



# ESSAY

DECEMBER 2015



## THE FUNDING STATUS OF STATE AND LOCAL GOVERNMENT PENSIONS IN MISSOURI

*By Andrew Biggs, Ph.D.*

### SUMMARY

The financial condition of public employee pension plans is a front-burner policy issue for elected officials around the country. Pension plans in Missouri have suffered as investment returns have fallen short of projections and taxpayers have been obliged to make up the difference. Annual required contributions have increased substantially even as the funding health of most plans has

declined. Moreover, most economists believe that the official funding numbers published by public plans substantially overstate these plans' financial health and understate their unfunded liabilities. Most economists believe that public plans in the United States should follow accounting practices similar to those required of U.S. corporate pensions or those used by public employee plans in other countries. Using this alternative approach, which is often termed

ADVANCING LIBERTY WITH RESPONSIBILITY  
BY PROMOTING MARKET SOLUTIONS  
FOR MISSOURI PUBLIC POLICY

*Using standard actuarial valuation, Missouri plans are, on average, 78 percent funded and unfunded liabilities are slightly below \$17 billion.*

“fair market valuation,” pension liabilities would be discounted using an interest rate designed to match the risk of those liabilities. Because Missouri pension benefits are treated as guaranteed, the fair market approach dictates that benefits should be valued using a low interest rate derived from safe investments, as opposed to the current actuarial valuation practice in which liabilities are valued using the assumed return on a risky portfolio of investments. The fair market approach provides a more comprehensive view of the costs to which taxpayers are exposed. Using data on 90 Missouri state and local government plans, I compare funding levels and unfunded liabilities using actuarial valuation and fair market valuation. Using standard actuarial valuation, Missouri plans are, on average, 78 percent funded and unfunded liabilities are slightly below \$17 billion. Using a fair market approach, funding ratios lie between 41 and 52 percent and unfunded liabilities total from \$57 to \$89 billion.

### **BACKGROUND ON DEFINED BENEFIT PENSION PLANS IN THE PUBLIC SECTOR**

Most state and local government employees participate in a so-called “defined benefit” (DB) retirement plan. In a DB plan, the employer and employee make contributions, which are invested. At retirement, the employee receives a benefit based on a formula. The employer chooses how plan investments are allocated and bears the risk of the plan’s investments. By contrast, most private

sector workers participate in a defined contribution (DC) plan, which works differently. In a DC plan, employers and employees make contributions to an investment account owned and controlled by the employee. The employee chooses how to allocate his investments and bears the risks and rewards of those choices.

Defined benefit plans in the public sector are sometimes referred to as “final earnings” plans because of the way in which benefits are calculated. Typically, the benefit an employee is entitled to at retirement is a given percentage of his or her final salary multiplied by the number of years for which he was employed. For instance, a final earnings plan might offer benefits equal to 2 percent of final salary multiplied by the number of years of service. Thus, an employee who works for 35 years would receive a benefit equal to 70 percent of his final earnings.

There are numerous variations on this approach. The “multiplier” applied to final earnings might be altered based on the number of years of work the employee had. Likewise, final earnings might be calculated not based on a single year but the average over a small number of years prior to retirement. But the basic benefit formula is generally quite similar from one plan to another.

### **ACTUARIAL VALUATION OF PENSION FINANCING**

The finances of public employee pensions are analyzed using methods that are here termed “actuarial valuation.” The actuarial approach

is based upon the Government Accounting Standards Board (GASB), in particular GASB's Statements 67 and 68, which recommend that pensions' future benefit obligations be discounted to the present using the expected rate of return on the plan's portfolio of investments, which is generally between 7 and 8 percent. If the plan's investments receive the projected rate of return every year in the future, plan finances will turn out as projected, abstracting from errors in the other factors that plan actuaries must project. In effect, this approach amounts to a "best guess" of how a pension program's finances will evolve over time.

From this present value of plan benefits, a plan's finances are generally summarized in two ways: the ratio of assets to liabilities, known as the "funding ratio"; and the plan's unfunded liability, which represents liabilities net of assets. Ideally, a plan would have a funding ratio of 100 percent, meaning that it has all the assets needed to pay benefits, which similarly would mean that the plan has an unfunded liability of zero.

In addition, pension actuaries use measures of plan obligations to calculate the annual required contribution that would be sufficient to pre-fund benefits accruing in the current year as well as to pay off, generally over 20 to 30 years, any unfunded obligations the plan might have. In most cases, employees make a contribution to the plan to help cover the "normal cost" of the pension, which refers to the future benefits that employees earn in that year. The employer covers the remainder

of the normal cost and any cost of paying off unfunded liabilities from prior years. This implies that it is plan sponsors who bear the risk of the plan's investments: if the investments pay returns above the projected rate, then the sponsor can reduce its annual contributions in future years. However, if the plan's investments fail to generate the assumed rate of return, as has been common in recent years, then the employer must increase future contributions to make up the difference.

As will be discussed in the following section, most economists object to the idea of a discount rate being *chosen* based on the assumed return on plan assets. Instead, they argue, the appropriate discount rate is an immutable function of the risk characteristics of the liability. If accrued pension benefits are riskless, economists argue, they should be discounted using a riskless rate of return such as that on U.S. Treasury securities. Riskless securities offer a lower rate of return than risky assets, because part of the return on a risky asset is compensation to the holder for taking risk. The use of a lower discount rate would produce a higher present value of pension liabilities, and thus a lower funding ratio and larger unfunded liabilities. This latter approach is often referred to as "fair market valuation." These two approaches give very different types of information regarding the funding health and affordability of Missouri's public employee pension plans.

*The use of a lower discount rate would produce a higher present value of pension liabilities, and thus a lower funding ratio and larger unfunded liabilities. This latter approach is often referred to as "fair market valuation."*

## DISCUSSION OF ACTUARIAL AND ECONOMIC LIABILITIES

In deciding whether to sponsor a pension plan, how generous to make the benefits, and how much to require employees and taxpayers to contribute toward the plan, policymakers should consider the full economic costs of the pension system. The economic cost of providing a future pension benefit depends both upon how much the sponsor must pay and when the sponsor must pay it. All other things equal, smaller payments imply lower costs than higher payments. Investing a plan's assets in stocks or other high-returning investments should, at least on average, lower contribution costs for the plan.

But all other things are not equal: payments that must be made in difficult economic times, when a plan sponsor's resources are smaller and its other obligations greater, are more costly in an economic sense than payments made when the sponsor is flush with cash. In economists' terms, the marginal value of a dollar rises in times when money is scarce. This is precisely what has occurred with public pensions around the country: downturns in financial markets coincided with downturns in the economy, which meant that pension sponsors had to increase their contributions at precisely the time they were least able to: when tax revenues were down and other government obligations such as social services were higher. Washington State's actuary put it simply with regard to the state's pension experiences: "Weak economic

environments were correlated with weak investment returns. Lower investment returns created the need for increased contributions at a time when employers and members could least afford them."<sup>1</sup>

The volatility and timing of required pension contributions illustrates a key shortfall of the GASB actuarial approach to public pension valuation: GASB's pension liability measures do not reveal the significant financial and budgetary risk that a plan sponsor takes on when it guarantees future benefits but funds those benefits using risky assets. This no-matter-what, come-what-may promise constitutes a liability whose true value to pension participants and cost to pension sponsors significantly outstrips the pension "liabilities" disclosed in accounting documents.

Put simply, what is termed a "liability" under GASB accounting differs fundamentally from the legal or economic definition of a liability – so much so, that some market-oriented actuaries refuse to apply the term "liability" to the figures measured using the GASB approach. Economist Barton L. Waring writes, "When a liability is discounted at the wrong rate, its resulting 'value' becomes a term of art, expressed no longer in actual dollars but in some other unit of trade..."<sup>2</sup>

A GASB pension "liability" is the present value of contributions that, if invested at a *steady, guaranteed* rate of return, would be sufficient to meet benefit payments as they come due. But when a pension plan promises employees some future

*... payments that must be made in difficult economic times, when a plan sponsor's resources are smaller and its other obligations greater, are more costly in an economic sense than payments made when the sponsor is flush with cash.*

stream of benefits, the plan is not buying into the steady contribution rate that, at some steady rate of investment return, would fund those benefits. Rather, the plan agrees to bear *whatever* contribution rate is necessary to pay those benefits – on time and in full – regardless of the returns the plan’s investments might generate. *That* is a liability. In other words, the plan sponsor is liable for promised benefits not in one set of circumstances – in which the plan’s investments generate steady assumed returns, year-in and year-out – but in every set of circumstances, including those in which long-term investment returns may be far below projected levels. For instance, if the Missouri State Employee Retirement System (MOSERS) receives a 7 percent long-term return on its investments rather than its projected rate of 8 percent – a return well within the range of possibilities, and one that many investment experts believe is a much more likely outcome than receiving an 8 percent return – then the annual contribution required to fund MOSERS benefits rises from 15.95 percent of payroll to 20.99 percent, a nearly one-third increase.<sup>3</sup>

Among economists there is no mystery as to how to capture this broader economic cost. Economists and financial markets are adept at assigning prices to financial products with uncertain future returns. The way financial markets measure the value of this full set of possible outcomes is by discounting a liability at an interest rate commensurate with the risk of that liability. For simplicity, if we assumed that pension liabilities were as safe as U.S. Treasury

securities (or municipal bonds, or corporate bonds), we would discount those liabilities using those rates. Corporation pensions, for instance, are required to discount their liabilities using a corporate bond yield. This implicitly assumes that corporate pension benefits carry the same risk as corporate bonds. Corporate pensions also must pay off unfunded liabilities far more quickly than public sector plans, over seven years versus a public sector average of about 25 years. As a result, corporate pensions set aside at least twice as much money upfront to fund a given dollar of future benefits. While this may make corporate pensions appear more “expensive,” it also means that the benefits they promise to employees have much greater assets standing behind them.

