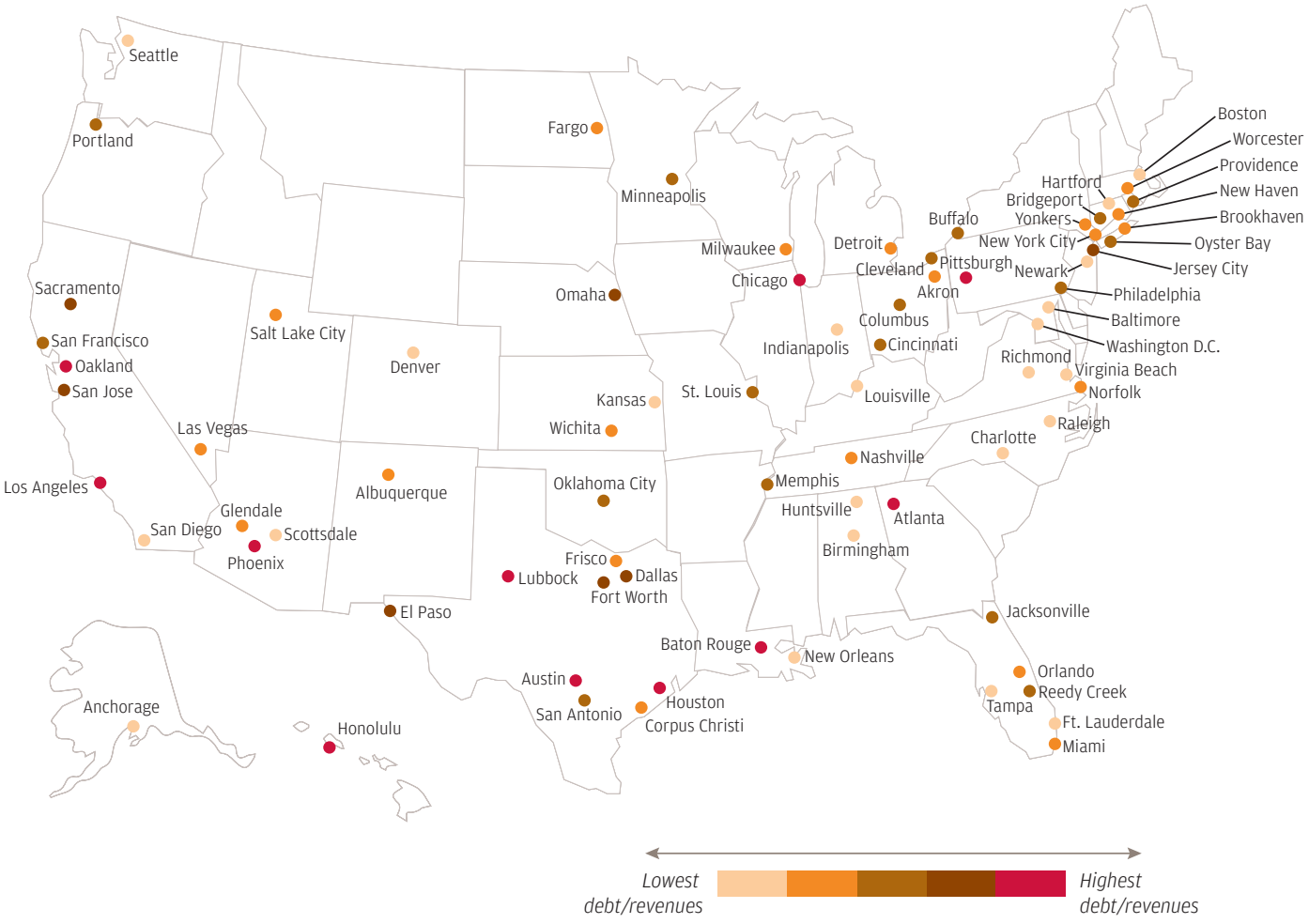
EYE ON THE MARKET • SPECIAL EDITION

The ARC and the Covenants 3.0

U.S. cities and counties

J.P. MORGAN PRIVATE BANK



In this third installment of our *"The Arc and the Covenants"* series, we look at the total indebtedness of U.S. cities and counties, including general obligation debt and underfunded pension and retiree healthcare plans. While most U.S. cities and counties have some time to undertake remediation measures to address underfunded plans, difficult choices will be required by some municipalities to meet all future obligations. Legal precedents from recent bankruptcies suggest that bondholders need to understand the totality of credit risks they face. While exemption from state and local taxation has value, investors must also weigh the benefits of portfolio diversification and the risks of concentration.

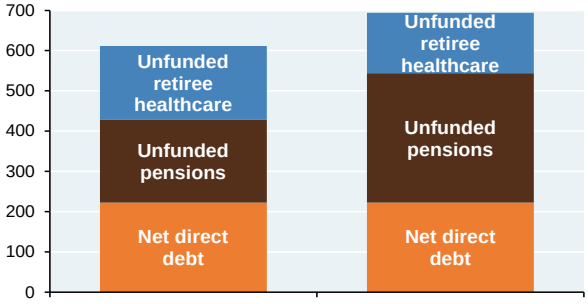
J.P.Morgan

The ARC and the Covenants: a comprehensive look at the total debt of US cities and counties

Executive Summary

As managers of $70 billion in US municipal bonds across our asset management business (Q2 2017), we're very focused on credit risk of US municipalities. Last year, we completed our tri-annual credit review of US states. While a few states have very large debts relative to their revenues, many are in decent shape[1]. This summer, we completed a review of the largest US cities and counties. In general, US cities and counties have substantially more debt relative to their revenues than US states. While most have several years to undertake remediation measures, some very difficult choices will be required in order for them to meet all of their future obligations. And when these choices become untenable and rare municipal bankruptcies do occur, bondholders have usually received lower recoveries than pensioners.

Full accrual indebtedness of select US cities and counties, US$ billions

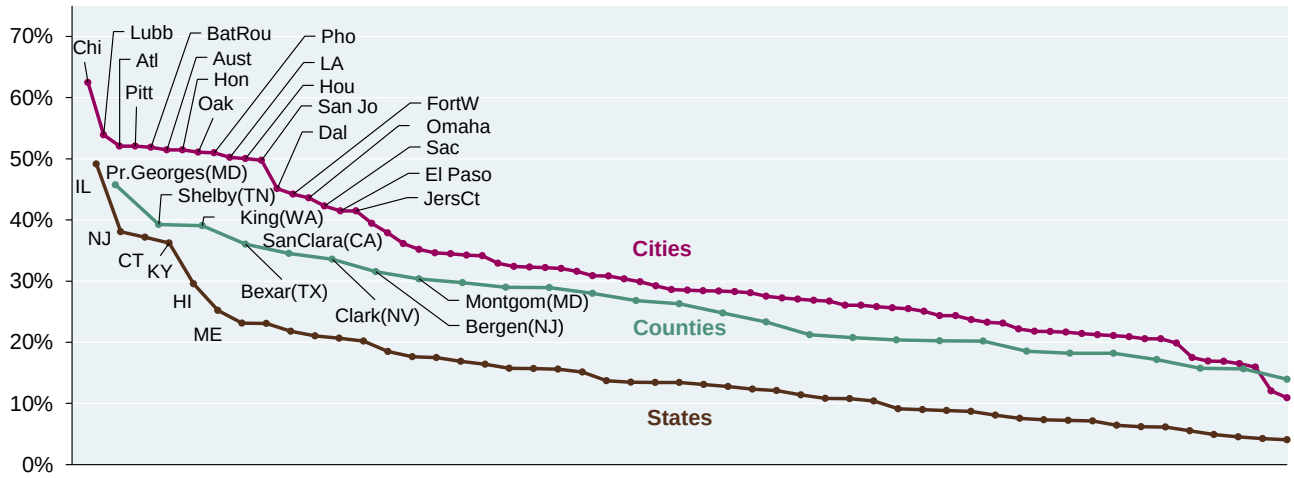


Source: JPMAM, Center for Retirement Research at BC, Moody's. FY 2015.

The concept of "debt" needs to be expanded when thinking about municipal credit risk, since general obligation bonds are only part of the picture. As "debt", we include unfunded obligations related to **pensions and retiree healthcare** along with bonds, leases and other obligations supported by each municipality's general account. As shown above, bonds and leases ("net direct debt") only represent around one third of the total debt of US cities and counties.

The chart below shows our "**IPOD**" ratio for US states, cities and counties. This measure represents the percentage of a municipality's revenues that would be needed to pay interest on direct debt, and *fully* amortize unfunded pension and retiree healthcare obligations over 30 years, assuming a conservative return of 6% on plan assets. While there's no hard and fast rule, municipalities with IPOD ratios over 30% may eventually face very difficult choices regarding taxation, non-pension spending, infrastructure investment, contributions to unfunded plans and bond repayment.

