.

Each state retirement system uses different key assumptions and methods in presenting its financial information. Pew made no adjustments or changes to the presentation of aggregate state asset or liability data for this brief.

Assumptions underlying each state's funding data include the assumed rate of return on investments and estimates of employees' life spans, retirement ages, salary growth, marriage rates, retention rates, and other demographic characteristics.

Appendix B: State data, 2018

In thousands

State	Assets (plan net position)	Liabilities (total pension liability)	Pension debt (net pension liability)	Funded ratio
Alabama	\$38,973,099	\$54,201,941	\$15,228,842	71.9%
Alaska	\$14,995,615	\$21,925,093	\$6,929,477	68.4%
Arizona	\$47,908,905	\$73,124,711	\$25,215,806	65.5%
Arkansas	\$28,149,299	\$34,657,689	\$6,508,389	81.2%
California	\$455,619,154	\$640,471,294	\$184,852,140	71.1%
Colorado	\$44,906,648	\$76,413,747	\$31,507,099	58.8%
Connecticut	\$30,697,189	\$65,768,148	\$35,070,959	46.7%
Delaware	\$10,064,363	\$11,825,432	\$1,761,069	85.1%
Florida	\$161,429,344	\$202,133,975	\$40,704,630	79.9%
Georgia	\$92,155,238	\$115,086,038	\$22,930,800	80.1%
Hawaii	\$16,598,408	\$29,917,401	\$13,318,993	55.5%
Idaho	\$16,757,951	\$18,138,483	\$1,380,532	92.4%
Illinois	\$89,823,202	\$230,416,362	\$140,593,161	39.0%
Indiana	\$28,971,090	\$43,542,361	\$14,571,271	66.5%
Iowa	\$33,054,838	\$39,536,464	\$6,481,626	83.6%
Kansas	\$19,696,209	\$28,596,716	\$8,900,507	68.9%
Kentucky	\$23,282,022	\$51,885,561	\$28,603,539	44.9%
Louisiana	\$36,140,052	\$53,731,083	\$17,591,031	67.3%
Maine	\$14,532,362	\$17,197,897	\$2,665,535	84.5%
Maryland	\$52,125,680	\$74,080,615	\$21,954,935	70.4%
Massachusetts	\$56,786,732	\$93,728,000	\$36,941,268	60.6%
Michigan	\$64,647,414	\$102,250,365	\$37,602,952	63.2%
Minnesota	\$68,422,729	\$83,611,446	\$15,188,717	81.8%

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Mississippi	\$28,135,395	\$44,944,890	\$16,809,495	62.6%
Missouri	\$58,211,187	\$74,846,702	\$16,635,515	77.8%
Montana	\$11,584,819	\$15,966,542	\$4,381,723	72.6%
Nebraska	\$14,256,785	\$15,783,762	\$1,526,977	90.3%
Nevada	\$41,560,782	\$55,212,291	\$13,651,509	75.3%
New Hampshire	\$8,894,798	\$13,747,481	\$4,852,683	64.7%
New Jersey	\$81,526,803	\$212,243,893	\$130,717,090	38.4%
New Mexico	\$28,373,494	\$46,539,973	\$18,166,479	61.0%
New York	\$212,076,811	\$216,315,013	\$4,238,202	98.0%
North Carolina	\$97,635,765	\$110,145,689	\$12,509,924	88.6%
North Dakota	\$5,675,354	\$8,705,612	\$3,030,258	65.2%
Ohio	\$157,058,983	\$207,077,595	\$50,018,612	75.8%
Oklahoma	\$32,237,217	\$39,635,039	\$7,397,822	81.3%
Oregon	\$69,327,500	\$84,476,100	\$15,148,600	82.1%
Pennsylvania	\$83,300,714	\$152,136,679	\$68,835,965	54.8%
Rhode Island	\$6,485,178	\$11,966,274	\$5,481,096	54.2%
South Carolina	\$31,207,104	\$56,672,828	\$25,465,724	55.1%
South Dakota	\$12,235,719	\$12,233,387	-\$2,332	100.0%
Tennessee	\$48,996,019	\$50,135,354	\$1,139,335	97.7%
Texas	\$183,858,309	\$260,330,851	\$76,472,542	70.6%
Utah	\$31,259,522	\$36,708,181	\$5,448,659	85.2%
Vermont	\$4,341,722	\$6,760,162	\$2,418,440	64.2%
Virginia	\$76,555,264	\$96,893,151	\$20,337,887	79.0%
Washington	\$92,610,488	\$98,658,961	\$6,048,473	93.9%
West Virginia	\$15,566,369	\$18,923,489	\$3,357,120	82.3%
Wisconsin	\$96,737,081	\$100,294,768	\$3,557,687	96.5%
Wyoming	\$7,914,035	\$11,556,643	\$3,642,608	68.5%
Total	\$2,983,360,762	\$4,221,152,134	\$1,237,791,374	70.7%

Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

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Appendix C: Net amortization details, 2018

In thousands

State	Beginning of year net pension liability	Assumed rate of return (weighted average across plans) [†]	Assumed interest due on 2018 beginning of year debt	2018 normal cost [†]	2018 total expected cost [‡]	2018 employee contributions with interest	2018 employer contribution benchmark [§]	2018 actual employer contributions with interest	Percent of employer benchmark paid	Net amortization
Alabama	\$15,251,096	7.75%	\$1,181,960	\$954,407	\$2,136,367	\$767,179	\$1,369,188	\$1,293,504	94%	-\$75,684
Alaska	\$7,243,003	8.00%	\$579,497	\$242,840	\$822,336	\$128,306	\$694,030	\$556,411	80%	-\$137,619
Arizona	\$27,416,368	7.74%	\$2,122,280	\$1,825,501	\$3,947,780	\$1,347,511	\$2,600,269	\$2,162,496	83%	-\$437,773
Arkansas	\$7,853,261	7.10%	\$557,951	\$534,527	\$1,092,478	\$219,977	\$872,501	\$776,295	89%	-\$96,206
California	\$191,130,787	7.07%	\$13,503,891	\$14,100,694	\$27,604,585	\$6,762,629	\$20,841,956	\$24,116,619	116%	\$3,274,664
Colorado	\$54,596,452	4.85%	\$2,648,807	\$2,185,834	\$4,834,641	\$819,995	\$4,014,647	\$1,903,073	47%	-\$2,111,573
Connecticut	\$34,811,035	7.33%	\$2,550,487	\$905,880	\$3,456,367	\$526,637	\$2,929,730	\$2,840,519	97%	-\$89,212
Delaware	\$1,961,753	6.31%	\$123,883	\$236,947	\$360,830	\$79,153	\$281,677	\$280,407	100%	-\$1,271
Florida	\$40,281,942	6.17%	\$2,483,643	\$2,682,437	\$5,166,080	\$772,653	\$4,393,427	\$3,501,282	80%	-\$892,145
Georgia	\$22,889,927	7.49%	\$1,714,408	\$1,674,041	\$3,388,449	\$826,840	\$2,561,609	\$2,857,440	112%	\$295,831
Hawaii	\$12,950,306	7.00%	\$906,521	\$584,470	\$1,490,992	\$268,354	\$1,222,637	\$876,760	72%	-\$345,878
Idaho	\$1,506,653	7.10%	\$106,972	\$440,220	\$547,193	\$253,207	\$293,986	\$394,422	134%	\$100,436
Illinois	\$136,881,554	6.96%	\$9,523,705	\$3,351,603	\$12,875,308	\$1,541,872	\$11,333,437	\$8,143,193	72%	-\$3,190,244
Indiana	\$17,326,203	6.75%	\$1,169,519	\$602,253	\$1,771,772	\$62,405	\$1,709,366	\$1,989,838	116%	\$280,471
Iowa	\$6,840,464	7.01%	\$479,728	\$881,056	\$1,360,783	\$505,976	\$854,807	\$777,309	91%	-\$77,498
Kansas	\$9,128,629	7.75%	\$707,469	\$552,423	\$1,259,892	\$436,267	\$823,625	\$921,493	112%	\$97,868