Public employee pension plans in countries other than the United States generally discount their liabilities using some variant on a government bond yield.<sup>4</sup> This implies that public employee plans overseas, which presumably have all the economic advantages that are touted for public pension plans in the United States, nevertheless employ liability discount rates that are 1.5 to 5.6 percentage points lower than are used by U.S. public plans. These lower discount rates increase the measured value of pension liabilities and cause these overseas public plans to increase their contributions to cover the costs of future benefit payments.

Now, there is some disagreement among economists on what is the precisely appropriate discount rate to use for pension liabilities.<sup>5</sup> This disagreement occurs because there is

*The way financial markets measure the value of this full set of possible outcomes is by discounting a liability at an interest rate commensurate with the risk of that liability.*

*... there is no financial market instrument whose risk characteristics precisely match those of public pension benefits.*

no financial market instrument whose risk characteristics precisely match those of public pension benefits. However, there is nearly universal agreement that the expected rate of return on a risky portfolio of assets is *not* the appropriate discount rate to use. Indeed, in a 2014 survey of professional economists conducted by the University of Chicago Business School, 96 percent agreed with the statement, “By discounting pension liabilities at high interest rates under government accounting standards, many U.S. state and local governments understate their pension liabilities and the costs of providing pensions to public-sector workers.”<sup>6</sup> Others, including Nobel Prize winning economists, argue that valuing guaranteed pension obligations using an interest rate from a risky portfolio of investments is fundamentally misleading regarding the risks being placed on taxpayers.<sup>7</sup>

Some observers confuse the issue by stating that discounting pension liabilities using a risk-adjusted interest rate assumes that the plan itself will invest in such a low-risk asset. For instance, Girard Miller – at the time a columnist for *Governing* magazine and now the Chief Investment Officer of the Orange County Employees Retirement System, stated, “Pension funds are not going to invest their entire portfolio in 3 percent Treasury bonds right now – or ever – so the risk-free model is not even descriptive of reality and has little normative value.”<sup>8</sup>

An example illustrates why that is not the case. Imagine that a pension plan owes a single lump-sum payment

of \$1 million in 15 years’ time. The plan assumes a 7.7 percent return on investment, meaning that a lump sum contribution of about \$315,058 today would make the plan “fully funded” in terms of a GASB actuarial valuation. Realistically however, there’s a less than 50 percent chance that a \$315,058 investment today will end up reaching \$1 million 15 years from now.<sup>9</sup> So a liability that is termed “fully funded” is in fact less than “50-50 funded,” meaning that is only a roughly 50 percent chance of the plan being able to pay all its liabilities with the assets it has on hand.

To protect against a potential shortfall, the plan could purchase a “put option,” which is a financial product that would make up any difference between the fund’s actual value and its goal of \$1 million. A put option is, in effect, an insurance policy, whose cost depends upon the “strike price” at which the insurance policy kicks in, the risk of the assets being insured, and the rate of return available on riskless investment. That put option would cost about \$386,424, but would ensure with 100 percent certainty – not the 50-50 under GASB rules – that the full \$1 million benefit could be paid without returning to future taxpayers for a bailout. This “*true* full funding” helps maintain intergenerational equity, which in GASB’s terms means that “taxpayers of today pay for the services that they receive and the burden of payment for services today is not shifted to taxpayers of the future.”<sup>10</sup> GASB illustrates intergenerational equity terms such as “living within our means” and “fairness.” Similarly,

the American Academy of Actuaries calls intergenerational equity one of the “three primary objectives [that] need to be balanced” by pension policymakers.<sup>11</sup>

Of course, there’s also the chance that the plan’s investments would end up being worth *more* than \$1 million. In that case, intergenerational equity would be violated in the other direction, in the sense that today’s taxpayers would overpay and tomorrow’s taxpayers would reap the benefits. To address this, the plan could sell a “call option” that would give away any fund surplus over \$1 million. The sale of the call option, which would reap about \$3,805, would reduce costs to current taxpayers while ensuring that future taxpayers don’t reap a bonus.

So here’s what we have: a \$1 million liability that can be paid in full, without overcharging or undercharging either current or future generations. How much does it cost? This is the important part for the pension valuation debate: the sum of the initial \$315,058 investment in risky assets and the \$386,424 purchase of the put option protecting against funding shortfalls, minus the \$3,805 sale of the call option giving away any funding surpluses, comes to \$697,676. That figure is precisely equal to present value of the \$1 million future liability if discounted at the government bond yield.<sup>12</sup>

In other words, discounting pension liabilities using low-risk bond yields does not assume that the pension plan may invest only in low-risk bonds. The result found above will

be the same regardless of how the plan chooses to invest. A plan that makes smaller contributions in riskier investments has a lower initial contribution and, in the process, shifts larger net costs onto future generations. A plan that makes larger contributions but takes less investment risk bears more of the cost upfront and shifts smaller contingent liabilities onto future generations. However, the total cost does not change.

Nor is it necessary to assume that pension plans actually buy put or call options. Instead, the public is unknowingly providing what economists call an “implicit put option,” a contingent liability placed on future taxpayers to make good on promises made by taxpayers today. In other words, the prices of the options used above illustrate the value the public places on risk. Not purchasing options does not make risk disappear, but rather shifts risk onto the general public without telling the public the cost of the risk it must bear. In the Congressional Budget Office’s terms, the fair market value approach reflects “the cost of the risk to taxpayers that the rate of return on risky pension assets may not meet expectations.”<sup>13</sup> Discounting pension liabilities using an interest rate commensurate with the risk of those liabilities captures the full value of the pension promises being made. That’s how economists, financial markets, and most other pension systems – including U.S. corporate pensions and public employee plans in other countries – value obligations.

*... discounting pension liabilities using low-risk bond yields does not assume that the pension plan may invest only in low-risk bonds.*

*Even over long periods, risky investments are indeed risky.*

The GASB accounting approach, by contrast, assumes either that pension investments have no risk over the long-run or that the cost of this risk is inconsequential. The former view appears to be prevalent among pension stakeholders, but among experts is generally held to be incorrect.<sup>14</sup> Even over long periods, risky investments are indeed risky. The latter view is inconsistent with the notion of generational equity, in which each generation should pay its own fair share of pension liabilities. Pension trustees, elected officials, and voters need and deserve the information provided by the fair value approach in order to make informed choices regarding pension policy.

### **CHOOSING A DISCOUNT RATE TO VALUE PENSION LIABILITIES**

To calculate the fair market value of liabilities for Missouri local government plans, I revalue those plans' liabilities, as expressed in GASB valuations, using a discount rate that is more commensurate with the risk of the plans' liabilities. Courts in Missouri have ruled that pension formulas are binding agreements between employers and employees and that reducing vested benefits would constitute an impairment of contract.<sup>15</sup> Thus, accrued benefits are a binding liability on governments and should be valued as such.

The most important choice in calculating pension liabilities on a fair market value basis is the discount rate. Many analysts have argued that, because pensions advertise a no-matter-what, come-what-may

benefit and because benefits have generally been paid even when plan sponsors were in significant financial distress, pension liabilities should be discounted using the yield on guaranteed U.S. Treasury securities. For instance, the Society of Actuaries Blue Ribbon Panel recommended that, as a supplement to existing measures, plan sponsors calculate plan liabilities using the Treasury yield curve.<sup>16</sup> Public pension liabilities measured using Treasury yields might be considered a reasonable upward bound on their value.

Others have argued for valuing pension liabilities using corporate bond yields, as private sector pensions are required to do. This approach could be appropriate if we wished to value public and private pension liabilities on a uniform basis, a reason the federal government's Bureau of Economic Analysis cites in using corporate bond yields to value pension liabilities for the National Income and Product Accounts.<sup>17</sup> Up through 2012, Moody's Investors Services accepted pension liabilities as reported under GASB accounting rules. In that year, however, Moody's outlined plans for calculating pension liabilities using a common discount rate whose risk more closely matched that of pension benefit liabilities.<sup>18</sup> Moody's discounts pension liabilities using a high-grade corporate bond yield derived from the Citibank's Pension Discount Curve, which is based on corporate bonds rated Aa or better. This choice implicitly assumes that accrued public pension benefits carry the same average level of risk as corporate bonds, which likely overstates their risk. Thus, liabilities

calculated using a corporate bond yield might be considered a reasonable lower bound.

