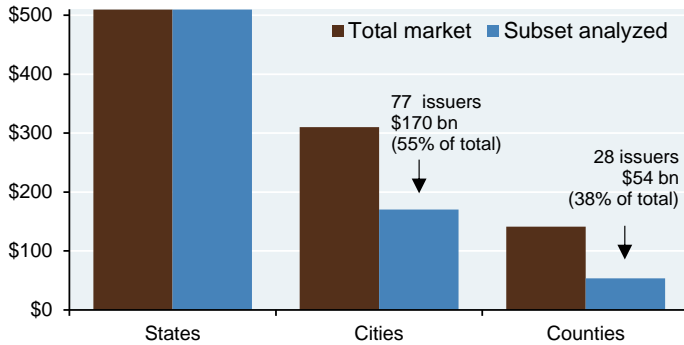


The ARC and the Covenants 3.0: US Cities and Counties

Our analysis of US cities and counties encompassed 470 single employer and multi-employer defined benefit plans across 77 of the largest cities and 28 of the largest counties. This sample accounts for over 50% of the net direct debt of US cities, and almost 40% of the net direct debt of US counties. As a result, we believe it is a representative sample.

State, city, and county net direct debt universe

Net direct debt (US\$ billions)

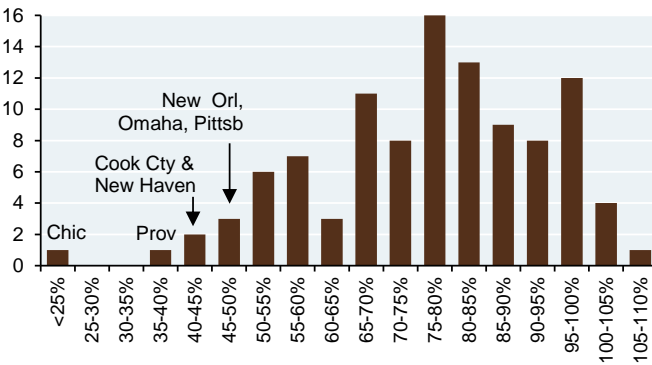


Source: J.P. Morgan Asset Management, Moody's. FY 2015.

The reason this issue gets so much attention: the **underfunded status of many municipal pension and OPEB plans** (OPEB = "other post-employment benefits", primarily retiree healthcare). The next charts show the distribution of *reported* pension and OPEB funding ratios (i.e., using their assumptions).

Distribution of reported pension funding ratios

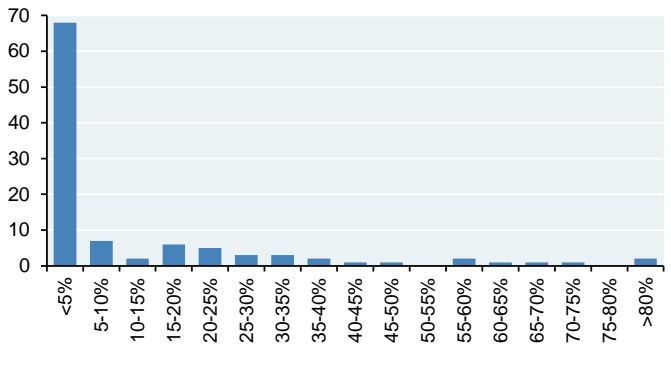
Number of cities/counties, N=105



Source: Center for Retirement Research at BC, City/county CAFRs. FY 2015.