The IPOD ratio: State, City and County debt burdens
% of municipality's revenues required to pay the sum of interest on net direct debt, the municipality's share of unfunded pension and retiree healthcare liabilities, and defined contribution plan payments; assuming 6% plan return and 30 year level dollar amortization



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

[1] *"The ARC and the Covenants, 2.0: an update on the long-term credit risk of US states"*, Eye on the Market special edition, May 2016

In recognition of these challenges, many municipalities are making substantial annual contributions to underfunded plans. In the table below, we focus on municipalities with the largest **"funding gaps"**: the difference between what they're paying now, and what they would need to pay on a full accrual basis according to our IPOD ratio. The table summarizes a few key statistics:

- **Remediation:** the increase in taxes, cuts in direct non-pension spending or increase in worker contributions that would be needed to close the gap. These steps would need to take place every year for 30 years, and are computed on a mutually exclusive basis
- In the absence of remediation, and assuming contributions remain at current levels, **what returns would be needed** on pension and retiree healthcare assets over the next 30 years to fully meet future projected obligations? If there's a label in that column, it means there's no solution; see page 8 for more details. Note: OPEB is an acronym for retiree healthcare.
- If remediation doesn't happen, if municipalities maintain current contributions and if portfolio returns turn out to be just 6%, what might **future pension funding ratios** look like in 10 years? Note that for the most part, the ratios don't decline that much if current contributions are maintained
- A **debt risk indicator** which synthesizes our IPOD ratio with other factors that either mitigate or compound fiscal challenges: revenue and population growth; OPEB size and flexibility; the speed with which pension dynamics worsen over time; and the size of the current operating deficit

Largest funding gaps				*30-year remediation (mut. exclusive)*						*W/O remediation, req. return on assets*		*Pension funding ratio*		
City	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*	Debt Risk indicator
Chicago	35%	62%	27%	27%	*or*	14%	*or*	428%		17.9%	-11.7%	23%	15%	121
Houston	24%	50%	26%	26%	*or*	23%	*or*	772%		10.0%	Con<Serv	66%	58%	86
Austin	26%	51%	26%	26%	*or*	28%	*or*	287%		9.1%	Con<Serv	67%	67%	56
Dallas	20%	45%	25%	25%	*or*	30%	*or*	459%		11.1%	No solution	54%	62%	95
Baton Rouge	28%	52%	24%	24%	*or*	20%	*or*	525%		8.0%	Con<Serv	71%	67%	90
Fort Worth	21%	44%	24%	24%	*or*	20%	*or*	549%		11.0%	No solution	58%	59%	78
Oakland	29%	51%	22%	22%	*or*	22%	*or*	462%		8.1%	No solution	72%	71%	88
Phoenix	29%	51%	22%	22%	*or*	18%	*or*	404%		11.2%	6.7%	52%	56%	119
Jersey City	20%	41%	21%	21%	*or*	29%	*or*	510%		10.0%	Con<Serv	56%	67%	66
Pittsburgh	33%	52%	20%	20%	*or*	24%	*or*	333%		11.5%	No solution	45%	57%	103
Atlanta	33%	52%	19%	19%	*or*	15%	*or*	329%		8.2%	No solution	69%	68%	98
Sacramento	23%	42%	19%	19%	*or*	18%	*or*	301%		7.9%	Con<Serv	77%	75%	76
Minneapolis	18%	36%	18%	18%	*or*	13%	*or*	217%		8.3%	No solution	82%	74%	83
Los Angeles	33%	50%	18%	18%	*or*	19%	*or*	228%		7.2%	8.0%	84%	77%	89
Omaha	26%	44%	17%	17%	*or*	19%	*or*	286%		12.4%	No solution	48%	50%	85
Honolulu	34%	51%	17%	17%	*or*	21%	*or*	76121%		10.0%	32.8%	64%	65%	81
Cleveland	19%	35%	16%	16%	*or*	15%	*or*	207%		8.3%	16.2%	80%	70%	99
El Paso	26%	41%	16%	16%	*or*	16%	*or*	200%		8.0%	Con<Serv	83%	76%	68
Columbus	19%	34%	15%	15%	*or*	15%	*or*	243%		8.9%	18.7%	73%	65%	59
Cincinnati	16%	31%	15%	15%	*or*	15%	*or*	278%		9.3%	8.8%	60%	49%	78
County														
Cook(IL)	11%	30%	19%	19%	*or*	33%	*or*	577%		Con<Serv	Con<Serv	41%	65%	47
King(WA)	21%	39%	18%	18%	*or*	9%	*or*	301%		7.8%	No solution	84%	80%	76
Pr.Georges(MD)	30%	46%	16%	16%	*or*	18%	*or*	783%		8.0%	No solution	61%	63%	70
LA(CA)	14%	29%	15%	15%	*or*	14%	*or*	552%		7.0%	Con<Serv	87%	79%	48
SanClara(CA)	21%	34%	13%	13%	*or*	16%	*or*	282%		8.2%	10.9%	77%	74%	39
Bergen(NJ)	19%	32%	13%	13%	*or*	17%	*or*	558%		9.9%	No solution	55%	69%	43
Shelby(TN)	27%	39%	12%	12%	*or*	16%	*or*	217%		7.4%	19.7%	94%	84%	62
Suffolk(NY)	14%	26%	12%	12%	*or*	11%	*or*	3855%		6.9%	No solution	98%	86%	39

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.

The table on the prior page assumes that municipalities are aiming for 100% funding ratios, and will meet retiree healthcare obligations as projected. In practice, many municipalities target funding ratios of ~80%, and are making reductions to retiree healthcare plans and costs. Both would reduce remediation costs shown in the table.

Before going further, I want to be clear about something. "The ARC and the Covenants" refers to the means by which municipalities address underfunded pension and retiree healthcare plans: through an "annual required contribution", or ARC. Public sector workers[2] form a critical part of our civil society. They risk their lives to rescue and protect us when we're in danger; they make our lives safer, cleaner and more efficient; they educate our children; they enforce the rule of law and provide remedies when laws are broken; they ensure access to clean air, water and food; and they heal us when we're sick. The legal, medical, environmental and educational problems sometimes found in other countries are a reminder of what life might be like without them. They have earned the benefits they accrued and which were granted by state and local legislatures, and have the right to expect them to be paid[3].

The body of the paper walks through pension and OPEB funding ratios, how much municipalities are currently contributing, why our normalized estimates are usually higher than current contributions, and our remediation and break-even return analysis. There's also a section on what pension funding ratios might look like in 10 years, and a section on our risk indicator. We include a link to supplementary materials on data, methodology, assumptions, scenario analysis and recent legal precedents.

As was the case with our 2016 analysis of US states, this was a challenging project. State and local disclosures are at times contradictory, incomplete or unclear, and thousands of data elements have to be compiled one by one since no databases exist that contain them. **That's why this is such a rewarding project: the end result is a comprehensive vision of an opaque universe of issuers whose bonds often represent the safe harbor in client portfolios.** At a time of tight spreads in credit markets, more comprehensive debt ratio measures can help guide the rebalancing of municipal portfolios.

Michael Cembalest
JP Morgan Asset Management

To read the full piece, click on the following link:
The ARC and the Covenants 3.0: US Cities and Counties

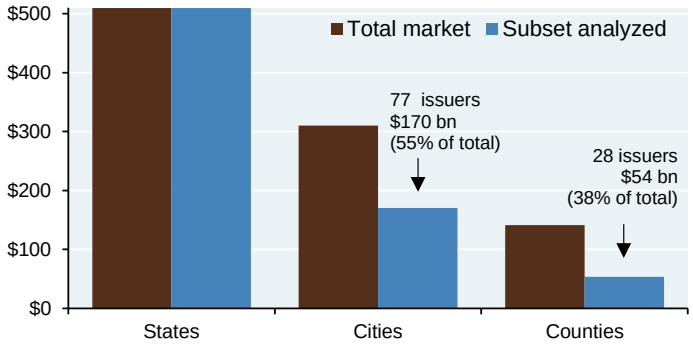
[2] State and local employment is currently 13% of total non-farm employment, the lowest level since 1970.

[3] **How do US public sector pensions compare to private sector pensions?** According to the Boston College Center for Retirement Research, public sector wages are around 9.5% lower than private sector wages, after adjusting for education, demographics and other factors. After incorporating modestly higher pension and OPEB benefits for public sector workers, BC found that public sector wages are **roughly equal** to the private sector.

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.

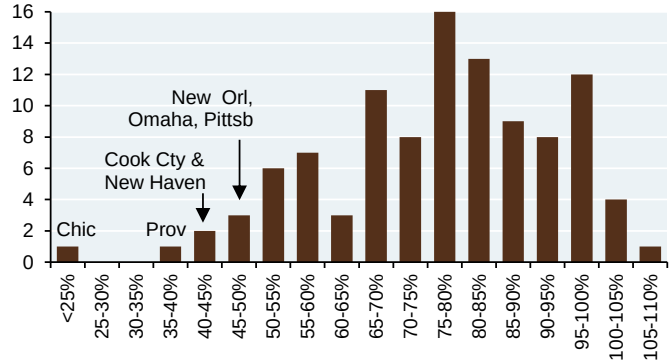
State, city, and county net direct debt universe
Net direct debt (US$ billions)



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

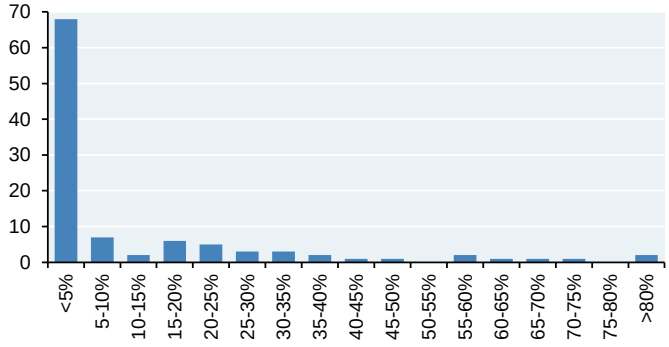
The reason this issue gets so much attention: the **underfunded status of many municipal pension and OPEB plans** (OPEB = "other post-employment benefits", primarily retiree healthcare). The next charts show the distribution of *reported* pension and OPEB funding ratios (i.e., using their assumptions).