To illustrate a reasonable range of values, I recalculate local government pension liabilities using both a U.S. Treasury yield and a corporate bond yield. Moody's assumes that pensions have an average duration of liabilities of 13 years, which means that half of liabilities occur in the next 13 years and the remaining half after 13 years. For that reason, I use the Citibank yield for pensions with a "short" duration of liabilities, averaging 12.24 years. For the period from July 1, 2013 to June 31, 2014, the Citibank Pension Discount Curve averaged 4.26 percent.<sup>19</sup> The assumption of an average duration of 13 years allows for a recalculation of pension liabilities by first compounding reported liabilities forward at the plan's assumed investment return for 13 years, and then discounting back to the present using the corporate bond yield. Thus, what these figures roughly reflect is how public pension funding would look if it were judged on the same terms as corporate pensions. The yield on 10-year U.S. Treasury securities was 2.35 percent in 2013. Liabilities measured using this discount rate would reflect the cost of paying a benefit under almost all imaginable circumstances.

Funding ratios and unfunded liabilities on a fair value basis are calculated by comparing the market value of assets to the *market* value of liabilities. This differs from GASB accounting, where the "actuarial value" of assets is used. The actuarial value of assets is generally calculated by smoothing investment

returns over a given period, usually about 5 years, though a wide variety of methods are used. In certain cases the market value of assets is not available and the actuarial value of assets is used.

## DATA

Data are from the Joint Committee on Public Employee Retirement's (JCPER) 2015 Annual Report to The Missouri General Assembly, which compiles pension funding data for fiscal year 2013. The JCPER is statutorily required to compile these data each year for the benefit of policymakers. The data cover the very largest plans in the state – such as the Public School Retirement System and the Missouri State Employees Retirement System – down to much smaller local plans, such as the Little River Drainage District Retirement Plan.

One advantage of fair market valuation is that it allows for more direct comparisons of different plans. Currently, the 90 Missouri plans analyzed in this paper use very different investment return assumptions, and these assumptions have enormous effects on the measured liabilities for these plans – despite the fact that these liabilities carry the same legal protections and guarantees of payment. Figure 1 below shows the distribution of assumed investment returns. Two plans have assumed returns of 4.75 percent or less,<sup>20</sup> and another two have assumed returns of between 4.75 and 5.25 percent. Much more common are plans assuming substantially higher investment returns: 29 plans assume returns between 6.76 and 7.25

*Pension trustees, elected officials, and voters need and deserve the information provided by the fair value approach in order to make informed choices regarding pension policy.*

*... on paper at least, GASB accounting rules unequivocally state that a plan that takes greater investment risk immediately becomes “better funded.”*

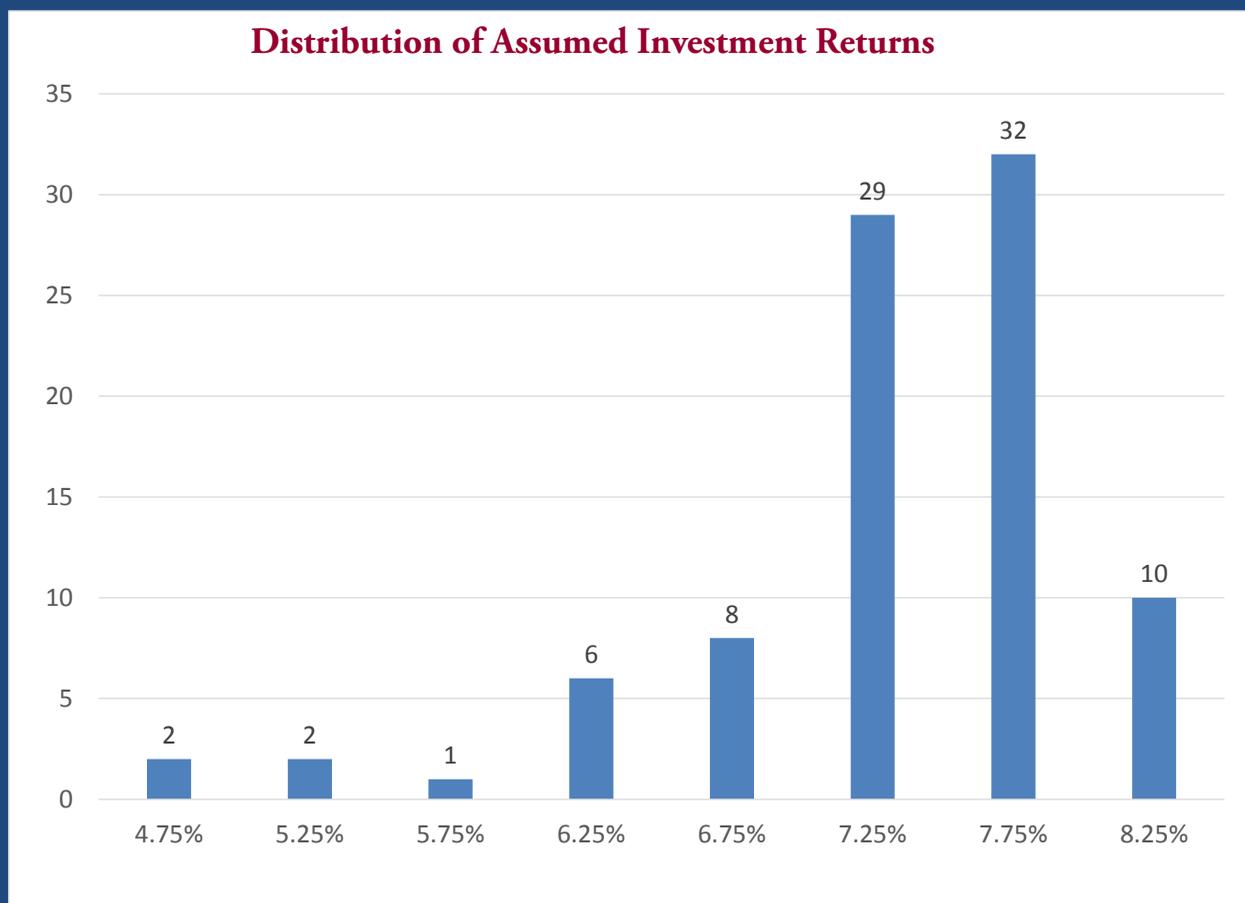
percent; 32 plans assume returns between 7.26 and 7.75 percent, and 10 plans assume returns between 7.76 and 8.25 percent.

Even among this universe of plans assuming higher returns, differences are meaningful: for instance, the Jackson County Employees Pension Plan – which assumes a 7.0 percent investment return – could instantly reduce its measured liabilities by \$25 million if it simply shifted to a riskier investment portfolio with an expected return of 8.0 percent. In reality, of course, the true cost of the Jackson County plan’s promised benefits would not change: it would make smaller contributions into a portfolio with higher risk, and the higher risk of that portfolio would mean more

volatile and potentially unpayable contribution levels in future years. But on paper at least, GASB accounting rules unequivocally state that a plan that takes greater investment risk immediately becomes “better funded.”

When plans are compared using a common discount rate, differences in plans’ choices regarding investment strategies are set aside and the reader is able to focus on the entirely separate issue of the size of the benefits promised by a plan. A plan that adopts a more aggressive funding strategy that assumes higher investment returns will invest smaller amounts in riskier assets and thus have more volatile contributions from year to year. A plan that adopts a more conservative funding strategy will

*Figure 1*



make larger average contributions, which are invested in safer assets that will produce a less volatile contribution path over time. However, the strategy adopted for funding a liability is different from the value of the liability itself. Valuing pension benefit liabilities using a common, risk-appropriate discount rate provides the best measure of the liabilities taken on by a plan and, by extension, by the taxpayer.

## VALUATION RESULTS

Results are shown in Tables 1, 1(a) and 1(b). Table 1 reports results from the JCPER report, in which plan financing is calculated using GASB methodology that discounts plan liabilities using the expected rate of return on plan assets. Table 1 reports the actuarial value of plan assets, actuarial liabilities, the unfunded liability, and the funding ratio. Table 1 also includes the assumed rate of return on plan assets, which is used to calculate the present value of plan liabilities. Tables 1(a) and 1(b) report the market value of plan assets and the market value of plan liabilities, with the latter calculated using a corporate bond yield in Table 1(a) and a Treasury yield in Table 1(b). Both Table 1(a) and Table 1(b) use the market value of plan assets and liabilities to calculate funding ratios and unfunded liabilities.

Under GASB methodology, Missouri plans range from a low funding ratio of 3 percent to a high of 187 percent, with a median funding ratio of 80 percent and a weighted average ratio of 78 percent. It should be noted that the 3 percent funding ratio in

2013 belonged to the Fire Fighters Retirement Plan of the City of Saint Louis'. Subsequent to the publication of the JCPER report, the City of Saint Louis made a substantial contribution to the plan, raising its funding ratio from 3 percent to 34 percent.<sup>21</sup> While still an extremely low level of funding health, this contribution kept the plan solvent and able to pay benefits. The best-funded plan, the Maplewood Police & Firemen Retirement Fund, is closed to new entrants. Total unfunded liabilities for Missouri state and local government plans included in the JCPER report equal \$16.953 billion.