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Kentucky	\$42,916,062	4.57%	\$1,962,340	\$1,344,834	\$3,307,174	\$459,624	\$2,847,550	\$1,885,289	66%	-\$962,261
Louisiana	\$18,214,179	7.67%	\$1,396,832	\$754,930	\$2,151,762	\$599,520	\$1,552,242	\$2,117,818	136%	\$565,576
Maine	\$2,995,575	6.88%	\$205,946	\$293,786	\$499,732	\$196,064	\$303,668	\$411,397	135%	\$107,728
Maryland	\$22,584,000	7.36%	\$1,663,262	\$1,358,213	\$3,021,475	\$824,117	\$2,197,359	\$2,110,351	96%	-\$87,008
Massachusetts	\$35,710,159	7.50%	\$2,678,262	\$1,757,434	\$4,435,696	\$1,406,338	\$3,029,358	\$2,674,071	88%	-\$355,287
Michigan	\$32,483,291	7.49%	\$2,432,624	\$850,399	\$3,283,024	\$448,739	\$2,834,285	\$3,675,705	130%	\$841,420
Minnesota	\$37,198,871	5.70%	\$2,118,482	\$2,394,914	\$4,513,396	\$1,140,576	\$3,372,821	\$1,399,477	41%	-\$1,973,343
Mississippi	\$16,783,124	7.75%	\$1,300,692	\$710,195	\$2,010,887	\$595,085	\$1,415,802	\$1,073,116	76%	-\$342,685
Missouri	\$15,774,044	7.58%	\$1,196,427	\$1,233,899	\$2,430,326	\$931,469	\$1,498,857	\$1,582,607	106%	\$83,750
Montana	\$4,080,482	7.69%	\$313,807	\$257,534	\$571,341	\$211,668	\$359,673	\$362,690	101%	\$3,017
Nebraska	\$1,474,474	8.04%	\$118,563	\$361,308	\$479,872	\$249,491	\$230,380	\$320,606	139%	\$90,225
Nevada	\$13,319,492	7.50%	\$998,962	\$1,138,361	\$2,137,323	\$1,024,105	\$1,113,217	\$970,167	87%	-\$143,051
New Hampshire	\$4,965,063	7.25%	\$359,849	\$273,264	\$633,113	\$226,092	\$407,022	\$444,277	109%	\$37,255
New Jersey	\$142,288,433	7.41%	\$10,539,842	\$4,970,779	\$15,510,621	\$2,168,820	\$13,341,800	\$4,691,558	35%	-\$8,650,242
New Mexico	\$16,485,691	6.41%	\$1,056,961	\$879,231	\$1,936,192	\$591,229	\$1,344,963	\$738,207	55%	-\$606,756
New York	\$11,468,876	7.00%	\$802,821	\$3,678,776	\$4,481,597	\$361,411	\$4,120,187	\$4,989,268	121%	\$869,081
North Carolina	\$9,631,900	7.21%	\$694,086	\$2,370,680	\$3,064,766	\$1,383,612	\$1,681,154	\$2,207,884	131%	\$526,731
North Dakota	\$2,987,137	7.06%	\$210,885	\$244,878	\$455,763	\$164,401	\$291,362	\$198,577	68%	-\$92,785
Ohio	\$39,735,633	7.35%	\$2,920,649	\$3,071,713	\$5,992,362	\$3,055,314	\$2,937,048	\$3,748,626	128%	\$811,578
Oklahoma	\$8,548,375	7.47%	\$638,452	\$763,718	\$1,402,170	\$456,570	\$945,600	\$1,326,526	140%	\$380,926
Oregon	\$13,480,000	7.20%	\$970,560	\$1,108,200	\$2,078,760	\$13,046	\$2,065,714	\$1,439,274	70%	-\$626,440