Distribution of reported OPEB funding ratios

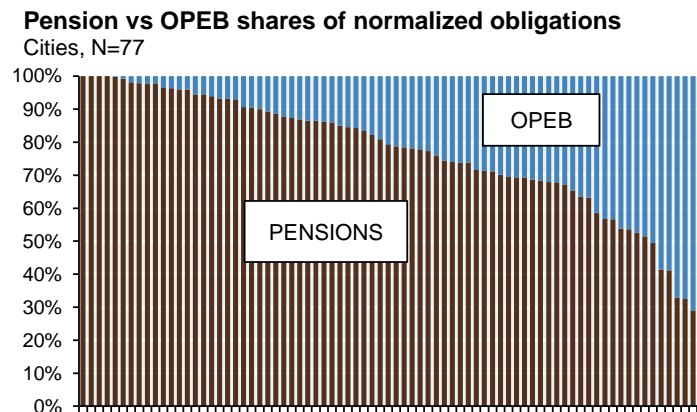
Number of cities/counties, N=105



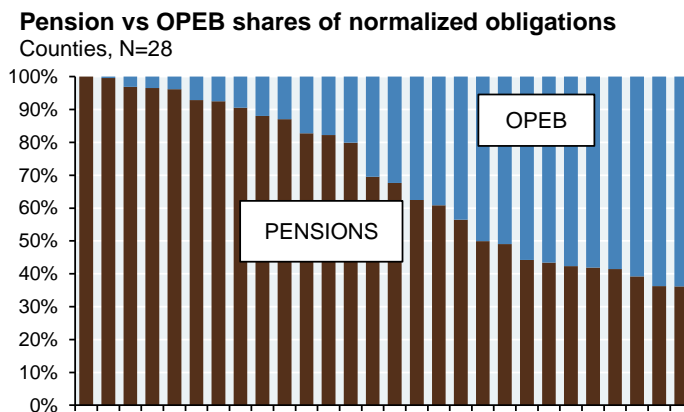
Source: Center for Retirement Research at BC, City/county CAFRs. FY 2015.

The median reported funding ratio for **pensions** is 75%-80%. In contrast, funding ratios for **OPEB** are much lower since only a few municipalities have made the decision to prefund them. Retiree healthcare is often referred to as a "soft" liability by actuaries, since unlike pensions, OPEB terms and conditions can generally be changed unilaterally. In exhibit SM9, we walk through some OPEB changes at the state level over the last few years. However, I think it's too cavalier to ignore them and simply assume that they will somehow disappear, or that public sector workers will end up being covered by the Affordable Care Act and completely relieve states, cities and counties of these obligations.

While OPEB funding ratios often are extremely low (if not zero), one mitigating factor is that **unfunded OPEB obligations are generally smaller than unfunded pensions**. The charts below show pension vs OPEB shares for cities and counties. For cities, the median pension share was 79%, while for counties, the median pension share was 69% (with wide distributions around the mean). For municipalities on the right side of both charts, changes to OPEB terms and conditions would have larger impacts on credit ratios, while for those on the left side, the credit risk consequences would be minimal.



Source: JPMAM, Center for Retirement Research at BC, FY 2015.



Source: JPMAM, Center for Retirement Research at BC, FY 2015.

Our IPOD credit ratio

Our approach to analyzing credit risk of US municipalities is based on an “IPOD” ratio:

Numerator (cost of debt) = interest on net direct debt (I) + current pension costs and amortization of unfunded pension balances (P) + current OPEB costs and amortization of unfunded OPEB balances (O) + current cost of defined contribution plans (D)

Denominator = revenues. These are the revenues the municipality can use to service its debts

Using this approach, we can compare what municipalities *currently* contribute to what they *would* have to contribute under another set of assumptions. Specifically, we vary the discount rate used to value pension and OPEB liabilities (i.e., the assumed portfolio return), and other assumptions such as the “amortization period”, which refers to the time frame over which unfunded amounts are paid down.

Why do we use a 6% discount rate?

This is a hotly debated topic in pension finance. Some pension plans have gradually been lowering their forward-looking return assumptions; the median pension discount rate used by municipalities in our sample was 7.5%. **We believe our 6% assumption is conservative, since it implies a forward-looking 4% real return assuming 2% inflation.** There’s a chart on page 8 showing real returns on a simplified stock/bond portfolio since 1956. A 4% real return would rank close to the lowest real 30-year compound returns of the post-war era.