Table 1(a) shows similar results, only here valuing liabilities using a corporate bond yield. This approach, which is consistent with the way Moody's Investors Services has chosen to value pension liabilities for purposes of bond ratings, treats government pensions equivalently to corporate pension plans. Under this approach, the median funding ratio declines to 56 percent while the minimum and maximum are 2 percent (again, the subsequently better-funded Saint Louis Fire Fighters plan) and 142 percent, respectively. The weighted average funding ratio is 52 percent, and unfunded liabilities are equal to \$57.3 billion.

Table 1(b) values Missouri pension liabilities using a U.S. Treasury yield of 2.35 percent. As would be expected, this approach produces the highest value of pension liabilities and thus the lowest funded ratios and highest unfunded liabilities. Using a Treasury-yield approach, which is

*Valuing pension benefit liabilities using a common, risk-appropriate discount rate provides the best measure of the liabilities taken on by a plan and, by extension, by the taxpayer.*

*If the full costs of DB pension plans in Missouri were known to policymakers and the public, it is more likely that these parties would demand more fundamental reforms to reduce costs and protect taxpayers and government budgets from excessive investment risk.*

consistent with most academic work on pension valuation as well as with the Society of Actuaries Blue Ribbon Panel's recommendations, the median funding ratio for Missouri plans falls to 44 percent, with a range from 1 percent to 112 percent. Aggregate funding falls to 41 percent, and total unfunded liabilities for Missouri state and local plans are equal to \$89.4 billion. The distribution of funding ratios under alternate valuation approaches is shown in Table 2.

The five best-funded Missouri plans on a fair market valuation basis are the Maplewood Police & Firemen Retirement Fund (112 percent funded), the Little River Drainage District Retirement Plan (80 percent), the Metro North Fire Protection District Retirement Plan (75 percent), the Community Fire Protection District Retirement Plan (70 percent), and the Jefferson City Firemen's Retirement System (67 percent). Three of the five best-funded plans are either closed or frozen.

The five poorest-funded plans are the Judicial Retirement System (13 percent); the Sedalia Police Retirement Fund (21 percent); Bi-State Development Agency Division 788, Clerical Unit A.T.U. (24 percent funded); the MoDOT & Highway Patrol Employees Retirement System (24 percent); and the Saint Louis City Firefighter's Retirement Plan (1 percent, though subsequent funding improvements took it to 34 percent in the most recent fiscal year).

The largest unfunded liabilities, measured using a Treasury yield, are the Public School Retirement System

(\$43.5 billion), the Missouri State Employees Retirement System (\$14.4 billion); the MoDOT & Highway Patrol Employees Retirement System (\$5.3 billion); the Public Education Employees Retirement System (\$4.7 billion); and the Local Government Employees Retirement System (\$4.7 billion).

Comparing figures calculated using a riskless discount rate to the GASB approach based upon the expected return on risky assets illustrates the degree to which a plan's "funding" depends upon realizing a risk premium that may or may not occur. In other words, part of a plan's funding health under GASB valuation is based upon the actual dollar value of the assets the plan holds. A second part of GASB "funding" is the assumption that the plan's assets will receive a premium return on risky assets. The figures above, which show a 78 percent average funding level using GASB valuation versus only 41 percent when liabilities are discounted using a riskless return, shows that nearly half of Missouri plans' funding health – 37 percentage points – is in reality not based on the current value of assets held by plans but on the expectation of receiving high investment returns in the future. The plan may receive those future returns, or it may not. But the taxpayer is liable for future benefit payments regardless.

## CONCLUSIONS

An important debate is taking place over how to measure the financial health of public employee pensions. On one side are the pension plans and the various groups that benefit

from these plans, which obviously include public employees but extend to actuarial firms, investment consultants, and others. On the other side are the vast majority of professional economists alongside nonpartisan government agencies such as the Congressional Budget Office, the Bureau of Economic Analysis, and experts from the Federal Reserve. These experts argue that state and local government plans should use accounting standards similar to those used by corporate pensions and by public employee pensions in other countries.

Even using standard actuarial analysis governed by GASB rules, state and local pension financing has suffered significantly in recent years and the taxpayer cost of maintaining such plans has increased substantially. Using more economically oriented methods, however, shows a far more challenging situation that demands greater policy action before it can be addressed. If the full costs of DB pension plans in Missouri were known to policymakers and the public, it is more likely that these parties would demand more fundamental reforms to reduce costs and protect taxpayers and government budgets from excessive investment risk.

Potential reforms range from incremental to fundamental. Incremental reforms include increases to employee contribution rates, which have been common in the wake of the Great Recession. Reductions in cost-of-living adjustments (COLAs) have also taken place, though less commonly and often under a legal cloud as to whether

such changes constitute reductions in accrued benefits. More fundamental reforms include greater risk-sharing between employers and employees. For instance, the State of Nevada at least formally requires employees to contribute half the total contribution, including amortization costs for unfunded liabilities, which shifts market risk away from taxpayers and onto public employees. More fundamental reforms include shifting newly-hired employees to defined contribution plans similar to 401(k)s. Alaska and Michigan are states that have undertaken such reforms.

It is for Missouri policymakers to decide what approach to favor. But in deciding upon pension policy, policymakers and citizens need an accurate view as to the relative costs and benefits of different approaches. More accurate pension accounting standards are first step in that direction.

---

*Andrew G. Biggs, Ph.D., Resident Scholar, The American Enterprise Institute*

---

*... in deciding upon pension policy, policymakers and citizens need an accurate view as to the relative costs and benefits of different approaches.*

## TABLES

Table 1

## Missouri Pension Assets, Liabilities, and Funding Ratios Using GASB Methodology

Plan Name	Actuarial Assets	Actuarial Liabilities	Unfunded Liability	Funding Ratio	Assumed Investment Return
Affton Fire Protection District	\$6,995,941	\$9,816,272	\$2,820,331	71%	6.5%
Antonia Fire Protection District Pension Plan <sup>1</sup>	\$1,501,224	\$2,093,678	\$592,454	72%	6.0%
Arnold Pension Police Plan	\$8,827,569	\$8,640,783	(\$186,786)	102%	6.5%
Berkeley Police & Fire Pension Fund	\$11,757,542	\$18,494,931	\$6,737,389	64%	7.5%
Bi-State Development Agency Division 788, A.T.U.	\$92,629,812	\$176,399,955	\$83,770,143	53%	7.25%
Bi-State Development Agency Local 2 I.B.E.W.2	\$2,400,205	\$3,342,338	\$942,133	72%	7.25%
Bi-State Development Agency Division 788, Clerical Unit A.T.U.	\$4,794,257	\$11,383,041	\$6,588,784	42%	7.25%
Bi-State Development Agency Salaried Employees	\$49,704,047	\$67,865,918	\$18,161,871	73%	7.5%
Black Jack Fire Protection District Retirement Plan	\$10,773,314	\$12,854,004	\$2,080,690	84%	7.0%
Bothwell Regional Health Center Retirement Plan <sup>2</sup>	\$43,331,426	\$48,386,017	\$5,054,591	90%	8.0%
Brentwood Police & Firemen's Retirement Fund	\$32,004,318	\$36,314,696	\$4,310,378	88%	7.0%
Bridgeton Employees Retirement Plan <sup>1</sup>	\$24,452,827	\$38,327,780	\$13,874,953	64%	7.5%
Carthage Police & Firemen's Pension Plan	\$6,693,549	\$8,449,252	\$1,755,703	79%	7.0%
Cedar Hill Fire Protection District Length of Service Awards Program	\$65,010	\$117,048	\$52,038	56%	4.75%
Clayton Non-Uniformed Employees Pension Plan	\$12,385,365	\$14,784,408	\$2,399,043	84%	7.0%
Clayton Uniformed Employees Pension Plan	\$36,876,487	\$39,590,741	\$2,714,254	93%	7.0%
Columbia's Firemen Retirement Plan	\$61,190,565	\$110,758,321	\$49,567,756	55%	7.5%
Columbia Police Retirement Plan	\$41,564,868	\$74,992,992	\$33,428,124	55%	7.5%
Community Fire Protection District Retirement Plan	\$22,968,764	\$18,500,803	(\$4,467,961)	124%	7.0%
County Employees Retirement Fund <sup>3</sup>	\$360,289,802	\$511,278,478	\$150,988,676	70%	8.0%
Creve Coeur Employees Retirement Plan <sup>2</sup>	\$17,979,590	\$25,144,283	\$7,164,693	72%	7.5%
Creve Coeur Fire Protection District Retirement Plan	\$8,713,275	\$9,255,005	\$541,730	94%	7.0%
Eureka Fire Protection District Retirement Plan	\$8,713,087	\$10,224,352	\$1,511,265	85%	7.0%
Fenton Fire Protection District Retirement Plan	\$24,253,963	\$28,691,151	\$4,437,188	85%	7.5%
Ferguson Pension Plan	\$22,015,577	\$22,059,641	\$44,064	100%	7.5%
Florissant Employees Pension Plan <sup>2</sup>	\$12,029,200	\$15,713,461	\$3,684,261	77%	6.0%
Florissant Valley Fire Protection District Retirement Plan	\$21,556,351	\$23,161,420	\$1,605,069	93%	6.75%
Glendale Pension Plan	\$4,946,663	\$6,844,239	\$1,897,576	72%	7.5%
Hannibal Police & Retirement Plan	\$12,616,812	\$24,262,236	\$11,645,424	52%	7.5%
Hazelwood City Council Members Retirement Plan	\$89,529	\$89,529	\$0	100%	7.5%
Hazelwood Retirement Plan	\$29,643,058	\$34,453,239	\$4,810,181	86%	7.5%
High Ridge Fire Protection District Pension Plan <sup>3</sup>	\$6,922,665	\$8,774,108	\$1,851,443	79%	7.0%
Jackson County Employees Pension Plan	\$192,022,046	\$250,552,204	\$58,530,158	77%	7.0%