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Pennsylvania	\$66,328,481	7.25%	\$4,808,815	\$2,855,906	\$7,664,721	\$1,470,963	\$6,193,758	\$6,522,941	105%	\$329,183
Rhode Island	\$5,454,061	7.00%	\$381,784	\$152,862	\$534,646	\$96,362	\$438,285	\$433,127	99%	-\$5,157
South Carolina	\$25,482,182	7.25%	\$1,847,458	\$1,103,205	\$2,950,663	\$1,046,631	\$1,904,033	\$1,710,476	90%	-\$193,557
South Dakota	-\$9,075	6.50%	-\$590	\$222,710	\$222,120	\$128,237	\$93,882	\$128,724	137%	\$34,842
Tennessee	\$1,695,312	7.31%	\$123,939	\$853,550	\$977,488	\$348,831	\$628,657	\$1,141,243	182%	\$512,586
Texas	\$55,145,722	6.87%	\$3,787,172	\$6,196,686	\$9,983,858	\$4,210,268	\$5,773,590	\$4,280,858	74%	-\$1,492,733
Utah	\$3,420,315	6.95%	\$237,712	\$642,590	\$880,302	\$37,553	\$842,749	\$1,177,968	140%	\$335,219
Vermont	\$2,283,896	7.93%	\$181,025	\$118,295	\$299,320	\$101,237	\$198,082	\$199,899	101%	\$1,816
Virginia	\$21,480,408	7.00%	\$1,503,629	\$1,888,831	\$3,392,460	\$891,439	\$2,501,020	\$2,554,085	102%	\$53,065
Washington	\$9,883,432	7.37%	\$728,406	\$1,931,582	\$2,659,988	\$1,100,150	\$1,559,838	\$2,827,714	181%	\$1,267,876
West Virginia	\$3,917,091	7.50%	\$293,782	\$281,951	\$575,733	\$164,283	\$411,449	\$678,234	165%	\$266,785
Wisconsin	-\$2,969,118	7.00%	-\$207,838	\$1,860,937	\$1,653,099	\$1,006,427	\$646,671	\$1,065,965	165%	\$419,294
Wyoming	\$2,700,673	6.71%	\$181,154	\$236,862	\$418,016	\$178,956	\$239,060	\$178,228	75%	-\$60,832

Note: Numbers may not be exact due to rounding.

* The assumed rate of return is weighted for the plans in each state by the net pension liability at the beginning of 2018.

† The normal cost refers to the cost of benefits earned by employees in any given year. Also called the service cost.

‡ The total expected cost represents the projected increase in the funding gap before taking employer and employee contributions into account. It is equal to the normal cost plus the assumed interest on the unfunded liability.

§ The employer contribution benchmark is the contribution level employers need to meet in order to keep pension debt from growing.

|| For net amortization, positive numbers mean expected progress in paying down pension debt. Negative numbers mean expected growth in pension debt.

Sources: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

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Appendix D: Details of changes to net pension liability, 2018