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

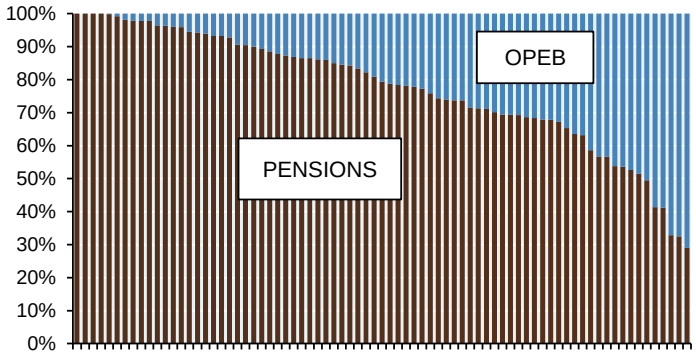


Source: Center for Retirement Research at BC, City/county CAFRs. FY 2015.

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.

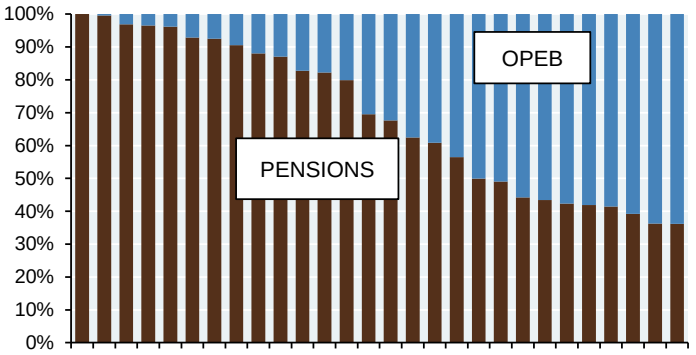
While OPEB funding ratios often are extremely low (if not zero), one mitigating factor is that **unfunded OPEB obligations are generally smaller than unfunded pensions.** The charts below show pension vs OPEB shares for cities and counties. For cities, the median pension share was 79%, while for counties, 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 debt ratios, while for those on the left side, the debt ratio consequences would be minimal.

Pension vs OPEB shares of normalized obligations
Cities, N=77



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

Pension vs OPEB shares of normalized obligations
Counties, N=28



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

Our IPOD credit ratio

Our approach to analyzing the debt burdens 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

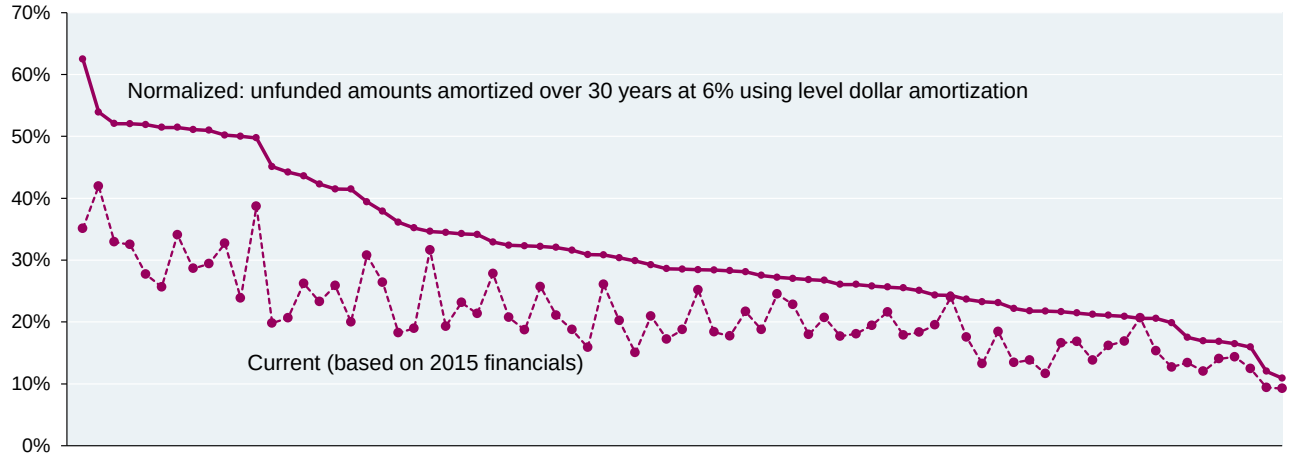
Normalizing pension and OPEB obligations across municipalities

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)

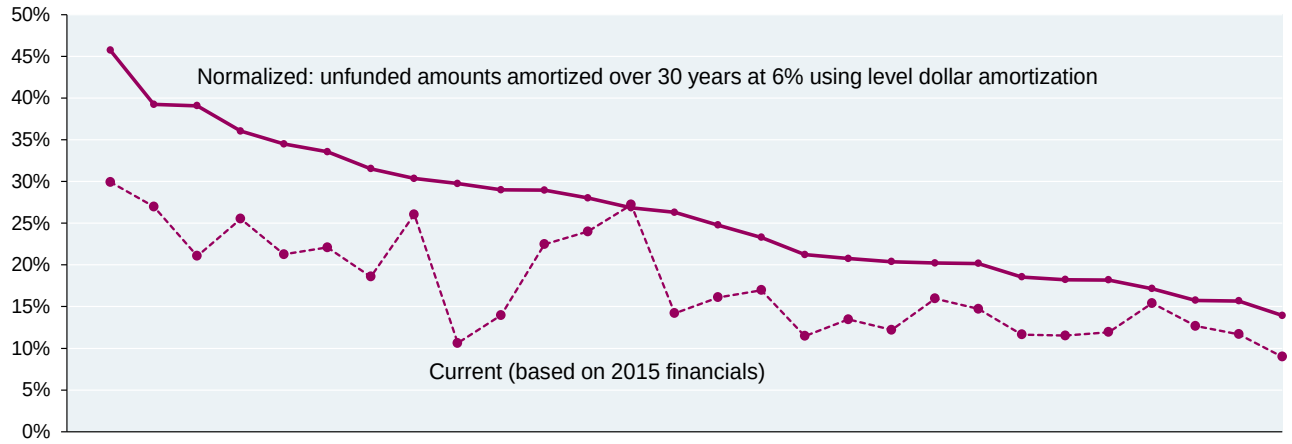
The next charts compare what cities and counties *currently* contribute to what they would be paying under our normalized IPOD analysis. In essence, these charts show **municipal funding gaps**.

City IPOD ratios: current payments vs normalized payments
% of municipality's revenues



Source: JPMAM, CRR, City CAFRs, Moody's. FY 2015.

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 contributions[5] 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"?

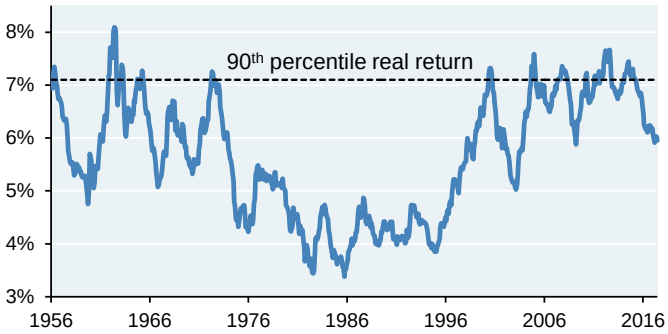
The table shows breakeven annual returns required for pension and OPEB plans. "Con<Serv" means that the municipality is not contributing more than its current service costs, in which case a breakeven return is impossible since no assets accumulate to amortize unfunded amounts. "No Solution" means that the required return is > 50%. The middle column shows the share of underfunded 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.

Without remediation, required compound 30-year investment return on plan assets to pay down liabilities			
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

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

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.

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 municipalities with the lowest pension funding ratios 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%

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

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%

Putting it all together: IPOD ratios and other factors affecting debt sustainability

Understanding debt sustainability requires synthesis of a lot of information, not just f our IPOD ratios. When we look at the forest and the trees, we have the greatest concerns about municipalities with high funding gaps; which have large operating deficits; 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.

Largest funding gaps				*30-year remediation (mut. exclusive)*						*W/O remediation, req. return on assets*		*Pension funding ratio*		
City	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*	Debt Risk indicator
Chicago	35%	62%	27%	27%	*or*	14%	*or*	428%		17.9%	-11.7%	23%	15%	**121**
Houston	24%	50%	26%	26%	*or*	23%	*or*	772%		10.0%	Con<Serv	66%	58%	**86**
Austin	26%	51%	26%	26%	*or*	28%	*or*	287%		9.1%	Con<Serv	67%	67%	56
Dallas	20%	45%	25%	25%	*or*	30%	*or*	459%		11.1%	No solution	54%	62%	**95**
Baton Rouge	28%	52%	24%	24%	*or*	20%	*or*	525%		8.0%	Con<Serv	71%	67%	**90**
Fort Worth	21%	44%	24%	24%	*or*	20%	*or*	549%		11.0%	No solution	58%	59%	**78**
Oakland	29%	51%	22%	22%	*or*	22%	*or*	462%		8.1%	No solution	72%	71%	**88**
Phoenix	29%	51%	22%	22%	*or*	18%	*or*	404%		11.2%	6.7%	52%	56%	**119**
Jersey City	20%	41%	21%	21%	*or*	29%	*or*	510%		10.0%	Con<Serv	56%	67%	66
Pittsburgh	33%	52%	20%	20%	*or*	24%	*or*	333%		11.5%	No solution	45%	57%	**103**
Atlanta	33%	52%	19%	19%	*or*	15%	*or*	329%		8.2%	No solution	69%	68%	**98**
Sacramento	23%	42%	19%	19%	*or*	18%	*or*	301%		7.9%	Con<Serv	77%	75%	**76**
Minneapolis	18%	36%	18%	18%	*or*	13%	*or*	217%		8.3%	No solution	82%	74%	**83**
Los Angeles	33%	50%	18%	18%	*or*	19%	*or*	228%		7.2%	8.0%	84%	77%	**89**
Omaha	26%	44%	17%	17%	*or*	19%	*or*	286%		12.4%	No solution	48%	50%	**85**
Honolulu	34%	51%	17%	17%	*or*	21%	*or*	76121%		10.0%	32.8%	64%	65%	**81**
Cleveland	19%	35%	16%	16%	*or*	15%	*or*	207%		8.3%	16.2%	80%	70%	**99**
El Paso	26%	41%	16%	16%	*or*	16%	*or*	200%		8.0%	Con<Serv	83%	76%	68
Columbus	19%	34%	15%	15%	*or*	15%	*or*	243%		8.9%	18.7%	73%	65%	59
Cincinnati	16%	31%	15%	15%	*or*	15%	*or*	278%		9.3%	8.8%	60%	49%	**78**
County														
Cook(IL)	11%	30%	19%	19%	*or*	33%	*or*	577%		Con<Serv	Con<Serv	41%	65%	47
King(WA)	21%	39%	18%	18%	*or*	9%	*or*	301%		7.8%	No solution	84%	80%	**76**
Pr.Georges(MD)	30%	46%	16%	16%	*or*	18%	*or*	783%		8.0%	No solution	61%	63%	**70**
LA(CA)	14%	29%	15%	15%	*or*	14%	*or*	552%		7.0%	Con<Serv	87%	79%	48
SanClara(CA)	21%	34%	13%	13%	*or*	16%	*or*	282%		8.2%	10.9%	77%	74%	39
Bergen(NJ)	19%	32%	13%	13%	*or*	17%	*or*	558%		9.9%	No solution	55%	69%	43
Shelby(TN)	27%	39%	12%	12%	*or*	16%	*or*	217%		7.4%	19.7%	94%	84%	62
Suffolk(NY)	14%	26%	12%	12%	*or*	11%	*or*	3855%		6.9%	No solution	98%	86%	39