Plan Name	Actuarial Assets	Actuarial Liabilities	Unfunded Liability	Funding Ratio	Assumed Investment Return
Jefferson City Firemen's Retirement System <sup>2</sup>	\$18,416,220	\$17,402,891	\$17,402,891	106%	6.0%
Jennings Police & Firemen's Retirement Fund <sup>2</sup>	\$5,604,265	\$8,554,488	\$8,554,488	66%	6.0%
Joplin Police & Fire Pension Plan	\$32,674,943	\$55,327,408	\$55,327,408	59%	7.0%
Judicial Retirement System	\$111,140,339	\$435,378,358	\$435,378,358	26%	8.0%
Kansas City Civilian Police Employees' Retirement System	\$113,170,844	\$148,662,779	\$148,662,779	76%	7.5%
Kansas City Employees' Retirement System	\$900,061,516	\$1,115,165,108	\$1,115,165,108	81%	7.5%
Kansas City Firefighter's Pension System	\$418,711,963	\$547,787,899	\$547,787,899	76%	7.75%
Kansas City Police Retirement System	\$749,617,334	\$964,302,215	\$964,302,215	78%	7.5%
Kansas City Public School Retirement System	\$710,828,744	\$875,451,114	\$875,451,114	81%	8.0%
Kansas City Area Transportation Authority Salaried Employees Pension	\$14,586,002	\$17,274,084	\$17,274,084	84%	7.5%
Kansas City Area Transportation Authority Union Employees Pension	\$39,432,485	\$56,277,872	\$16,845,387	70%	7.5%
Ladue Non-Uniformed Employees Retirement Plan	\$3,970,357	\$4,608,004	\$637,647	86%	7.0%
Ladue Police & Fire Pension Plan	\$26,010,558	\$36,417,906	\$10,407,348	71%	7.0%
LAGERS Staff Retirement Plan	\$7,084,227	\$8,203,335	\$1,119,108	86%	7.25%
Little River Drainage District Retirement Plan	\$1,140,945	\$1,020,392	(\$120,553)	112%	5.0%
Local Government Employees Retirement System	\$4,692,218,862	\$5,423,684,860	\$731,465,998	87%	7.25%
Maplewood Police & Firemen Retirement Fund <sup>2</sup>	\$12,893,481	\$6,877,127	(\$6,016,354)	187%	7.0%
Mehlville Fire Protection District Retirement Plan	\$5,502,468	\$12,563,061	\$7,060,593	44%	5.0%
Metro North Fire Protection District Retirement Plan <sup>1</sup>	\$1,188,692	\$892,803	(\$295,889)	133%	7.0%
Metro Saint Louis Sewer District Employees Pension Plan <sup>2</sup>	\$237,432,706	\$275,656,711	\$38,224,005	86%	7.25%
Metro West Fire Protection District Retirement Plan	\$41,726,629	\$52,467,083	\$10,740,454	80%	7.0%
Mid-County Fire Protection District Retirement Plan <sup>3</sup>	\$2,089,154	\$2,325,346	\$236,192	90%	7.0%
Missouri Higher Education Loan Authority Pension Plan	\$31,487,722	\$31,459,436	(\$28,286)	100%	6.75%
Missouri State Employees Retirement System	\$8,096,436,929	\$11,134,637,484	\$3,038,200,555	73%	8.0%
MoDOT & Highway Patrol Employees Retirement System	\$1,657,402,393	\$3,583,975,557	\$1,926,573,164	46%	7.75%
North Kansas City Hospital Retirement Plan	\$232,307,626	\$207,320,000	(\$24,987,626)	112%	7.25%
North Kansas City Policeman's & Firemen's Retirement Fund	\$42,131,291	\$45,675,222	\$3,543,931	92%	6.5%
Olivette Salaried Employees' Retirement Plan	\$19,030,485	\$23,421,613	\$4,391,128	81%	7.25%
Overland Non-Uniform Employees Pension Plan	\$9,858,128	\$12,281,939	\$2,423,811	80%	7.5%
Overland Police Retirement Fund	\$13,942,330	\$19,506,350	\$5,564,020	71%	7.5%
Pattonville-Bridgeton Fire Protection District Retirement Plan	\$24,713,305	\$31,622,661	\$6,909,356	78%	7.75%
Poplar Bluff Police & Fire Pension Plan	\$12,218,815	\$12,218,815	\$0	100%	5.75%
Prosecuting Attorneys' & Circuit Attorneys' Retirement System	\$32,001,750	\$37,435,553	\$5,433,803	85%	7.25%
Public Education Employees' Retirement System	\$3,237,199,555	\$3,967,618,752	\$730,419,197	82%	8.0%

Plan Name	Actuarial Assets	Actuarial Liabilities	Unfunded Liability	Funding Ratio	Assumed Investment Return
Public School Retirement System	\$29,443,146,872	\$36,758,165,411	\$7,315,018,539	80%	8.0%
Raytown Policemen's Retirement Fund <sup>1</sup>	\$10,434,102	\$16,493,351	\$6,059,249	63%	7.5%
Richmond Heights Police & Fire Retirement Plan	\$37,744,358	\$34,593,578	(\$3,150,780)	109%	7.5%
Rock Community Fire Protection District Retirement Plan	\$11,542,969	\$13,561,051	\$2,018,082	85%	7.5%
Rock Hill Police & Firemen's Pension Plan <sup>2</sup>	\$2,004,533	\$3,642,395	\$1,637,862	55%	6.0%
Saline Valley Fire Protection District Retirement Plan <sup>3</sup>	\$1,798,881	\$1,903,696	\$104,815	94%	7.0%
Sedalia Firemen's Retirement Fund	\$6,659,838	\$9,328,942	\$2,669,104	71%	7.0%
Sedalia Police Retirement Fund <sup>1</sup>	\$3,153,449	\$9,382,244	\$6,228,795	34%	6.0%
Sheriff's Retirement System	\$34,364,720	\$40,644,087	\$6,279,367	85%	6.5%
Springfield Police & Fire Retirement Fund <sup>2</sup>	\$251,103,602	\$375,635,753	\$124,532,151	67%	7.5%
Saint Joseph Policemen's Pension Fund	\$34,616,253	\$42,717,575	\$8,101,322	81%	7.5%
Saint Louis County Employees Retirement Plan	\$540,088,551	\$775,144,405	\$235,055,854	70%	8.0%
Saint Louis County Library District Employees Pension Plan	\$38,384,403	\$43,090,780	\$4,706,377	89%	7.25%
Saint Louis Employees Retirement System	\$685,397,323	\$889,448,579	\$204,051,256	77%	8.0%
Saint Louis City Firefighter's Retirement Plan	\$1,504,817	\$59,755,256	\$58,250,439	3%	7.625%
Saint Louis Firemen's Retirement System <sup>1</sup>	\$459,116,128	\$459,116,128	\$0	100%	7.625%
Saint Louis Police Retirement System	\$690,731,190	\$879,906,781	\$189,175,591	79%	7.75%
Saint Louis Public School Retirement System	\$922,922,386	\$1,093,394,768	\$170,472,382	84%	8.0%
University City Non-Uniformed Retirement Plan	\$17,811,583	\$22,598,553	\$4,786,970	79%	6.5%
University City Police & Fire Retirement Fund	\$26,144,233	\$32,308,830	\$6,164,597	81%	6.5%
University of MO Retirement, Disability, & Death Benefit Program	\$2,950,555,185	\$3,463,025,603	\$512,470,418	85%	7.75%
Valley Park Fire Protection District Retirement Plan	\$4,717,536	\$4,468,113	(\$249,423)	106%	7.5%
Warrenton Fire Protection District Length of Service Awards Program	\$178,851	\$260,525	\$81,674	69%	4.75%

<sup>1</sup>Plan is frozen.

<sup>2</sup>Plan is closed.

<sup>3</sup>Plan has defined contribution component.