In thousands

State	Beginning of year net pension liability	End of year net pension liability	Total changes	Net amortization benchmark	Employer + other contributions	Net amortization	Change to reconcile	Investment experience	Benefit changes	Actuarial experience	Actuarial changes
Alabama	\$15,251,096	\$15,228,842	-\$22,254	\$1,369,188	\$1,293,504	-\$75,684	-\$97,938	-\$544,500	\$0	\$177,032	\$269,530
Alaska	\$7,243,003	\$6,929,477	-\$313,526	\$694,030	\$556,411	-\$137,619	-\$451,145	-\$17,225	\$0	-\$433,920	\$0
Arizona	\$27,416,368	\$25,215,806	-\$2,200,562	\$2,600,269	\$2,162,496	-\$437,773	-\$2,638,335	-\$826,137	-\$116,011	\$515,560	-\$2,211,747
Arkansas	\$7,853,261	\$6,508,389	-\$1,344,872	\$872,501	\$776,295	-\$96,206	-\$1,441,078	-\$959,873	\$0	\$34,562	-\$515,767
California	\$191,130,787	\$184,852,140	-\$6,278,647	\$20,841,956	\$24,116,619	\$3,274,664	-\$3,003,983	-\$3,031,295	\$668	\$2,158,587	-\$2,131,943
Colorado	\$54,596,452	\$31,507,099	-\$23,089,353	\$4,014,647	\$1,903,073	-\$2,111,573	-\$25,200,926	\$4,206,458	-\$5,980,577	\$889,134	-\$24,315,941
Connecticut	\$34,811,035	\$35,070,959	\$259,924	\$2,929,730	\$2,840,519	-\$89,212	\$170,712	\$74,367	\$510,940	-\$414,595	\$0
Delaware	\$1,961,753	\$1,761,069	-\$200,684	\$281,677	\$280,407	-\$1,271	-\$201,955	-\$285,729	\$11,154	\$89,307	-\$16,687
Florida	\$40,281,942	\$40,704,631	\$422,689	\$4,393,427	\$3,501,282	-\$892,145	-\$469,456	-\$3,049,099	\$0	\$742,984	\$1,836,659
Georgia	\$22,889,927	\$22,930,800	\$40,873	\$2,561,609	\$2,857,440	\$295,831	\$336,704	-\$1,164,304	\$72,381	\$1,084,627	\$344,000
Hawaii	\$12,950,306	\$13,318,993	\$368,687	\$1,222,637	\$876,760	-\$345,878	\$22,810	-\$101,944	\$0	\$124,753	\$0
Idaho	\$1,506,653	\$1,380,532	-\$126,121	\$293,986	\$394,422	\$100,436	-\$25,684	-\$167,683	\$83,585	-\$47,697	\$106,111
Illinois	\$136,881,554	\$140,593,161	\$3,711,607	\$11,333,437	\$8,143,193	-\$3,190,244	\$521,363	-\$797,304	-\$374,603	\$731,439	\$961,832
Indiana	\$17,326,203	\$14,571,271	-\$2,754,932	\$1,709,366	\$1,989,838	\$280,471	-\$2,474,461	-\$619,782	\$0	-\$169,086	-\$1,685,593
Iowa	\$6,840,464	\$6,481,626	-\$358,838	\$854,807	\$777,309	-\$77,498	-\$436,336	-\$363,061	-\$1,208	-\$140,228	\$68,161
Kansas	\$9,128,629	\$8,900,507	-\$228,122	\$823,625	\$921,493	\$97,868	-\$130,254	-\$83,111	\$0	-\$47,143	\$0
Kentucky	\$42,916,062	\$28,603,539	-\$14,312,523	\$2,847,550	\$1,885,289	-\$962,261	-\$15,274,784	-\$1,098,415	\$10,513	-\$19,567	-\$14,167,315
Louisiana	\$18,214,179	\$17,591,031	-\$623,148	\$1,552,242	\$2,117,818	\$565,576	-\$57,572	-\$696,779	\$658	-\$195,920	\$834,469