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 municipalities we see as having the most difficult choices ahead of them. To be clear, municipalities can default for reasons unrelated to pensions and OPEB, simply because their revenues are far below their operational expenditures, which is current the risk facing cities like Hartford.

Michael Cembalest
JP Morgan Asset Management

see next page for Acknowledgements and a link to Supplementary Materials

Acknowledgements. My team and I would like to thank Jean-Pierre Aubry, Associate Director of State and Local Research at the Center for Retirement Research at Boston College; Joshua Rauh, Ormond Family Professor of Finance at Stanford Graduate School of Business; and David Skeel, S. Samuel Arsht Professor of Corporate Law at University of Pennsylvania Law School. Their insights and observations were very helpful in the preparation of this paper.

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

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

This packet of supplementary materials accompanies an analysis entitled "*The ARC and the Covenants: a comprehensive look at the total debt of US cities and counties*", published in September 2017.

Supplementary Materials (SM) Table of Contents

Michael Cembalest
JP Morgan Asset Management

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

[SM1] Definitions and sources

- *Universe analyzed.* Our city universe includes the top 65 US cities based on "net direct debt", as well as 12 additional cities with large populations. Our county universe includes US counties with over $1 billion of net direct debt. These universes represent 55% and 38% of city and county net direct debt
- *Data aggregation.* Pension, OPEB and defined contribution plan data for FY2015 was compiled by the Center for Retirement Research at Boston College using publicly available Comprehensive Annual Financial Reports (CAFRs). All net direct debt, operational revenue, operational expenses, population growth and revenue growth data for FY2015 was sourced from Moody's as of September 1, 2017. For the entire data set, fiscal year 2015 data was provided when available. In a few cases, revenue and expense data was not available for 2015, in which case the most recent year was used.
- *Net direct debt* includes bonds, unconditional general fund obligations, capital leases, pension obligation bonds and lease revenue bonds. This concept excludes revenue bonds of state enterprises (e.g., essential service revenue bonds) and self-supporting debt (i.e., if a city issues a general obligation bond but a water utility pays for it or has covered debt service for 3 consecutive years, the debt is excluded).
- *Plan liabilities.* Pension and OPEB obligations include (a) amortization of unfunded liabilities, and (b) the municipality's share of annual service costs. For pensions, service costs were obtained by subtracting employee contributions from total plan service costs. For OPEB, service costs are typically not disclosed; we estimated OPEB service costs by deducting the amortization of the unfunded liability from the municipality's reported annual required contribution. When GASB 74 and GASB 75 become effective in FY 2017-2018, OPEB disclosures should improve and be consistent with pension disclosures.
- *Revenues* include a) real estate taxes, sales and use taxes, income taxes, Federal aid[7] and other payments into the General Fund, and b) payments into general debt service funds. Revenues from capital projects or categorized as "non-major" or "non-recurring" are excluded.
- *Spending.* City and county spending includes all expenses reported for governmental activities such as public safety, transportation, general government operations/administration, and principal/interest payments on debt. Expenses related to business-type activities such as municipal utilities are excluded.
- *Commingled school districts.* Several municipalities in our universe are fiscally intertwined with a local school district. For example, when a city with a commingled school district is responsible for both levying taxes to support the school district and for issuing debt to finance the activities of the school district, we included both revenues collected by the city on behalf of the school district and interest payments to service the debt related to the school district in our IPOD ratio. In a subset of these cases, the city/county is also responsible for unfunded pension or OPEB obligations; if so, they are included in our IPOD calculations as well.
- Our analysis does not incorporate changes municipalities have enacted since FY2015. In some cases (Houston and Dallas, for example), municipalities have lowered their discount rates. This would raise their pension and OPEB ARC levels, and perhaps their actual contributions as well

[7] Our IPOD analysis on states excluded Federal transfers from revenues, since many of these transfers are earmarked for Medicaid and are not available to service pension or OPEB liabilities. For cities and counties, while Moody's does exclude some intergovernmental transfers, others are included. Not all transfers are earmarked for specific use, so some portion may be used for debt service and pension/retiree costs. Ultimately, lack of clear disclosure prevents the determination of non-earmarked revenues available to service debt and pension/retiree costs at the local level. As a result, some city and county IPOD ratios may be understated to the extent that any earmarked government transfers were included in that municipality's revenues. On the other hand, we also were not able to exclude any net pension liabilities associated with enterprise systems (i.e., water, sewer), which would have the opposite effect.

[SM2] IPOD ratio methodology

We used the same debt ratio for cities and counties that we used in 2014 and 2016 when analyzing US states:

$$\text{Credit ratio} = \frac{I + P + O + D}{R}$$

Where:

I = interest on net direct debt
P = amortization of unfunded pension liability, plus annual pension service cost
O = amortization of unfunded retiree healthcare obligation (OPEB), plus annual OPEB service cost
D = defined contribution payments
R = municipal revenues

There are several assumptions used in our models. The most important ones involve the process by which we **normalize** pension and OPEB obligations across all states, cities and counties.

Key assumptions:

Interest rate on net direct debt	5%
Investment return on pension plan and OPEB plan assets	6%
Amortization period for unfunded obligations	30 years
Amortization method for unfunded obligations	Level dollar (see SM4)
Assumed OPEB plan duration	14.3 years[8]

When normalizing across plans:

- First, increase gross pension or OPEB liability based on the duration of the plan[9], and the difference between the municipality's assumed discount rate and our assumed rate of 6%
- Second, recompute the net pension or OPEB liability, which is re-amortized at 6% over 30 years using a level dollar approach
- Third, adjust service costs using the duration of the plan, since service costs also incorporate the municipality's assumed discount rate
- The normalized annual payment for pensions and OPEB is the sum of the recomputed amortization component and the recomputed annual service cost

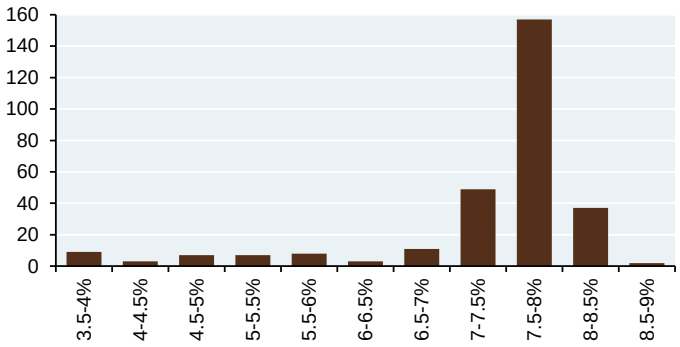
[8] We calculated the duration of **pension** liabilities based on interest rate sensitivity disclosures added to the CAFR in 2015 as per GASB 68. However, **OPEB** liability duration disclosure is not yet required. We assumed a14.3-year duration for all OPEB liabilities based on data from the state of California in its 2015 CAFR.

[9] While duration measures can be used to linearly re-estimate liabilities when small discount rate changes take place (i.e., plus or minus 1%), such measures are less accurate for larger changes in rates, even when convexity measures are used as well. Working with the pension team at JP Morgan Asset Management, we developed a series of prototype pension and OPEB cash flow vectors for different durations. We then used these prototype vectors when re-estimating the value of city and county liabilities using our 6% discount rate.

[SM3] Pension and OPEB discount rates and amortization terms

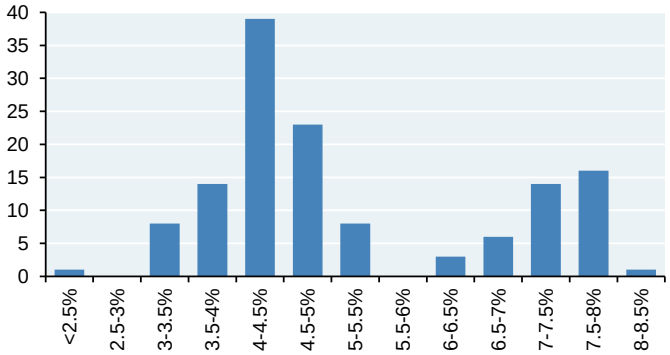
Most cities and counties use higher discount rates on **pensions** than our 6% assumption. As a result, our re-computed pension liabilities and service costs are generally higher than theirs. For **OPEB**, most (but not all) cities and counties use *lower* discount rates than 6%. Consequently, our estimates of OPEB ARCs are often *below* what municipalities show in their CAFRs. In many cases, however, this is a moot point, since many municipalities' current OPEB contributions are nowhere near their reported annual required contributions (see SM5).