Table 1a

### Missouri Pension Assets, Liabilities, and Funding Ratios Using Corporate Bond Yield (4.26%)

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Affton Fire Protection District	\$7,173,934	\$12,940,800	\$5,766,866	55%
Antonia Fire Protection District Pension Plan <sup>1</sup>	\$1,756,378	\$2,596,305	\$839,927	68%
Arnold Police Pension Plan	\$8,827,568	\$11,391,152	\$2,563,584	77%
Berkeley Police & Fire Pension Fund	\$12,181,113	\$27,531,659	\$15,350,546	44%
Bi-State Development Agency Division 788, A.T.U.	\$97,975,716	\$254,761,040	\$156,785,324	38%
Bi-State Development Agency Local 2 I.B.E.W. <sup>2</sup>	\$2,504,459	\$4,827,085	\$2,322,626	52%
Bi-State Development Agency Division 788, Clerical Unit A.T.U.	\$5,118,949	\$16,439,660	\$11,320,711	31%
Bi-State Development Agency Salaried Employees	\$50,848,421	\$101,025,590	\$50,177,169	50%
Black Jack Fire Protection District Retirement Plan	\$10,773,314	\$18,009,314	\$7,236,000	60%
Bothwell Regional Health Center Retirement Plan <sup>2</sup>	\$43,331,426	\$76,506,499	\$33,175,073	57%
Brentwood Police & Firemen's Retirement Fund	\$31,815,681	\$50,879,303	\$19,063,622	63%
Bridgeton Employees Retirement Plan <sup>1</sup>	\$25,278,995	\$57,054,950	\$31,775,955	44%
Carthage Police & Firemen's Pension Plan	\$6,288,542	\$11,837,964	\$5,549,422	53%
Cedar Hill Fire Protection District Length of Service Awards Program	\$65,010	\$124,404	\$59,394	52%
Clayton Non-Uniformed Employees Pension Plan	\$12,563,070	\$20,713,938	\$8,150,868	61%
Clayton Uniformed Employees Pension Plan	\$34,557,423	\$55,469,260	\$20,911,837	62%
Columbia Firemen Retirement Plan	\$60,876,677	\$164,875,464	\$103,998,787	37%
Columbia Police Retirement Plan	\$42,007,703	\$111,634,993	\$69,627,290	38%
Community Fire Protection District Retirement Plan	\$22,968,765	\$25,920,855	\$2,952,090	89%
County Employees Retirement Fund <sup>3</sup>	\$417,200,061	\$808,417,982	\$391,217,921	52%
Creve Coeur Employees Retirement Plan <sup>2</sup>	\$18,172,066	\$37,429,922	\$19,257,856	49%
Creve Coeur Fire Protection District Retirement Plan	\$9,998,240	\$12,966,877	\$2,968,637	77%
Eureka Fire Protection District Retirement Plan	\$9,047,042	\$14,324,997	\$5,277,955	63%
Fenton Fire Protection District Retirement Plan	\$24,690,991	\$42,709,810	\$18,018,819	58%
Ferguson Pension Plan	\$21,412,846	\$32,838,107	\$11,425,261	65%
Florissant Employees Pension Plan <sup>2</sup>	\$12,029,200	\$19,485,777	\$7,456,577	62%
Florissant Valley Fire Protection District Retirement Plan	\$22,485,210	\$31,478,737	\$8,993,527	71%
Glendale Pension Plan	\$4,922,234	\$10,188,373	\$5,266,139	48%
Hannibal Police & Retirement Plan	\$12,636,059	\$36,116,902	\$23,480,843	35%
Hazelwood City Council Members Retirement Plan	\$89,529	\$133,273	\$43,744	67%
Hazelwood Retirement Plan	\$30,014,407	\$51,287,287	\$21,272,880	59%
High Ridge Fire Protection District Pension Plan <sup>3</sup>	\$7,173,456	\$12,293,109	\$5,119,653	58%
Jackson County Employees Pension Plan	\$208,173,540	\$351,040,294	\$142,866,754	59%

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Jefferson City Firemen's Retirement System <sup>2</sup>	\$18,416,220	\$21,580,787	\$3,164,567	85%
Jennings Police & Firemen's Retirement Fund <sup>2</sup>	\$5,604,265	\$10,608,156	\$5,003,891	53%
Joplin Police & Fire Pension Plan	\$33,287,630	\$77,517,377	\$44,229,747	43%
Judicial Retirement System	\$111,203,538	\$688,407,021	\$577,203,483	16%
Kansas City Civilian Police Employees' Retirement System	\$108,517,949	\$221,300,255	\$112,782,306	49%
Kansas City Employees' Retirement System	\$947,069,626	\$1,660,041,098	\$712,971,472	57%
Kansas City Firefighter's Pension System	\$434,142,532	\$840,439,956	\$406,297,424	52%
Kansas City Police Retirement System	\$717,317,928	\$1,435,465,741	\$718,147,813	50%
Kansas City Public School Retirement System	\$726,553,301	\$1,384,236,681	\$657,683,380	52%
Kansas City Area Transportation Authority Salaried Employees Pension	\$15,524,463	\$25,714,299	\$10,189,836	60%
Kansas City Area Transportation Authority Union Employees Pension	\$41,775,903	\$83,775,559	\$41,999,656	50%
Ladue Non-Uniformed Employees Retirement Plan	\$4,207,065	\$6,456,120	\$2,249,055	65%
Ladue Police & Fire Pension Plan	\$27,602,346	\$51,023,907	\$23,421,561	54%
LAGERS Staff Retirement Plan	\$7,288,012	\$11,847,453	\$4,559,441	62%
Little River Drainage District Retirement Plan	\$1,140,945	\$1,118,659	-\$22,286	102%
Local Government Employees Retirement System	\$5,326,275,641	\$7,833,015,585	\$2,506,739,944	68%
Maplewood Police & Firemen Retirement Fund <sup>2</sup>	\$13,696,491	\$9,635,312	-\$4,061,179	142%
Mehlville Fire Protection District Retirement Plan	\$4,387,562	\$13,772,919	\$9,385,357	32%
Metro North Fire Protection District Retirement Plan <sup>1</sup>	\$1,188,691	\$1,250,876	\$62,185	95%
Metro Saint Louis Sewer District Employees Pension Plan <sup>2</sup>	\$246,247,278	\$398,110,025	\$151,862,747	62%
Metro West Fire Protection District Retirement Plan	\$41,726,629	\$73,509,871	\$31,783,242	57%
Mid-County Fire Protection District Retirement Plan <sup>3</sup>	\$2,089,154	\$3,257,964	\$1,168,810	64%
Missouri Higher Education Loan Authority Pension Plan	\$31,487,722	\$42,756,589	\$11,268,867	74%
Missouri State Employees Retirement System	\$7,993,837,570	\$17,605,750,206	\$9,611,912,636	45%
MoDOT & Highway Patrol Employees Retirement System	\$1,685,732,710	\$5,498,690,761	\$3,812,958,051	31%
North Kansas City Hospital Retirement Plan	\$232,307,626	\$299,416,510	\$67,108,884	78%
North Kansas City Policeman's & Firemen's Retirement Fund	\$44,290,031	\$60,213,684	\$15,923,653	74%
Olivette Salaried Employees' Retirement Plan	\$19,030,485	\$33,826,054	\$14,795,569	56%
Overland Non-Uniform Employees Pension Plan	\$9,274,897	\$18,282,964	\$9,008,067	51%
Overland Police Retirement Fund	\$12,676,129	\$29,037,263	\$16,361,134	44%
Pattonville-Bridgeton Fire Protection District Retirement Plan	\$27,904,194	\$48,516,858	\$20,612,664	58%
Poplar Bluff Police & Fire Pension Plan	\$11,914,830	\$14,694,121	\$2,779,291	81%
Prosecuting Attorneys' & Circuit Attorneys' Retirement System	\$31,927,976	\$54,065,322	\$22,137,346	59%
Public Education Employees' Retirement System	\$3,316,512,796	\$6,273,478,123	\$2,956,965,327	53%