An independent Blue Ribbon panel commissioned in 2014 by the US Society of Actuaries looked at the question of pension discount rates and historical returns. Their conclusion: “return experience does not readily suggest that return assumptions currently in use have been inconsistent with prior experience”⁴. However, the panel also concluded that while historical returns can be a useful reference point, return assumptions should ideally be based on a risk-free rate plus explicit forward-looking risk premia. As a separate risk measure, the panel recommended disclosure of plan liabilities using the risk-free rate.

⁴ “Report of the Blue Ribbon Panel on Public Pension Plan Funding”, An Independent Panel Commissioned by the Society of Actuaries, February 2014

Normalizing pension and OPEB obligations across municipalities

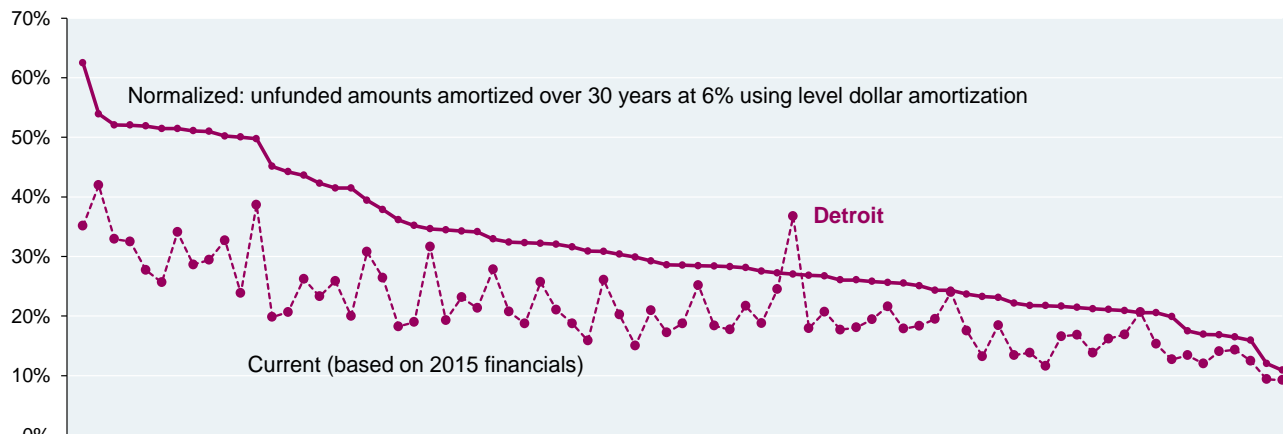
Most of the time, our normalized IPOD estimate of pension and OPEB costs is **higher** than what municipalities currently contribute. There are four primary reasons for this:

- Some municipalities do not meet the annual required contribution computed by their own actuaries. As with US states, pension ARC compliance is considerably higher than OPEB ARC compliance. Of 105 cities and counties in our universe, 97 contributed at least 80% of the pension ARC in FY2015, while only 37 contributed at least 80% of the OPEB ARC (see SM5)
- Some contribute 100% of their “required” contribution, but this contribution is sometimes set by statute (e.g., by the legislature) rather than by its actuaries
- We assume a 6% discount rate instead of the generally higher pension discount rates assumed by many municipalities; this increases the size of the gross and net pension liability (see SM3)
- We assume level dollar amortization instead of an approach more commonly used which assumes that ARC payments rise over time (“level percent”; see SM4)

The next charts compare what cities and counties *currently* contribute to what they would be paying under our normalized IPOD analysis. In essence, these charts show **municipal funding gaps**.