Distribution of pension plan discount rates
Number of city/county pension plans



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

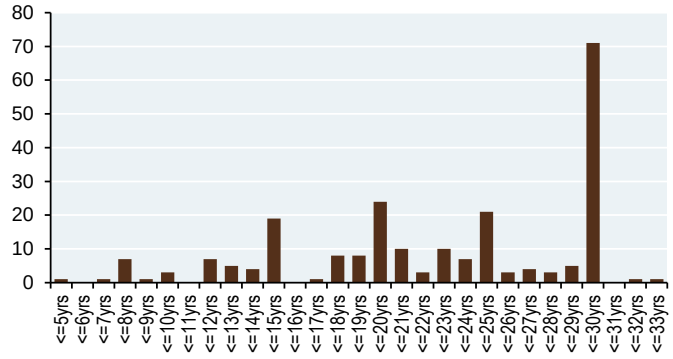
Distribution of OPEB plan discount rates
Number of city/county OPEB plans



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

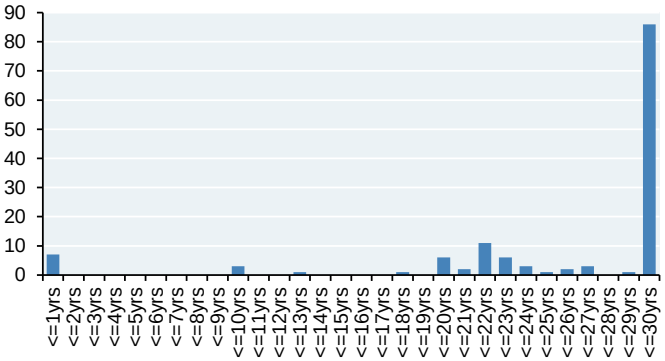
Most cities and counties amortize unfunded obligations over 30 years, although a fair number of them use shorter periods to amortize unfunded pensions. When computing our normalized IPOD ratios, we assumed 30 years for all entities for both pensions and OPEB.

Distribution of pension plan amortization terms
Number of city/county pension plans



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

Distribution of OPEB plan amortization terms
Number of city/county OPEB plans

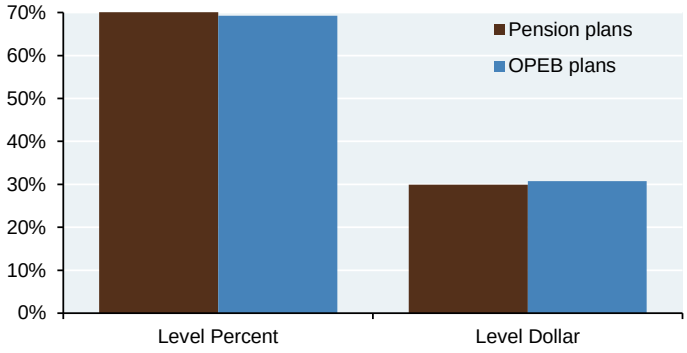


Source: Center for Retirement Research at BC, City/county CAFRs. FY 2015.

[SM4] Amortization methods: level dollar vs level percent

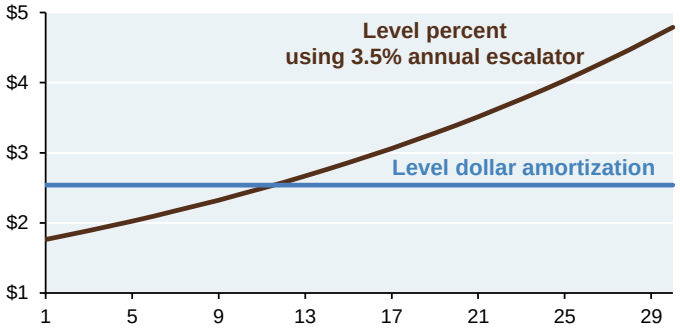
When normalizing across plans, there are three essential components: the discount rate, the amortization term and the **amortization method**. The latter refers to whether a municipality assumes level payments over time ("level dollar"), or assumes that amortization payments rise over time ("level percent"). As shown in the first chart, most plans in our universe use the level percent approach. However, when computing our IPOD ratios, we normalized across all plans using the level dollar approach. The second chart compares ARC payments for a hypothetical plan with a 70% funding ratio using both level dollar and level percent amortization.

Most plans use the "level percent" amortization method
% of city/county plans



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

Level dollar vs. level percent amortization
ARC payment, US$ millions



Source: J.P. Morgan Asset Management. Assuming 70% funding ratio, $100mm gross pension liability and 7.5% discount rate.

The table shows how an IPOD ratio would change if a city used both a higher discount rate than our 6% assumption, and if it used the level percent approach with a 3.5% annual escalator. In the base case, the required pension amortization is $17.7 mm per year, and the IPOD ratio is 16%. After adjusting for a lower discount rate and the level dollar approach, the required pension amortization doubles and the IPOD ratio rises to 26%. In this particular example, the use of level dollar accounts for 40% of the increase in the IPOD ratio, while the discount rate change explains the rest.

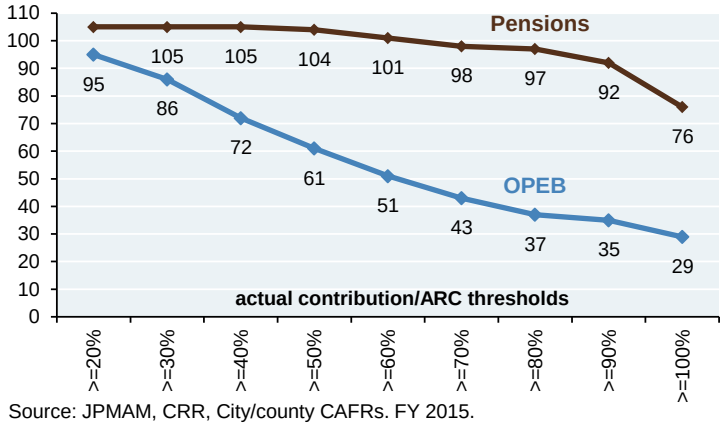
Hypothetical Example	
Pension discount rate	7.5%
Current pension liability, $mm	1,000
Pension funding ratio	70%
Current pension assets, $mm	700
Pension duration	12%
Pension amortization term	30
Escalator	3.5%
Net pension liability ($mm)	300
Pension amortization w/escalator, $mm	17.7
Pension amortization, no escalator, $mm	25.4
OPEB Amortization, $mm	6.4
Interest, $mm	7.9
Interest + Pension + OPEB, $mm	32.0
Revenues, $mm	200
Current IPOD ratio	**16%**
Pension discount rate	6%
Pension liability , $mm	1,207
Net pension liability, $mm	507
Pension amortization, no escalator, $mm	36.8
Revised IPOD ratio	**26%**

[SM5] Actual contributions as % of annual required contributions

The phrase "annual required contribution" is an actuarial term only; states, cities and counties are not legally bound to make these contributions in full, and in some years, many haven't. For **pensions**, there is generally a higher level of compliance, as we saw with US states[10]. Of 105 cities and counties in our sample, 97 contributed more than 80% of the ARC in FY2015 (the table shows the exceptions).

For **OPEB**, only 37 of the 105 cities and counties paid more than 80% of the reported ARC. The remainder paid less, and at times, substantially less. This might reflect the fact that unlike pensions, OPEB obligations can change over time and are referred to as "soft liabilities" by actuaries. See SM9 for examples of states that changed OPEB plan terms and conditions. The most common were changes to retiree premium contributions, copayments, vesting terms and deductibles.

Cities and county actual contributions as a % of reported ARC, Number of municipalities above specified levels



Source: JPMAM, CRR, City/county CAFRs. FY 2015.

Cities paying less than 80%	Pension contributions as % of ARC
Albuquerque	46%
Birmingham	51%
Chicago	52%
Oklahoma City	53%
Cincinnati	66%
Memphis	67%
Oyster Bay	68%
Philadelphia	78%

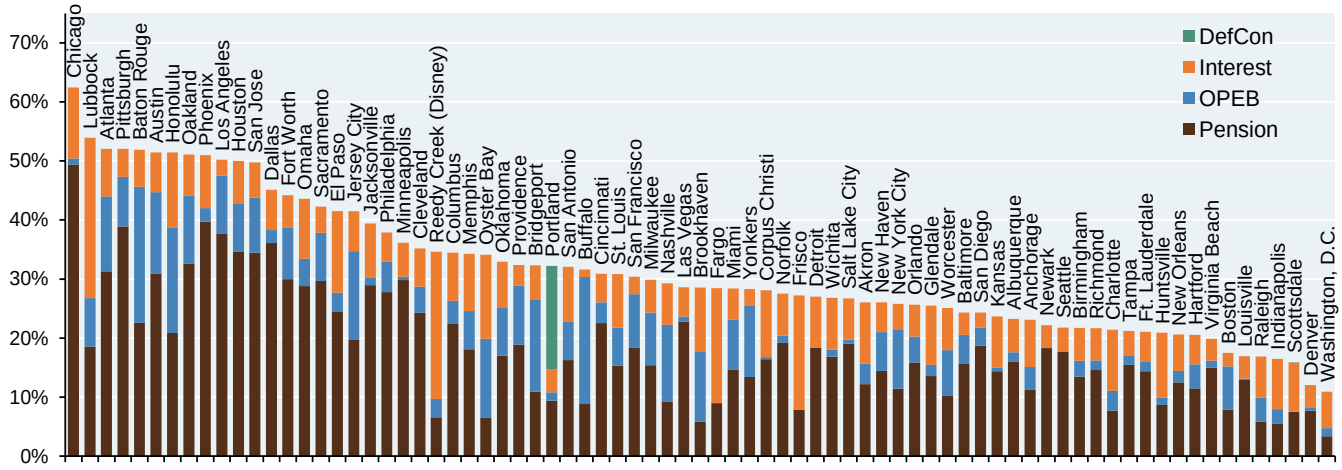
Source: JPMAM, CRR, City CAFRs. FY 2015.