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Maine	\$2,995,575	\$2,665,535	-\$330,041	\$303,668	\$411,397	\$107,728	-\$222,312	-\$391,240	-\$106,123	\$35,815	\$239,236
Maryland	\$22,584,000	\$21,954,935	-\$629,065	\$2,197,359	\$2,110,351	-\$87,008	-\$716,073	-\$185,256	\$5,505	-\$653,748	\$117,426
Massachusetts	\$35,710,159	\$36,941,268	\$1,231,109	\$3,029,358	\$2,674,071	-\$355,287	\$875,822	-\$785,503	\$0	\$194,325	\$1,467,000
Michigan	\$32,483,291	\$37,602,953	\$5,119,662	\$2,834,285	\$3,675,705	\$841,420	\$5,961,081	-\$2,089,131	\$0	-\$64,336	\$8,114,548
Minnesota	\$37,198,871	\$15,188,717	-\$22,010,154	\$3,372,821	\$1,399,477	-\$1,973,343	-\$23,983,497	-\$2,573,005	-\$5,765,677	\$1,583	-\$15,646,398
Mississippi	\$16,783,124	\$16,809,495	\$26,371	\$1,415,802	\$1,073,116	-\$342,685	-\$316,314	-\$354,928	\$0	\$38,614	\$0
Missouri	\$15,774,044	\$16,635,515	\$861,471	\$1,498,857	\$1,582,607	\$83,750	\$945,221	-\$404,892	-\$8	-\$7,407	\$1,357,528
Montana	\$4,080,482	\$4,381,723	\$301,241	\$359,673	\$362,690	\$3,017	\$304,258	-\$109,601	\$0	\$207,538	\$206,321
Nebraska	\$1,474,474	\$1,526,977	\$52,503	\$230,380	\$320,606	\$90,225	\$142,728	\$119,428	\$88,636	-\$65,335	\$0
Nevada	\$13,319,492	\$13,651,509	\$332,017	\$1,113,217	\$970,167	-\$143,051	\$188,966	-\$315,116	\$0	\$504,082	\$0
New Hampshire	\$4,965,063	\$4,852,683	-\$112,380	\$407,022	\$444,277	\$37,255	-\$75,125	-\$108,669	\$0	\$29,109	\$4,435
New Jersey	\$142,288,433	\$130,717,090	-\$11,571,343	\$13,341,800	\$4,691,558	-\$8,650,242	-\$20,221,585	-\$6,169,156	\$0	\$850,491	-\$14,902,920
New Mexico	\$16,485,691	\$18,166,479	\$1,680,788	\$1,344,963	\$738,207	-\$606,756	\$1,074,032	-\$58,134	\$0	-\$74,477	\$1,206,643
New York	\$11,468,876	\$4,238,202	-\$7,230,674	\$4,120,187	\$4,989,268	\$869,081	-\$6,361,593	-\$7,838,038	\$0	\$1,476,445	\$0
North Carolina	\$9,631,900	\$12,509,924	\$2,878,024	\$1,681,154	\$2,207,884	\$526,731	\$3,404,755	-\$100,834	\$44,793	\$1,199,449	\$2,261,347
North Dakota	\$2,987,137	\$3,030,258	\$43,121	\$291,362	\$198,577	-\$92,785	-\$49,665	-\$86,485	\$0	-\$94,216	\$131,036
Ohio	\$39,735,633	\$50,018,612	\$10,282,979	\$2,937,048	\$3,748,626	\$811,578	\$11,094,557	\$7,711,615	\$0	-\$307,530	\$3,690,472
Oklahoma	\$8,548,375	\$7,397,822	-\$1,150,553	\$945,600	\$1,326,526	\$380,926	-\$769,626	-\$575,769	-\$113,763	-\$105,401	\$25,307
Oregon	\$13,480,000	\$15,148,600	\$1,668,600	\$2,065,714	\$1,439,274	-\$626,440	\$1,042,160	-\$1,272,440	\$0	\$74,300	\$2,240,300
Pennsylvania	\$66,328,481	\$68,835,965	\$2,507,484	\$6,193,758	\$6,522,941	\$329,183	\$2,836,667	\$3,414,973	\$0	-\$578,306	\$0
Rhode Island	\$5,454,061	\$5,481,096	\$27,035	\$438,285	\$433,127	-\$5,157	\$21,877	-\$50,633	\$0	\$72,627	-\$116
South Carolina	\$25,482,182	\$25,465,724	-\$16,458	\$1,904,033	\$1,710,476	-\$193,557	-\$210,015	-\$136,380	\$0	-\$73,635	\$0

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South Dakota	-\$9,075	-\$2,332	\$6,743	\$93,882	\$128,724	\$34,842	\$41,585	-\$145,567	\$0	\$5,221	\$181,932
Tennessee	\$1,695,312	\$1,139,335	-\$555,977	\$628,657	\$1,141,243	\$512,586	-\$43,391	-\$606,253	\$17,316	-\$32,315	\$577,861
Texas	\$55,145,722	\$76,472,542	\$21,326,821	\$5,773,590	\$4,280,858	-\$1,492,733	\$19,834,088	-\$274,164	\$2,825	\$68,677	\$20,036,750
Utah	\$3,420,315	\$5,448,659	\$2,028,344	\$842,749	\$1,177,968	\$335,219	\$2,363,563	\$2,338,849	\$0	\$24,714	\$0
Vermont	\$2,283,896	\$2,418,440	\$134,544	\$198,082	\$199,899	\$1,816	\$136,361	\$12,217	\$194	\$156,907	-\$32,957
Virginia	\$21,480,408	\$20,337,887	-\$1,142,521	\$2,501,020	\$2,554,085	\$53,065	-\$1,089,456	-\$240,348	\$10,811	-\$859,919	\$0
Washington	\$9,883,432	\$6,048,473	-\$3,834,959	\$1,559,838	\$2,827,714	\$1,267,876	-\$2,567,083	-\$1,546,224	\$175,100	-\$118,086	-\$1,077,873
West Virginia	\$3,917,091	\$3,357,120	-\$559,971	\$411,449	\$678,234	\$266,785	-\$293,186	-\$279,644	\$0	-\$14,504	\$962
Wisconsin	-\$2,969,118	\$3,557,687	\$6,526,805	\$646,671	\$1,065,965	\$419,294	\$6,946,099	\$11,552,920	\$0	-\$4,968,302	\$361,481
Wyoming	\$2,700,673	\$3,642,608	\$941,935	\$239,060	\$178,228	-\$60,832	\$881,102	\$882,867	\$0	-\$67,752	\$65,987
Total	\$1,276,007,674	\$1,237,791,374	-\$38,216,300	\$126,118,030	\$114,658,013	-\$11,460,017	-\$49,676,317	-\$10,189,958	-\$11,422,892	\$1,934,455	-\$29,997,922