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Public School Retirement System	\$29,443,146,872	\$58,120,893,400	\$27,745,476,607	52%
Raytown Policemen's Retirement Fund <sup>1</sup>	\$10,434,102	\$24,552,096	\$14,370,554	41%
Richmond Heights Police & Fire Retirement Plan	\$37,744,358	\$51,496,196	\$10,935,522	79%
Rock Community Fire Protection District Retirement Plan	\$11,542,969	\$20,187,057	\$7,940,492	61%
Rock Hill Police & Firemen's Pension Plan <sup>2</sup>	\$2,004,533	\$4,516,821	\$2,625,290	42%
Saline Valley Fire Protection District Retirement Plan <sup>3</sup>	\$1,798,881	\$2,667,205	\$868,324	67%
Sedalia Firemen's Retirement Fund	\$6,659,838	\$13,070,468	\$6,410,630	51%
Sedalia Police Retirement Fund <sup>1</sup>	\$3,153,449	\$11,634,631	\$8,481,182	27%
Sheriff's Retirement System	\$34,364,720	\$53,581,135	\$16,419,143	69%
Springfield Police & Fire Retirement Fund <sup>2</sup>	\$251,103,602	\$559,173,510	\$304,815,761	45%
Saint Joseph Policemen's Pension Fund	\$34,616,253	\$63,589,624	\$31,810,437	50%
Saint Louis County Employees Retirement Plan	\$540,088,551	\$1,225,634,762	\$645,421,310	47%
Saint Louis County Library District Employees Pension Plan	\$38,384,403	\$62,232,737	\$22,220,800	64%
Saint Louis Employees Retirement System	\$685,397,323	\$1,406,369,047	\$675,878,835	52%
Saint Louis City Firefighter's Retirement Plan	\$1,504,817	\$90,306,057	\$88,653,226	2%
Saint Louis Firemen's Retirement System <sup>1</sup>	\$459,116,128	\$693,846,368	\$195,489,700	72%
Saint Louis Police Retirement System	\$690,731,190	\$1,349,991,151	\$643,714,483	52%
Saint Louis Public School Retirement System	\$922,922,386	\$1,728,842,559	\$766,125,194	56%
University City Non-Uniformed Retirement Plan	\$17,811,583	\$29,791,692	\$13,777,211	54%
University City Police & Fire Retirement Fund	\$26,144,233	\$42,592,758	\$19,235,814	55%
University of MO Retirement, Disability, & Death Benefit Program	\$2,950,555,185	\$5,313,124,095	\$2,261,207,666	57%
Valley Park Fire Protection District Retirement Plan	\$4,717,536	\$6,651,258	\$1,933,722	71%
Warrenton Fire Protection District Length of Service Awards Program	\$178,851	\$276,899	\$98,048	65%
<b>Totals</b>	<b>\$60,918,229,735</b>	<b>\$118,191,087,286</b>	<b>\$57,272,857,551</b>	<b>52%</b>

<sup>1</sup>Plan is frozen.

<sup>2</sup>Plan is closed.

<sup>3</sup>Plan has defined contribution component.

*Table 1b***Missouri Pension Assets, Liabilities, and Funding Ratios Using Treasury Yield (2.35%)**

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Affton Fire Protection District	\$7,173,934	\$16,456,955	\$9,283,021	44%
Antonia Fire Protection District Pension Plan <sup>1</sup>	\$1,756,378	\$3,301,750	\$1,545,372	53%
Arnold Police Pension Plan	\$8,827,568	\$14,486,250	\$5,658,682	61%
Berkeley Police & Fire Pension Fund	\$12,181,113	\$35,012,308	\$22,831,195	35%
Bi-State Development Agency Division 788, A.T.U.	\$97,975,716	\$323,982,364	\$226,006,648	30%
Bi-State Development Agency Local 2 I.B.E.W. <sup>2</sup>	\$2,504,459	\$6,138,656	\$3,634,197	41%
Bi-State Development Agency Division 788, Clerical Unit A.T.U.	\$5,118,949	\$20,906,494	\$15,787,545	24%
Bi-State Development Agency Salaried Employees	\$50,848,421	\$128,475,333	\$77,626,912	40%
Black Jack Fire Protection District Retirement Plan	\$10,773,314	\$22,902,639	\$12,129,325	47%
Bothwell Regional Health Center Retirement Plan <sup>2</sup>	\$43,331,426	\$97,294,140	\$53,962,714	45%
Brentwood Police & Firemen's Retirement Fund	\$31,815,681	\$64,703,759	\$32,888,078	49%
Bridgeton Employees Retirement Plan <sup>1</sup>	\$25,278,995	\$72,557,396	\$47,278,401	35%
Carthage Police & Firemen's Pension Plan	\$6,288,542	\$15,054,466	\$8,765,924	42%
Cedar Hill Fire Protection District Length of Service Awards Program	\$65,010	\$158,207	\$93,197	41%
Clayton Non-Uniformed Employees Pension Plan	\$12,563,070	\$26,342,139	\$13,779,069	48%
Clayton Uniformed Employees Pension Plan	\$34,557,423	\$70,540,857	\$35,983,434	49%
Columbia Firemen Retirement Plan	\$60,876,677	\$209,673,907	\$148,797,230	29%
Columbia Police Retirement Plan	\$42,007,703	\$141,967,425	\$99,959,722	30%
Community Fire Protection District Retirement Plan	\$22,968,765	\$32,963,831	\$9,995,066	70%
County Employees Retirement Fund <sup>3</sup>	\$417,200,061	\$1,028,073,872	\$610,873,811	41%
Creve Coeur Employees Retirement Plan <sup>2</sup>	\$18,172,066	\$47,600,036	\$29,427,970	38%
Creve Coeur Fire Protection District Retirement Plan	\$9,998,240	\$16,490,118	\$6,491,878	61%
Eureka Fire Protection District Retirement Plan	\$9,047,042	\$18,217,253	\$9,170,211	50%
Fenton Fire Protection District Retirement Plan	\$24,690,991	\$54,314,526	\$29,623,535	45%
Ferguson Pension Plan	\$21,412,846	\$41,760,575	\$20,347,729	51%
Florissant Employees Pension Plan <sup>2</sup>	\$12,029,200	\$24,780,273	\$12,751,073	49%
Florissant Valley Fire Protection District Retirement Plan	\$22,485,210	\$40,031,850	\$17,546,640	56%
Glendale Pension Plan	\$4,922,234	\$12,956,664	\$8,034,430	38%
Hannibal Police & Retirement Plan	\$12,636,059	\$45,930,254	\$33,294,195	28%
Hazelwood City Council Members Retirement Plan	\$89,529	\$169,485	\$79,956	53%
Hazelwood Retirement Plan	\$30,014,407	\$65,222,596	\$35,208,189	46%
High Ridge Fire Protection District Pension Plan <sup>3</sup>	\$7,173,456	\$15,633,279	\$8,459,823	46%
Jackson County Employees Pension Plan	\$208,173,540	\$446,421,730	\$238,248,190	47%

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Jefferson City Firemen's Retirement System <sup>2</sup>	\$18,416,220	\$27,444,520	\$9,028,300	67%
Jennings Police & Firemen's Retirement Fund <sup>2</sup>	\$5,604,265	\$13,490,507	\$7,886,242	42%
Joplin Police & Fire Pension Plan	\$33,287,630	\$98,579,684	\$65,292,054	34%
Judicial Retirement System	\$111,203,538	\$875,454,637	\$764,251,099	13%
Kansas City Civilian Police Employees' Retirement System	\$108,517,949	\$281,429,923	\$172,911,974	39%
Kansas City Employees' Retirement System	\$947,069,626	\$2,111,092,179	\$1,164,022,553	45%
Kansas City Firefighter's Pension System	\$434,142,532	\$1,068,796,562	\$634,654,030	41%
Kansas City Police Retirement System	\$717,317,928	\$1,825,497,273	\$1,108,179,345	39%
Kansas City Public School Retirement System	\$726,553,301	\$1,760,348,725	\$1,033,795,424	41%
Kansas City Area Transportation Authority Salaried Employees Pension	\$15,524,463	\$32,701,152	\$17,176,689	47%
Kansas City Area Transportation Authority Union Employees Pension	\$41,775,903	\$106,538,283	\$64,762,380	39%
Ladue Non-Uniformed Employees Retirement Plan	\$4,207,065	\$8,210,317	\$4,003,252	51%
Ladue Police & Fire Pension Plan	\$27,602,346	\$64,887,654	\$37,285,308	43%
LAGERS Staff Retirement Plan	\$7,288,012	\$15,066,534	\$7,778,522	48%
Little River Drainage District Retirement Plan	\$1,140,945	\$1,422,610	\$281,665	80%
Local Government Employees Retirement System	\$5,326,275,641	\$9,961,330,450	\$4,635,054,809	53%
Maplewood Police & Firemen Retirement Fund <sup>2</sup>	\$13,696,491	\$12,253,330	-\$1,443,161	112%
Mehlville Fire Protection District Retirement Plan	\$4,387,562	\$17,515,170	\$13,127,608	25%
Metro North Fire Protection District Retirement Plan <sup>1</sup>	\$1,188,691	\$1,590,753	\$402,062	75%
Metro Saint Louis Sewer District Employees Pension Plan <sup>2</sup>	\$246,247,278	\$506,280,815	\$260,033,537	49%
Metro West Fire Protection District Retirement Plan	\$41,726,629	\$93,483,296	\$51,756,667	45%
Mid-County Fire Protection District Retirement Plan <sup>3</sup>	\$2,089,154	\$4,143,188	\$2,054,034	50%
Missouri Higher Education Loan Authority Pension Plan	\$31,487,722	\$54,374,016	\$22,886,294	58%
Missouri State Employees Retirement System	\$7,993,837,570	\$22,389,422,532	\$14,395,584,962	36%
MoDOT & Highway Patrol Employees Retirement System	\$1,685,732,710	\$6,992,744,381	\$5,307,011,671	24%
North Kansas City Hospital Retirement Plan	\$232,307,626	\$380,771,207	\$148,463,581	61%
North Kansas City Policeman's & Firemen's Retirement Fund	\$44,290,031	\$76,574,392	\$32,284,361	58%
Olivette Salaried Employees' Retirement Plan	\$19,030,485	\$43,016,959	\$23,986,474	44%
Overland Non-Uniform Employees Pension Plan	\$9,274,897	\$23,250,643	\$13,975,746	40%
Overland Police Retirement Fund	\$12,676,129	\$36,927,001	\$24,250,872	34%
Pattonville-Bridgeton Fire Protection District Retirement Plan	\$27,904,194	\$61,699,412	\$33,795,218	45%
Poplar Bluff Police & Fire Pension Plan	\$11,914,830	\$18,686,672	\$6,771,842	64%
Prosecuting Attorneys' & Circuit Attorneys' Retirement System	\$31,927,976	\$68,755,454	\$36,827,478	46%
Public Education Employees' Retirement System	\$3,316,512,796	\$7,978,049,830	\$4,661,537,034	42%