[10] In our 2016 analysis of the states, there were 10 states that contributed less than 80% of their pension annual required contribution in FY2015: Virginia (79%), Wyoming (78%), Pennsylvania (78%), Texas (77%), Minnesota (69%), California (68%), North Dakota (67%), Kentucky (66%), New Mexico (58%) and New Jersey (23%). For Virginia, Wyoming, Minnesota, North Dakota and New Mexico, this was less of a concern since their IPOD ratios were quite low, and/or their pension systems had higher funding ratios.

[SM6] IPOD ratios by component for cities and counties

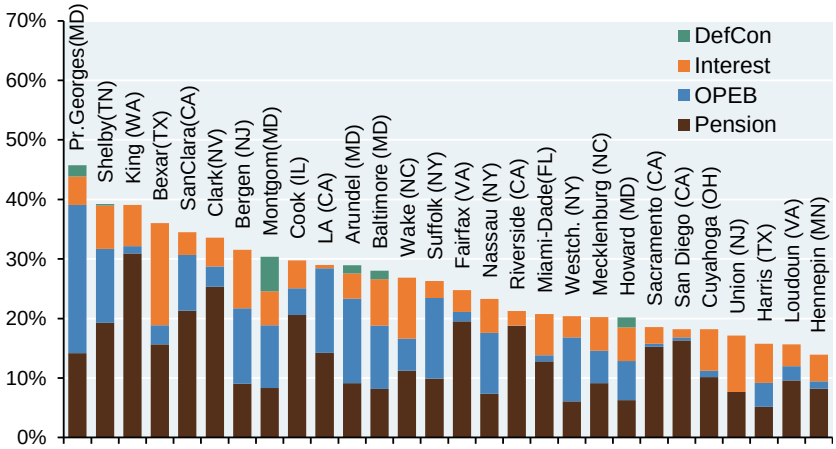
The charts break down our normalized IPOD ratios by component. See below for an explanation of the defined contribution segment.

City IPOD ratios: interest, pension, and OPEB components
IPOD ratios assuming 6% plan return and 30 year level dollar amortization



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

County IPOD ratios: interest, pension, and OPEB components
IPOD ratios assuming 6% plan return and 30 year level dollar amortization



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

Defined contribution plans. Only 6 municipalities in our universe have defined contribution plans, and they are all very small. We also include certain pension plans in the DC segment when contributions are not determined by their funded status. For example, in Maryland, 5 counties participate in a state-run, multi-employer teacher plan into which they make annual contributions. However, their contributions are not driven by the funded ratio of the plan, and represent their share of service costs. Portland has a Police and Fire plan whose primary source of repayment is a property tax lien; Portland makes an annual contribution that is equal to the benefits paid in that year. For computational purposes, we included these Maryland and Portland plans in the Defined Contribution segment; while they are not DC plans per se, they represent payments that are not impacted by changing discount rates or other assumptions.

[SM7] How have municipal bondholders fared in recent bankruptcies? Some legal precedents

Our IPOD ratio makes the implicit assumption that bondholders can be affected by pension restructuring events. While pensions and bonds are not explicitly cross-defaulted obligations according to municipal bond prospectuses, here's a brief explanation as to why we take this position.

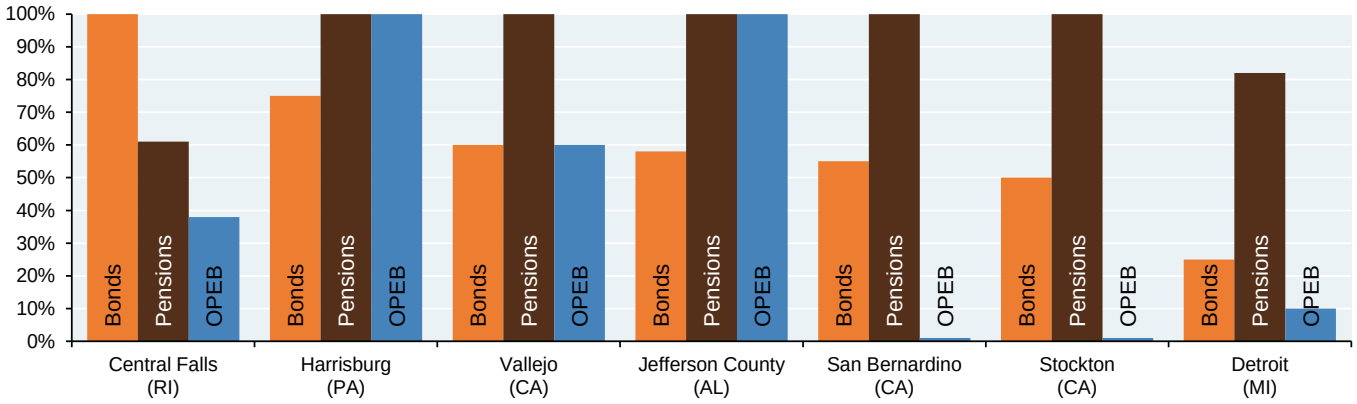
Federalism and the US Bankruptcy Code. Chapter 9 states that the court may approve restructuring plans of cities and counties if "the plan does not discriminate unfairly, and is fair and equitable, with respect to each class of claims or interests". For many years, it was unclear how such a statute would be interpreted by the courts. The judge in the Detroit bankruptcy provided his view: "pension benefits are a contractual obligation of a municipality and not entitled to any heightened protection in bankruptcy". While this ruling was meant to indicate that pensions could not be prioritized *over* bondholders, it also suggests that bondholders cannot be prioritized over pensioners. In effect, pensions and bondholders are considered "municipal obligations" that can be restructured and need to be treated "fairly". In practice, bankrupt municipalities have had wide latitude in restructuring pensions, OPEB and bonds; **"fair" certainly does not have to mean an equal recovery rate for each creditor class.**

While Chapter 9 does not apply to US states[11], I suspect that its provisions (or something very similar to it) might be granted to states should any experience severe fiscal distress requiring restructuring. If that's the case, then state constitutions asserting that either pensions or bonds are inviolable obligations that cannot be impaired or diminished (such as Michigan, Article IX Section 24 on pensions) would end up in conflict with, and likely superseded by, Federal bankruptcy law requiring equal treatment of creditors.

"Service delivery insolvency". Another reason to incorporate underfunded pensions is that they can be a sign that a municipality has been starving the pension system to meet essential services. This in turn raises the prospect of "service delivery insolvency", a situation in which a city cannot provide a basic standard of essential services, and which is now recognized by some courts as a basis for bankruptcy.

In addition to these judicial/legal views, the recent history of municipal default also supports our decision to include pensions alongside bonds in our credit ratio. As per a 2016 Moody's[12] report, not only are bondholders *not* protected in Chapter 9 filings, but they have often fared *worse* than pensioners. The Central Falls (RI) bankruptcy in which bondholders were protected while pensions and OPEB were restructured was the exception rather than the rule (see next page for more details).

Municipal recovery rates in bankruptcy: bondholders usually fare worse than pensioners
Percent of original claim



Source: Moody's; estimates as of August 2017.

[11] Legal scholars we spoke with believe that some Democrats are against Chapter 9 being extended to states since they do not want to make pension restructuring easier, while some Republicans are against Chapter 9 being extended to states since they do not want to make it easier to restructure municipal bonds.

[12] "*Recent Municipal Bankruptcies Provide Greater Clarity on Outcomes for Investors*", Lipitz et al, Moody's Investors Service, February 25, 2016

Each one of these cases was different, as Chapter 9 bankruptcies tend to be[13]:

- In **Central Falls (RI)**, the primary reason bondholders were protected was a decision by the state to give GO bondholders a first priority lien on property taxes. In the bankruptcy proceeding, the GO bonds were all treated as secured, while pensions and OPEB were impaired. Sierra Kings Healthcare District (CA) is another example of a municipality that retroactively gave bondholders explicit lien protection. Questions remain as to whether the retroactive Central Falls property tax lien would have been upheld had the plan been challenged by other creditors
- Bonds backed by special purpose entities (e.g., water and sewer utilities) are often unimpaired during bankruptcy, and payments continue to be paid during the bankruptcy process. **Jefferson County (AL)** was the exception: according to the Moody's report, its special purpose sewer bonds had *lower* recovery rates than their GO bonds, in part since sewer system revenues were insufficient to cover interest expense after the payment of operating expenses. In Detroit, while the city *threatened* impairment of some water and sewer bonds, they were paid in full and on a timely basis
- In **Detroit (MI)**, investors in general obligation "unlimited tax" bonds had property tax liens. However, they still settled for 73 cents on the dollar given the declining amount of property taxes the city was collecting, leaving open from a judicial perspective the question of whether the pledges were valid. The recovery rate on Detroit GO bonds with unlimited property tax liens was substantially higher than on other Detroit GO bonds, which recovered 42 cents on the dollar (GO bonds with limited tax liens) and 12 cents on the dollar (certificates of participation used to fund pensions)
- In **Stockton (CA)**, pensions were kept whole while bondholders suffered substantial 50% losses. The judge ruled that the restructuring was "fair", since public sector workers experienced a practically 100% reduction in the value of their OPEB claims. A similar outcome (pensions intact, OPEB reduced, bonds reduced) occurred in **Vallejo (CA).** In Detroit, OPEB obligations were written down as well, adding to the trend of OPEB claims suffering larger writedowns than pensions
- **San Bernardino (CA)** originally proposed writing down pension obligation bonds by 99%, following a trend set by Detroit and Stockton to impose large writedowns on such bonds. Ultimately, San Bernardino agreed to pay 40 cents on the dollar on POBs. To be clear, bonds and certificates used to invest proceeds in a pension fund are not backed by the assets in the fund itself, and are instead usually secured by either a general obligation or annual appropriation pledge of the issuer