City IPOD ratios: current payments vs normalized payments

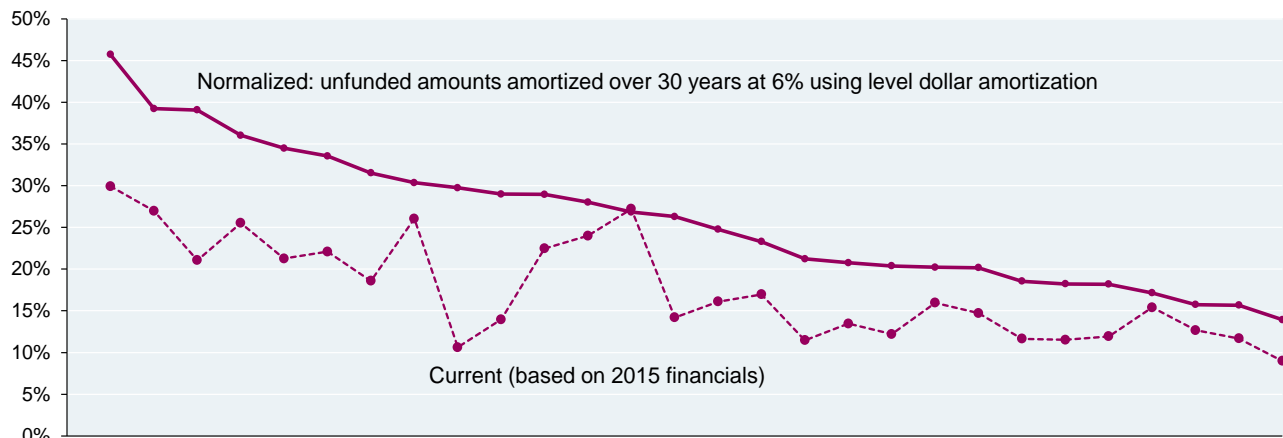
% of municipality's revenues



Source: J.P. Morgan Asset Management, Center for Retirement Research at B.C., City CAFRs, Moody's, FY 2015. Detroit FY 2015 current payment did not yet reflect bankruptcy and pension restructuring.

County IPOD ratios: current payments vs normalized payments

% of municipality's revenues



Source: J.P. Morgan Asset Management, Center for Retirement Research at B.C., County CAFRs, Moody's, FY 2015.

What options do municipalities have to close their funding gaps?

The table shows the cities and counties with the largest funding gaps. We refer to options for closing the gaps as the “**cost of remediation**”, measured as the increase in taxes, cuts in non-pension spending or increase in public sector worker contributions⁵ that would close the gap fully over time:

- All of these steps would need to take place every year for 30 years
- The tax increase would have to be a “dedicated” tax whose proceeds are only used to shore up underfunded pension and OPEB plans. In other words, a tax paid by all citizens to address issues affecting public sector workers. According to the BEA, public sector workers comprise 7% of the total workforce in the cities in our sample, and 15% of the workforce on a national level
- To be clear, this table assumes that (a) the municipality **wants** to fully close the gap over 30 years, and (b) believes that **6%** is the right discount rate assumption to use when estimating the cost
- Other remediation options include reductions in pension cost-of-living adjustments (COLA)⁶, and changes to terms and conditions for OPEB (see SM9 for OPEB scenario analysis)