Plan Name	Market Value Of Assets	Market Value Of Liabilities	Unfunded Liability	Funding Ratio
Public School Retirement System	\$30,375,416,793	\$73,912,967,358	\$43,537,550,565	41%
Raytown Policemen's Retirement Fund <sup>1</sup>	\$10,181,542	\$31,223,165	\$21,041,623	33%
Richmond Heights Police & Fire Retirement Plan	\$40,560,674	\$65,488,268	\$24,927,594	62%
Rock Community Fire Protection District Retirement Plan	\$12,246,565	\$25,672,099	\$13,425,534	48%
Rock Hill Police & Firemen's Pension Plan <sup>2</sup>	\$1,891,531	\$5,744,091	\$3,852,560	33%
Saline Valley Fire Protection District Retirement Plan <sup>3</sup>	\$1,798,881	\$3,391,913	\$1,593,032	53%
Sedalia Firemen's Retirement Fund	\$6,659,838	\$16,621,855	\$9,962,017	40%
Sedalia Police Retirement Fund <sup>1</sup>	\$3,153,449	\$14,795,885	\$11,642,436	21%
Sheriff's Retirement System	\$37,161,992	\$68,139,707	\$30,977,715	55%
Springfield Police & Fire Retirement Fund <sup>2</sup>	\$254,357,749	\$711,106,987	\$456,749,238	36%
Saint Joseph Policemen's Pension Fund	\$31,779,187	\$80,867,611	\$49,088,424	39%
Saint Louis County Employees Retirement Plan	\$580,213,452	\$1,558,652,954	\$978,439,502	37%
Saint Louis County Library District Employees Pension Plan	\$40,011,937	\$79,142,043	\$39,130,106	51%
Saint Louis Employees Retirement System	\$730,490,212	\$1,788,494,694	\$1,058,004,482	41%
Saint Louis City Firefighter's Retirement Plan	\$1,652,831	\$114,843,188	\$113,190,357	1%
Saint Louis Firemen's Retirement System <sup>1</sup>	\$498,356,668	\$882,371,914	\$384,015,246	56%
Saint Louis Police Retirement System	\$706,276,668	\$1,716,798,315	\$1,010,521,647	41%
Saint Louis Public School Retirement System	\$962,717,365	\$2,198,587,739	\$1,235,870,374	44%
University City Non-Uniformed Retirement Plan	\$16,014,481	\$37,886,416	\$21,871,935	42%
University City Police & Fire Retirement Fund	\$23,356,944	\$54,165,670	\$30,808,726	43%
University of MO Retirement, Disability, & Death Benefit Program	\$3,051,916,429	\$6,756,757,249	\$3,704,840,820	45%
Valley Park Fire Protection District Retirement Plan	\$4,717,536	\$8,458,477	\$3,740,941	56%
Warrenton Fire Protection District Length of Service Awards Program	\$178,851	\$352,135	\$173,284	51%
<b>Totals</b>	<b>\$60,918,229,735</b>	<b>\$150,304,881,180</b>	<b>\$89,386,651,445</b>	<b>41%</b>

<sup>1</sup>Plan is frozen.

<sup>2</sup>Plan is closed.

<sup>3</sup>Plan has defined contribution component.

*Table 2***Distribution of Funding Ratios by Valuation Methodology**

Percentile of Plans	Expected Return (GASB method)	Corporate Bond Yield	Treasury Yield
5%	45%	31%	25%
10%	55%	38%	30%
25%	71%	50%	39%
50%	80%	56%	44%
75%	88%	65%	51%
90%	100%	77%	61%
95%	111%	83%	66%

**NOTES**

<sup>1</sup> Office of the (Washington) State Actuary, “Washington State 2009 Actuarial Valuation Report.” October 2010.

<sup>2</sup> Waring, M. Barton. Pension Finance: Putting the Risks and Costs of Defined Benefit Plans Back Under Your Control. Vol. 708. John Wiley & Sons, 2011.

<sup>3</sup> Missouri State Employees’ Retirement System. Annual Actuarial Valuation. June 30, 2014. <http://www.mosers.org/About-MOSERS/Annual-Report.aspx>.

<sup>4</sup> Van der Wal, Dirk. “The measurement of international pension obligations. Have we harmonised enough?” Netherlands Central Bank, Research Department, 2014.

<sup>5</sup> For a recent discussion see Brown, Jeffrey R. and George G. Pennacchi. “Discounting Pension Liabilities: Funding versus Value.” NBER Working Paper Number #21276. June 2015.

<sup>6</sup> “U.S. State Budgets (revisited).” Chicago Booth IGM Forum. August 26, 2014. [http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV\\_7ajlg33Q5Pff0Z7](http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV_7ajlg33Q5Pff0Z7)

<sup>7</sup> See “Harshes Critics of Public Pensions are Nobel Prize Winning Economists.” Mark Glennon. Wirepoints Illinois News Service. July 26, 2015. <http://www.wirepoints.com/harshes-critics-of-public-pensions-are-nobel-prize-winning-economists-wp-original/>

<sup>8</sup> Girard Miller. “Pension Puffery.” Governing Magazine. January 5, 2012.

<sup>9</sup> The reason is that the mean, or average, stock return is several percentage points higher than the median return. Thus, even if the average return is assumed to be 7.7 percent, less than 50 percent of outcomes will exceed that average.

<sup>10</sup> GASB. 2009. “The User’s Perspective: Interperiod Equity and What It Means to You” (June). [www.gasb.org/cs/ContentServer?c=GASBContent\\_C&pagename=GASB%2FGASBContent\\_C%2FUsersArticlePage&cid=1176156731381](http://www.gasb.org/cs/ContentServer?c=GASBContent_C&pagename=GASB%2FGASBContent_C%2FUsersArticlePage&cid=1176156731381).

<sup>11</sup> American Academy of Actuaries (2014).

<sup>12</sup> The Black-Scholes options pricing formula operates in continuous time, so the liability is discounted at the bond rate using a similar method. This produces small differences versus discount using annual compounding.

<sup>13</sup> Congressional Budget Office. “The Underfunding of State and Local Pension Plans.” May 2011.

<sup>14</sup> For instance, see Lubos Pastor and Robert F. Stambaugh, “Are Stocks Really Less Volatile in the Long Run?” Working Paper No. 14757 (Cambridge, Mass.: National Bureau of Economic Research, February

2009) and Zvi Bodie, “On the Risk of Stocks in the Long Run.” Working Paper No. 95-013 (Cambridge, Mass.: Harvard Business School, December 1994).

<sup>15</sup> See Firemen’s Retirement System v. City of Saint Louis, 2006 WL 2403955. Mo.App. E.D. Aug 22, 2006.

<sup>16</sup> Society of Actuaries Blue Ribbon Panel on Public Pension Plan Funding. “Report of the Blue Ribbon Panel on Public Pension Plan Funding.” Society of Actuaries. February 24, 2014.

<sup>17</sup> See Lenze, David G. State and Local Government Defined Benefit Pension Plans: Estimates of Liabilities and Employer Normal Costs by State, 2000-2011. No. 0104. Bureau of Economic Analysis, 2013.

<sup>18</sup> See Moody’s Investment Services. “Adjustments to US State and Local Government Reported Pension Data.” July 2012.

<sup>19</sup> Citibank also offers yield curves for liabilities averaging 15.04 and 18.92 years.

<sup>20</sup> These are plans that provide length of service awards to employees.

<sup>21</sup> See Firefighters Retirement Plan of the City of Saint Louis. Actuarial Valuation as of October 1, 2014. Performed by Cheiron. Released March 2015.



5297 Washington Place | Saint Louis, MO 63108 | 314-454-0647  
3645 Troost Avenue | Kansas City, MO 64109 | 816-287-0370

View State Government Spending: [showmeliving.org](http://showmeliving.org)

Use Our Interactive Database: [showmedata.org](http://showmedata.org)

Visit Us: [showmeinstitute.org](http://showmeinstitute.org)

Find Us on Facebook: [facebook.com/showmeinstitute](https://facebook.com/showmeinstitute)

Follow Us on Twitter: [twitter.com/showme](https://twitter.com/showme)