[13] As a reminder, bankruptcy filing rules for municipal entities vary by state. According to Moody's, only 15 states fully authorize municipalities to file at their discretion. Another 13 states allow municipalities to file, but with limitations on certain kinds of issuers, and/or subject to state authorization. In 21 states, bankruptcy filing rules for municipalities are not explicitly codified, and in Georgia, it is expressly prohibited. **However, defaults can take place outside the context of bankruptcy**. While bankruptcy often results in modification of contracts, creditors and issuers can agree to restructure debt outside of bankruptcy. In addition, **an issuer can default when it does not have sufficient resources to pay its debt, even outside a bankruptcy filing.** As a result, state bankruptcy rules are in our view not a material issue to consider when evaluating municipal credit risk.

[SM8] How long might it take for a deeply underfunded pension plan to run out of money?

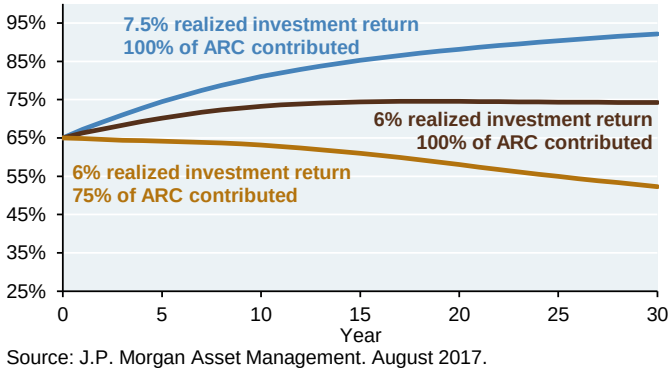
This is actually a pretty complicated question with a wide variety of potential outcomes. Public sector plans are usually "open", meaning that new workers, new contributions and new accrued liabilities are added over time. Any analysis attempting to answer this question has to deal with the open-ended nature of public plans, and not assume for the sake of analytical convenience that the plan is closed. Working with our pension team at JP Morgan Asset Management, we ran a few scenarios that looked at what could happen to a city whose pension plan was 65% funded today.

- *Fixed assumptions*: the city's discount rate is 7.5%; the plan's service costs are 3% of total pension liabilities; payroll growth rises at 4% per year; the duration of the plan's liabilities is 13%; and the city uses an "open" amortization approach, meaning that it keeps re-amortizing its net pension liability each year over the subsequent 30 years[14]
- *Variable assumptions*: the realized investment return on plan assets; the percentage of the required ARC that the city makes each year; and whether the city uses a level dollar or level percent method when computing its ARC payments (see SM4)

Let's start with the chart on the left, which assumes **level dollar** amortization. If the city makes its ARC each year and achieves its target return, its funding ratio would rise over time and eventually converge towards 100% (blue line). If the city makes the full ARC but only earns 6% instead of 7.5%, its funding ratio would stay roughly constant (brown line). And if the city falls short on returns and only makes 75% of the ARC, its funding ratio would deteriorate (tan line).

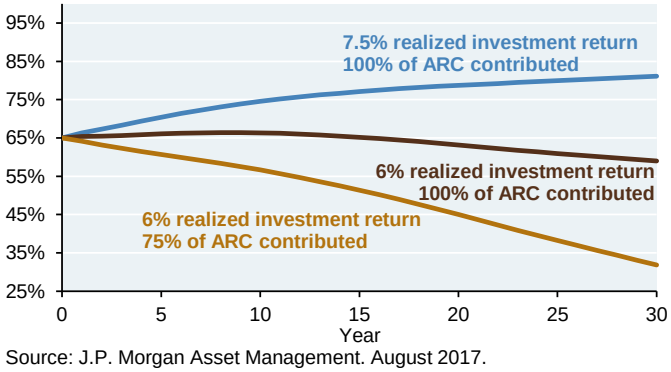
The dynamics are much less favorable when a city uses **level percent** amortization, since the city is constantly making payments that represent the earliest rungs on the rising amortization ladder, and is never contributing the larger amounts. Roughly 70% of the municipalities in our sample use level percent, so this actuarial complexity is an important part of understanding municipal debt burdens, particularly for pension and OPEB plans with large degrees of underfunding.

Pension funded status: level dollar amortization
Assets/liabilities, assuming 7.5% discount rate and 30 year term



Source: J.P. Morgan Asset Management. August 2017.

Pension funded status: level percent amortization
Assets/liabilities, assuming 7.5% discount rate and 30 year term



Source: J.P. Morgan Asset Management. August 2017.

[14] In contrast, a "closed" amortization approach would require unfunded liabilities to be fully paid down by a specific fixed date, which could result in sky-rocketing ARC payments if investment shortfalls occurred.

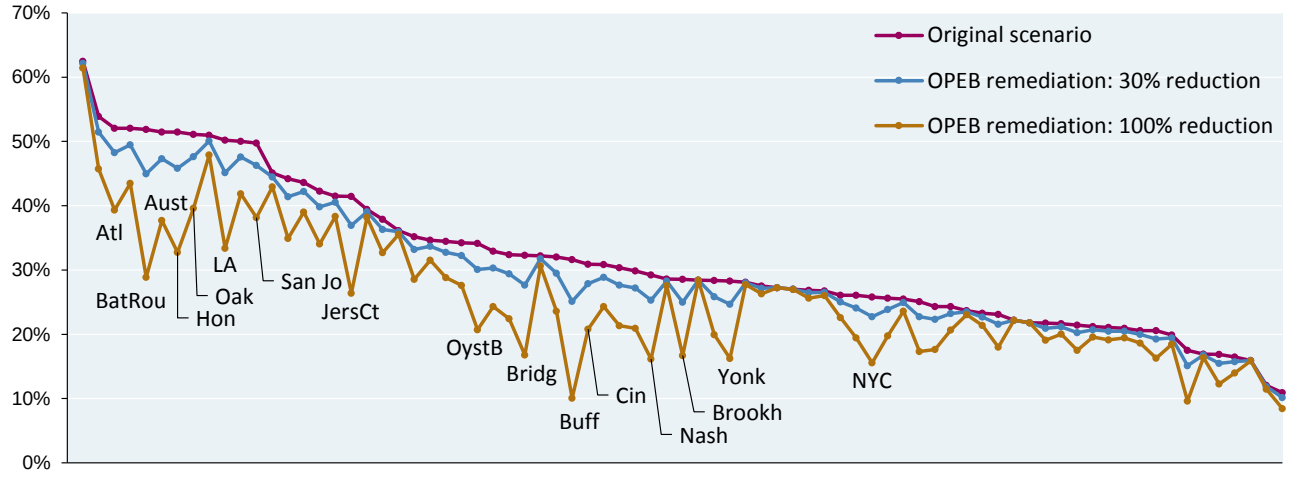
[SM9] Examples of OPEB plan changes enacted by states, and OPEB scenario analysis

Two-thirds of state respondents to 2013 surveys cited by the Center for State and Local Government Excellence indicated that they made changes to retiree healthcare in recent years, with the most common being changes to retiree premium contributions, copayments, and deductibles. Examples include[15]:

- Delaware: vesting terms have been extended, and contributions were increased
- Georgia: raised premiums, co-pays, and out-of-pocket maximums for retirees; linked its insurance subsidy program to number of years worked
- Idaho: the state no longer covers Medicare eligible retirees or their dependents
- Indiana: increased copayments and deductibles
- Maryland: reduced prescription drug coverage by requiring higher copayments by retirees
- Nevada: revamped plan through increased deductibles and beneficiary premiums, while eliminating eligibility for employees hired after 2011
- New Jersey: costs shifted to the Federal gov't by becoming an official Medicare Part D plan
- Ohio: increased required service for eligibility for all employees, currently phasing out all spousal coverage and Medicare Part B reimbursements
- Pennsylvania: increased the minimum years of service for coverage eligibility
- Utah: closed plan to employees hired after 2005; shifted increases in healthcare costs to employees and retirees
- West Virginia: made subsidies eligible only for employees hired before July 2010; placed a cap on subsidy levels for eligible employees

While many municipalities have adjusted OPEB, moderate OPEB changes that we modeled did not substantially reduce IPOD ratios. In the chart below, we compare our baseline IPOD ratios to a case in which each city's OPEB liabilities are reduced by 30%, and by 100%. The modest impacts from the 30% reduction reflect the generally smaller size of OPEB liabilities compared to pensions, discussed in the body of the paper, and which is shown in the table in SM11. For the 100% elimination case, we highlight the cities with some of the largest IPOD ratio declines.

City IPOD ratios: the impact of OPEB remediation
% of municipality's revenues



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

[15] "*US Municipal Governments Can Leverage Federal Medicare to Lower OPEB Costs*", Marcia Van Wagner, Moody's, March 2014

[SM10] IPOD ratios, debt risk indicators and Moody's ratings

The table shows Moody's ratings for cities and counties in our universe that have the highest debt risk indicator. To reiterate a point made earlier, the debt risk indicator captures the magnitude of the IPOD ratio, the IPOD funding gap, and the extent to which other factors such as population and revenue growth and OPEB flexibility mitigate the magnitude of the debt.