Largest funding gaps				30-year remediation (mut. exclusive)								
City	Pension Funding Ratio (%)	Pension share of Pen+OPEB	OPEB Funding Ratio (%)	Current IPOD ratio	Normalized IPOD ratio	Funding gap: normalized minus current	Increase in revenues (taxes)	Cuts in direct non-pension spending	Increase in worker contributions			
Chicago	23%	98%	0%	35%	62%	27%	27%	or	14%	or	428%	
Houston	66%	81%	0%	24%	50%	26%	26%	or	23%	or	772%	
Austin	67%	69%	0%	26%	51%	26%	26%	or	28%	or	287%	
Dallas	54%	94%	0%	20%	45%	25%	25%	or	30%	or	459%	
Baton Rouge	71%	50%	0%	28%	52%	24%	24%	or	20%	or	525%	
Fort Worth	58%	77%	7%	21%	44%	24%	24%	or	20%	or	549%	
Oakland	72%	74%	0%	29%	51%	22%	22%	or	22%	or	462%	
Phoenix	52%	95%	32%	29%	51%	22%	22%	or	18%	or	404%	
Jersey City	56%	57%	0%	20%	41%	21%	21%	or	29%	or	510%	
Pittsburgh	45%	82%	2%	33%	52%	20%	20%	or	24%	or	333%	
Atlanta	69%	71%	0%	33%	52%	19%	19%	or	15%	or	329%	
Sacramento	77%	78%	2%	23%	42%	19%	19%	or	18%	or	301%	
Minneapolis	82%	98%	0%	18%	36%	18%	18%	or	13%	or	217%	
Los Angeles	84%	79%	67%	33%	50%	18%	18%	or	19%	or	228%	
Omaha	48%	86%	0%	26%	44%	17%	17%	or	19%	or	286%	
Honolulu	64%	54%	7%	34%	51%	17%	17%	or	21%	or	76121%	
Cleveland	80%	85%	29%	19%	35%	16%	16%	or	15%	or	207%	
El Paso	83%	89%	0%	26%	41%	16%	16%	or	16%	or	200%	
Columbus	73%	85%	25%	19%	34%	15%	15%	or	15%	or	243%	
Cincinnati	60%	87%	73%	16%	31%	15%	15%	or	15%	or	278%	
County												
Cook(IL)	41%	82%	0%	11%	30%	19%	19%	or	33%	or	577%	
King(WA)	84%	96%	0%	21%	39%	18%	18%	or	9%	or	301%	
Pr.Georges(MD)	61%	36%	2%	30%	46%	16%	16%	or	18%	or	783%	
LA(CA)	87%	50%	2%	14%	29%	15%	15%	or	14%	or	552%	
SanClara(CA)	77%	70%	29%	21%	34%	13%	13%	or	16%	or	282%	
Bergen(NJ)	55%	41%	0%	19%	32%	13%	13%	or	17%	or	558%	
Shelby(TN)	94%	61%	12%	27%	39%	12%	12%	or	16%	or	217%	
Suffolk(NY)	98%	42%	0%	14%	26%	12%	12%	or	11%	or	3855%	

Source: J.P. Morgan Asset Management, Center for Retirement Research at BC, City/county CAFRs. FY 2015.

⁵ The high figures in the worker contribution column for Honolulu and Suffolk County reflect the fact that their public sector workers have only recently begun contributing to pensions. As a result, the baseline amounts are small and would have to increase astronomically to close the funding gap on their own.

⁶ How would COLA adjustments impact this table? Take the example of Chicago. A 1% COLA reduction would reduce its liabilities by ~8%; its IPOD ratio would fall to 55%; and its required tax increase would fall to 20%.

Can municipalities earn their way out through higher investment returns?

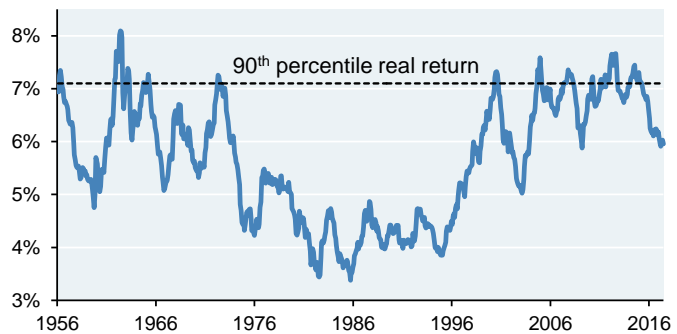
In the absence of remediation, and assuming contributions remain at current levels, what investment returns would be needed over the next 30 years to meet future projected obligations? In other words, “can municipalities earn their way out”?

The table shows breakeven annual returns required for pension and OPEB plans. “Con<Serv” means that the municipality is not contributing more than its current service costs, in which case a breakeven return is impossible since no assets accumulate to amortize unfunded amounts. “No Solution” means that the required return is > 50%. The middle column shows the share of unfunded amounts made up by pensions. For example, while Chicago and Phoenix have negative or low breakeven OPEB returns, their OPEB burdens are small to begin with, representing less than 5% of the pension + OPEB amount.