Sources: Comprehensive annual financial reports, actuarial reports and valuations, or other public documents, or as provided by plan

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Appendix E: Debt drivers

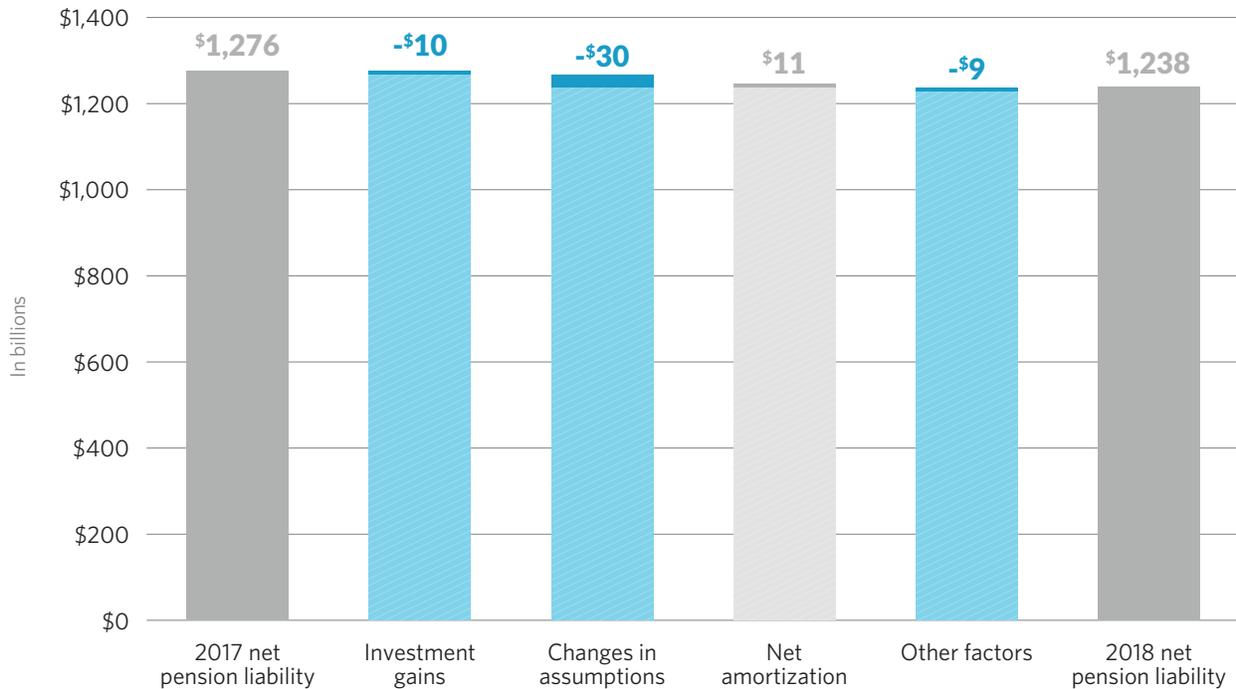
States' improved fiscal position in 2018 was driven by strong investment returns—8.6% for those reporting on a fiscal year ending June 30—that exceeded plan assumptions. On their own, investment returns lowered the cumulative funding gap by more than \$10 billion, although this reduction was offset by insufficient contributions. Average performance through the following fiscal year ending June 30, 2019, was under 7%¹⁰. Economic conditions in the third quarter of fiscal year 2020 point to a shortfall in meeting investment targets and an increase in unfunded liabilities of up to \$500 billion, nine months through the fiscal year.