How high are these returns? The chart shows rolling 30-year real returns on a 70/30 stock bond portfolio since 1956. The 90th percentile of this real return distribution is 7.1%. Assuming 2.5% future inflation, the 90th percentile nominal return would be 9.6%. As a result, cities like Chicago, Dallas, Houston, Fort Worth, Phoenix, etc would have to earn among the highest real returns on record on (or above them) to “earn their way out” of underfunded pensions. A tall order at a time of low yields.

<i>Without remediation, required compound 30-year investment return on plan assets to pay down liabilities</i>			
City	B/E nominal pension return	Pension % of unfund. obligation	B/E nominal OPEB return
Chicago	17.9%	98%	-11.7%
Houston	10.0%	81%	Con<Serv
Austin	9.1%	69%	Con<Serv
Dallas	11.1%	94%	No solution
Baton Rouge	8.0%	50%	Con<Serv
Fort Worth	11.0%	77%	No solution
Oakland	8.1%	74%	No solution
Phoenix	11.2%	95%	6.7%
Jersey City	10.0%	57%	Con<Serv
Pittsburgh	11.5%	82%	No solution
Atlanta	8.2%	71%	No solution
Sacramento	7.9%	78%	Con<Serv
Minneapolis	8.3%	98%	No solution
Los Angeles	7.2%	79%	8.0%
Omaha	12.4%	86%	No solution
Honolulu	10.0%	54%	32.8%
Cleveland	8.3%	85%	16.2%
El Paso	8.0%	89%	Con<Serv
Columbus	8.9%	85%	18.7%
Cincinnati	9.3%	87%	8.8%
County			
Cook(IL)	Con<Serv	82%	Con<Serv
King(WA)	7.8%	96%	No solution
Pr.Georges(MD)	8.0%	36%	No solution
LA(CA)	7.0%	50%	Con<Serv
SanClara(CA)	8.2%	70%	10.9%
Bergen(NJ)	9.9%	41%	No solution
Shelby(TN)	7.4%	61%	19.7%
Suffolk(NY)	6.9%	42%	No solution

Historical real returns for hypothetical 70% stock, 30% bond portfolio, 30-year rolling real return



Source: JPMAM, Shiller, Ibbotson. June 2017. Past performance is not indicative of future results.

Source: J.P. Morgan Asset Management, Center for Retirement Research at BC, City/county CAFRs. FY 2015.

What might pension funding ratios look like in 10 years without remediation and assuming a conservative 6% return on plan assets?

This is a complex question, since unlike closed plans, most public plans are “open” and receive new contributions and accrue new liabilities each year. In SM8, we walk through our open plan model for estimating what funding ratios might be in 10 years. The results for some of the more highly indebted municipalities appear in the table. To be clear, there are **a lot of assumptions involved** in such an exercise (see box), and actual outcomes could differ substantially from our estimates.

In the table, we show two scenarios since municipalities can use either “level dollar” amortization or “level percent” amortization. As explained in SM4, level percent amortization results in lower ARC payments in early years, and higher ones in later years. When combined with an “open” amortization method (which recomputes ARC payments annually over the subsequent 30 years rather than for a fixed future date), level percent payments are consistently lower than level dollar, and result in lower funding ratios. Yes, I know it’s complicated; no one ever said actuarial pension math was simple.

Most pension funding ratios improve over time, or do not deteriorate very much. This suggests that many cities and counties have several years over which to address underfunded pensions, and that most of the time, there’s no “fuse” resulting in imminent, sharp declines in funded status. But to reiterate, **this assumes that municipalities consistently make the pension contributions specified in the table** (which has *not* always been the case), *and* that there is no major setback in asset values.

Estimated Year 10 pension funding ratios; sorted by current funding ratio

Municipality	Current contrib % of pension ARC	Current pension funding ratio	Year 10 funding ratio: level dollar	Year 10 funding ratio: level percent
Chicago	52%	23%	26%	15%
Providence	100%	39%	56%	43%
Cook (IL)	98%	41%	74%	65%
New Haven	100%	43%	60%	48%
New Orleans	88%	45%	56%	44%
Pittsburgh	118%	45%	69%	57%
Omaha	96%	48%	61%	50%
Philadelphia	78%	50%	50%	39%
Louisville	100%	51%	69%	59%
Phoenix	100%	52%	66%	56%
Dallas	90%	54%	70%	62%
Union (NJ)	100%	54%	77%	68%
Bergen (NJ)	100%	55%	77%	69%
Newark	100%	55%	79%	72%
Jersey City	100%	56%	76%	67%
Jacksonville	99%	57%	71%	62%
Fort Worth	86%	58%	67%	59%
Boston	100%	60%	73%	65%
Cincinnati	66%	60%	57%	49%
Glendale	100%	60%	67%	57%
Pr. Georges (MD)	100%	61%	71%	63%
Birmingham	51%	63%	57%	51%
Honolulu	109%	64%	74%	65%
Houston	88%	66%	66%	58%
Anchorage	100%	66%	71%	63%

Future pension funding ratio assumptions:

- Realized investment return of 6% (ex-post)
- Municipality maintains current contribution ratio relative to ARC
- Municipality maintains its current discount rate (ex-ante)
- Starting point is current funding ratio
- “Open” amortization method (rolling 30-year period rather than fixed date)
- Service costs equal to 3% of liabilities
- Payroll growth of 4%

Source: J.P. Morgan Asset Management, Center for Retirement Research at BC, City/county CAFRs. FY 2015.

Putting it all together: IPOD ratios and other factors affecting municipal credit risk

Understanding municipal credit risk requires synthesis of a lot of information, not just factors driving our IPOD ratios. When we look at the forest along with the trees, we have the greatest concerns about municipalities with high funding gaps; which do not have high revenue and/or population growth (making it harder to grow out of the problem); whose underfunding problems are mostly related to pensions rather than OPEB (limiting their flexibility); and whose pension dynamics deteriorate more rapidly over time. We created a risk indicator which synthesizes our IPOD ratio with these other factors. The risk indicator is shown in the last column, along with other summary statistics from this paper.