States cannot rely on investment income alone to chip away at their accumulated pension debt. Pew has collected annual financial data on state-run pension systems since before the recession. But even after a decade of economic recovery, states have made limited progress in paying down pension debt. In fact, since 2007 the shortfall between actual contributions to state pension plans and minimum actuarial funding standards was \$200 billion.¹¹

Changes to plan assumptions also decreased reported liabilities by \$30 billion in 2018; however, that result is driven by Colorado, Kentucky, Minnesota, and New Jersey, where improvements in funded status allowed plans to substantially increase their discount rates. The remaining 46 states reported an increase in liabilities of \$39 billion from assumption changes.

Change in Pension Debt

Strong investment performance and changes in assumptions reduced reported pension debt by \$10 billion and \$30 billion, respectively



Source: Comprehensive annual financial reports, actuarial reports and valuations, other public documents, or as provided by plan officials

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Appendix F: Net amortization benchmark

The benchmark is calculated by taking the sum of service cost (the actuarial value of the benefits earned in 2018, also called normal cost) and interest on the net pension liability at the beginning of the year (each pension plan's total pension liability and the net pension liability both grow annually at the plan's assumed rate of return) and subtracting employee contributions. Employer and employee contributions are adjusted to reflect expected interest. After subtracting the \$43 billion contributed by workers nationwide in 2018 (including interest), employers would have needed to contribute \$126 billion to meet the net amortization benchmark to keep pension debt from growing. To actually make progress on closing the funding gap, states would have to exceed the contribution benchmark on a consistent basis.

Endnotes

- 1 See Appendix F for more information on the net amortization benchmark.
- 2 For example, the U.S. experienced annual gross domestic product (GDP) growth of more than 5.5% from 1988 through 2007, while the Congressional Budget Office now projects only 4% annual growth for the next decade. See Congressional Budget Office, “The Budget and Economic Outlook: 2019 to 2029” (2019), <https://www.cbo.gov/sstem/files/2019-03/54918-Outlook-3.pdf>.
- 3 See SEBAC 2017 Agreement, http://aftct.org/sites/aftct.org/files/sebac_2017_ta_signed.pdf, for details on Connecticut State Employees Retirement System (SERS) pension reforms.
- 4 See Fitch Ratings, “Connecticut Teacher Pension Changes Costly, but Lower Fiscal Risks,” Feb. 28, 2019, <https://www.fitchratings.com/site/pr/10064878>.
- 5 National Association of State Retirement Administrators, “NASRA Issue Brief: Public Pension Plan Investment Return Assumptions” (updated April 2014), <http://www.nasra.org/files/Issue%20Briefs/NASRAInvReturnAssumptBrief.pdf>.
- 6 Low return scenario assumes a 5% return.
- 7 K. Brainard and A. Brown, “In-Depth: Risk Sharing in Public Retirement Plans” (National Association of State Retirement Administrators, 2018).
- 8 GASB Statement 67 on Financial Reporting for Pension Plans does also require an adjustment to the discount rate assumptions—resulting in a higher reported pension liability—if current contribution policies are deemed insufficient. However, as of 2018 reporting, only nine of the largest 100 plans across the 50 states are required to make this adjustment, down from 15 in 2017.
- 9 The Pew Charitable Trusts, “Foundation for Public Pensions Risk Reporting” (2018), [https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/programs/Foundation%20for%20Pensions%20Risk%20Reporting%20\(Strawman\).pdf](https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/programs/Foundation%20for%20Pensions%20Risk%20Reporting%20(Strawman).pdf).
- 10 Wilshire Trust Universe Comparison Service and Wilshire TUCS are service marks of Wilshire Associates Inc. (“Wilshire”) and have been licensed for use by The Pew Charitable Trusts. All content of Wilshire TUCS is copyright 2019 Wilshire Associates Inc., all rights reserved.
- 11 Accounting standards changed in 2014. From 2007 to 2013, the shortfall is calculated between the actuarial recommended contribution and actual employer contributions. From 2014 to 2018, the shortfall represents the gap between the net amortization benchmark and employer contributions.

For further information, please visit:

pewtrusts.org/pensions

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