City	Largest funding gaps			30-year remediation (mut. exclusive)				W/O remediation, req. return on assets		Pension funding ratio		Risk indicator
	Current IPOD ratio	Norm. IPOD ratio	Funding gap	Tax increase	Cut in direct non-pension spending	Increase in worker contributions	B/E nom. pension return	B/E nom. OPEB return	Current	Est. in 10 yrs w/out remed @ 6% return*		
Chicago	35%	62%	27%	27%	or 14%	or 428%	17.9%	-11.7%	23%	15%	105	
Houston	24%	50%	26%	26%	or 23%	or 772%	10.0%	Con<Serv	66%	58%	83	
Austin	26%	51%	26%	26%	or 28%	or 287%	9.1%	Con<Serv	67%	67%	64	
Dallas	20%	45%	25%	25%	or 30%	or 459%	11.1%	No solution	54%	62%	101	
Baton Rouge	28%	52%	24%	24%	or 20%	or 525%	8.0%	Con<Serv	71%	67%	78	
Fort Worth	21%	44%	24%	24%	or 20%	or 549%	11.0%	No solution	58%	59%	75	
Oakland	29%	51%	22%	22%	or 22%	or 462%	8.1%	No solution	72%	71%	81	
Phoenix	29%	51%	22%	22%	or 18%	or 404%	11.2%	6.7%	52%	56%	101	
Jersey City	20%	41%	21%	21%	or 29%	or 510%	10.0%	Con<Serv	56%	67%	78	
Pittsburgh	33%	52%	20%	20%	or 24%	or 333%	11.5%	No solution	45%	57%	93	
Atlanta	33%	52%	19%	19%	or 15%	or 329%	8.2%	No solution	69%	68%	79	
Sacramento	23%	42%	19%	19%	or 18%	or 301%	7.9%	Con<Serv	77%	75%	73	
Minneapolis	18%	36%	18%	18%	or 13%	or 217%	8.3%	No solution	82%	74%	79	
Los Angeles	33%	50%	18%	18%	or 19%	or 228%	7.2%	8.0%	84%	77%	78	
Omaha	26%	44%	17%	17%	or 19%	or 286%	12.4%	No solution	48%	50%	80	
Honolulu	34%	51%	17%	17%	or 21%	or 76121%	10.0%	32.8%	64%	65%	70	
Cleveland	19%	35%	16%	16%	or 15%	or 207%	8.3%	16.2%	80%	70%	88	
El Paso	26%	41%	16%	16%	or 16%	or 200%	8.0%	Con<Serv	83%	76%	65	
Columbus	19%	34%	15%	15%	or 15%	or 243%	8.9%	18.7%	73%	65%	62	
Cincinnati	16%	31%	15%	15%	or 15%	or 278%	9.3%	8.8%	60%	49%	82	
County												
Cook(IL)	11%	30%	19%	19%	or 33%	or 577%	Con<Serv	Con<Serv	41%	65%	80	
King(WA)	21%	39%	18%	18%	or 9%	or 301%	7.8%	No solution	84%	80%	71	
Pr.Georges(MD)	30%	46%	16%	16%	or 18%	or 783%	8.0%	No solution	61%	63%	61	
LA(CA)	14%	29%	15%	15%	or 14%	or 552%	7.0%	Con<Serv	87%	79%	61	
SanClara(CA)	21%	34%	13%	13%	or 16%	or 282%	8.2%	10.9%	77%	74%	50	
Bergen(NJ)	19%	32%	13%	13%	or 17%	or 558%	9.9%	No solution	55%	69%	56	
Shelby(TN)	27%	39%	12%	12%	or 16%	or 217%	7.4%	19.7%	94%	84%	58	
Suffolk(NY)	14%	26%	12%	12%	or 11%	or 3855%	6.9%	No solution	98%	86%	52	

Source: J.P. Morgan Asset Management, Center for Retirement Research at BC, City/county CAFRs. FY 2015. * See page 9 for details on calculations and assumptions.

While the red and orange risk indicators do not necessarily imply immediate risks for bondholders, they do highlight the municipalities that we see as having the most difficult choices ahead of them.

Michael Cembalest
 JP Morgan Asset Management

see next page for Acknowledgements and a link to Supplementary Materials

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The link below will take you to the supplementary materials, which contain information on our IPOD assumptions and methodology, background data and sources, scenario analysis and legal precedents

[Supplementary Materials \(SM\) Table of Contents](#)

- [SM1] Definitions and sources
- [SM2] IPOD ratio methodology
- [SM3] Pension and OPEB discount rates and amortization terms
- [SM4] Amortization methods: level dollar vs level percent
- [SM5] Actual contributions as % of reported annual required contributions
- [SM6] IPOD ratios by component for cities and counties
- [SM7] How have municipal bondholders fared in recent bankruptcies? Some legal precedents
- [SM8] How long might it take for a deeply underfunded pension plan to run out of money?
- [SM9] Examples of OPEB plan changes enacted by states, and OPEB scenario analysis
- [SM10] IPOD ratios vs Moody's ratings
- [SM11] IPOD and other statistics for cities and counties in our universe

Acronyms

ARC Annual Required Contribution, sometimes referred to as an Actuarially Determined Contribution; **CAFR** Comprehensive Annual Financial Report; **COP** Certificate of Participation; **FY** Fiscal year; **GASB** General Accounting Standards Board; **IPOD** Interest, Pensions, OPEB and Defined Contribution, divided by Revenues; **OPEB** Other post-employment benefits (retiree healthcare); **POB** Pension Obligation Bond

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