In cities like Hartford, the problem is a very high operational deficit (a shortfall in revenues vs operational spending), rather than debt levels per se, in which case our debt indicator will not reflect the primary challenge facing the municipality. The IPOD ratio is designed to highlight situations where overall debt burdens are at the heart of fiscal problems, rather than highlighting operational shortfalls.

City	Normalized IPOD ratio	Funding Gap	Debt Risk indicator	Moody's credit rating
Chicago	62%	27%	**121**	Ba1
Phoenix	51%	22%	**119**	Aa1
Pittsburgh	52%	20%	**103**	A1
Cleveland	35%	16%	**99**	A1
Atlanta	52%	19%	**98**	Aa1
Dallas	45%	25%	**95**	A1
Philadelphia	38%	11%	**95**	A2
Baton Rouge	52%	24%	**90**	Aa2
Los Angeles	50%	18%	**89**	Aa2
Oakland	51%	22%	**88**	Aa2
Houston	50%	26%	**86**	Aa3
Omaha	44%	17%	**85**	Aa2
Minneapolis	36%	18%	**83**	Aa1
Honolulu	51%	17%	**81**	Aa1
Fort Worth	44%	24%	**78**	Aa3
Cincinnati	31%	15%	**78**	Aa2
Sacramento	42%	19%	**76**	Aa2
King(WA)	39%	18%	**76**	Aaa
Memphis	34%	11%	**72**	Aa2
Pr.Georges(MD)	46%	16%	**70**	Aaa
Jacksonville	39%	9%	69	Aa2
El Paso	41%	16%	68	Aa2
Jersey City	41%	21%	66	Aa3
Bridgeport	32%	14%	66	A2
Providence	32%	12%	65	Baa1
St. Louis	31%	5%	63	A3
Birmingham	22%	10%	62	Aa2
Shelby(TN)	39%	12%	62	Aa1
Milwaukee	30%	15%	61	Aa3
San Jose	50%	11%	59	Aa1
Columbus	34%	15%	59	Aaa
Detroit	27%	4%	58	B2
Clark(NV)	34%	11%	56	Aa1
Austin	51%	26%	56	Aaa
Norfolk	28%	9%	53	Aa2
Lubbock	54%	12%	51	Aa2
Las Vegas	29%	11%	49	Aa2
Buffalo	32%	13%	49	A1
LA(CA)	29%	15%	48	Aa1
Cook(IL)	30%	19%	47	A2
Oyster Bay	34%	13%	46	Baa3
San Antonio	32%	11%	45	Aaa
Bexar(TX)	36%	11%	44	Aaa
Bergen(NJ)	32%	13%	43	Aaa
Newark	22%	9%	43	Baa3
Brookhaven	29%	10%	41	Aa2
Hartford	21%	5%	41	B2
Fargo	28%	3%	40	Aa1
SanClara(CA)	34%	13%	39	Aa2
Wichita	27%	9%	39	Aa1

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

[SM11] IPOD and other statistics for cities and counties in our universe

IPOD ratios

	State		City		County	
1	IL	49%	1 Chicago	62%	1 Pr.Georges(MD)	46%
2	NJ	38%	2 Lubbock	54%	2 Shelby(TN)	39%
3	CT	37%	3 Atlanta	52%	3 King(WA)	39%
4	KY	36%	4 Pittsburgh	52%	4 Bexar(TX)	36%
5	HI	30%	5 Baton Rouge	52%	5 SanClara(CA)	34%
6	ME	25%	6 Austin	51%	6 Clark(NV)	34%
7	MD	23%	7 Honolulu	51%	7 Bergen(NJ)	32%
8	TX	23%	8 Oakland	51%	8 Montgom(MD)	30%
9	MA	22%	9 Phoenix	51%	9 Cook(IL)	30%
10	DE	21%	10 Los Angeles	50%	10 LA(CA)	29%
11	CA	21%	11 Houston	50%	11 Arundel (MD)	29%
12	PA	20%	12 San Jose	50%	12 Baltimore(MD)	28%
13	SC	18%	13 Dallas	45%	13 Wake (NC)	27%
14	AL	18%	14 Fort Worth	44%	14 Suffolk(NY)	26%
15	AK	17%	15 Omaha	44%	15 Fairfax(VA)	25%
16	WV	17%	16 Sacramento	42%	16 Nassau(NY)	23%
17	NV	16%	17 El Paso	41%	17 Riverside (CA)	21%
18	VT	16%	18 Jersey City	41%	18 Miami-Dade(FL)	21%
19	MT	16%	19 Jacksonville	39%	19 Westch. (NY)	20%
20	NY	16%	20 Philadelphia	38%	20 Mecklenburg (NC)	20%
21	WA	15%	21 Minneapolis	36%	21 Howard (MD)	20%
22	CO	14%	22 Cleveland	35%	22 Sacramento (CA)	19%
23	NM	13%	23 Reedy Creek (Disn	35%	23 San Diego (CA)	18%
24	RI	13%	24 Columbus	34%	24 Cuyahoga (OH)	18%
25	NC	13%	25 Memphis	34%	25 Union (NJ)	17%
26	LA	13%	26 Oyster Bay	34%	26 Harris(TX)	16%
27	MO	13%	27 Oklahoma City	33%	27 Loudoun(VA)	16%
28	GA	12%	28 Providence	32%	28 Hennepin (MN)	14%
29	NH	12%	29 Bridgeport	32%		
30	MI	11%	30 Portland	32%		
31	IN	11%	31 San Antonio	32%		
32	UT	11%	32 Buffalo	32%		
33	VA	10%	33 Cincinnati	31%		
34	KS	9%	34 St. Louis	31%		
35	OR	9%	35 San Francisco	30%		
36	AZ	9%	36 Milwaukee	30%		
37	OK	9%	37 Nashville	29%		
38	MS	8%	38 Las Vegas	29%		
39	AR	8%	39 Brookhaven	29%		
40	OH	7%	40 Fargo	28%		
41	TN	7%	41 Miami	28%		
42	SD	7%	42 Yonkers	28%		
43	WI	6%	43 Corpus Christi	28%		
44	FL	6%	44 Norfolk	28%		
45	MN	6%	45 Frisco	27%		
46	IA	6%	46 Detroit	27%		
47	ND	5%	47 Wichita	27%		
48	WY	5%	48 Salt Lake City	27%		
49	NE	4%	49 Akron	26%		
50	ID	4%	50 New Haven	26%		
			51 New York City	26%		
			52 Orlando	26%		
			53 Glendale	26%		
			54 Worcester	25%		
			55 Baltimore	24%		
			56 San Diego	24%		
			57 Kansas	24%		
			58 Albuquerque	23%		
			59 Anchorage	23%		
			60 Newark	22%		
			61 Seattle	22%		
			62 Birmingham	22%		
			63 Richmond	22%		
			64 Charlotte	21%		
			65 Tampa	21%		
			66 Ft. Lauderdale	21%		
			67 Huntsville	21%		
			68 New Orleans	21%		
			69 Hartford	21%		
			70 Virginia Beach	20%		
			71 Boston	18%		
			72 Louisville	17%		
			73 Raleigh	17%		
			74 Indianapolis	16%		
			75 Scottsdale	16%		
			76 Denver	12%		
			77 Washington, D.C.	11%		

IPOD funding gaps (normalized IPOD ratio less current contributions)

	State		City		County	
1	NJ	26%	1 Chicago	27%	1 Cook(IL)	19%
2	KY	23%	2 Houston	26%	2 King(WA)	18%
3	IL	22%	3 Austin	26%	3 Pr.Georges(MD)	16%
4	TX	16%	4 Dallas	25%	4 LA(CA)	15%
5	CT	15%	5 Baton Rouge	24%	5 SanClara(CA)	13%
6	SC	12%	6 Fort Worth	24%	6 Bergen(NJ)	13%
7	HI	10%	7 Oakland	22%	7 Shelby(TN)	12%
8	CA	10%	8 Phoenix	22%	8 Suffolk(NY)	12%
9	DE	10%	9 Jersey City	21%	9 Clark(NV)	11%
10	VT	9%	10 Pittsburgh	20%	10 Bexar(TX)	11%
11	AK	9%	11 Atlanta	19%	11 Riverside (CA)	10%
12	PA	8%	12 Sacramento	19%	12 Fairfax(VA)	9%
13	AL	8%	13 Minneapolis	18%	13 Westch. (NY)	8%
14	MD	8%	14 Los Angeles	18%	14 Miami-Dade(FL)	7%
15	NC	8%	15 Omaha	17%	15 Sacramento (CA)	7%
16	ME	8%	16 Honolulu	17%	16 San Diego (CA)	7%
17	CO	8%	17 Cleveland	16%	17 Arundel (MD)	7%
18	NM	8%	18 El Paso	16%	18 Nassau(NY)	6%
19	NV	8%	19 Columbus	15%	19 Cuyahoga (OH)	6%
20	WA	7%	20 Cincinnati	15%	20 Howard (MD)	5%
21	MA	7%	21 Milwaukee	15%	21 Hennepin (MN)	5%
22	NY	6%	22 Bridgeport	14%	22 Montgom(MD)	4%
23	NH	6%	23 Buffalo	13%	23 Mecklenburg (NC)	4%
24	MT	6%	24 Oyster Bay	13%	24 Baltimore(MD)	4%
25	GA	5%	25 Lubbock	12%	25 Loudoun(VA)	4%
26	WV	5%	26 Providence	12%	26 Harris(TX)	3%
27	MO	5%	27 Philadelphia	11%	27 Union (NJ)	2%
28	MI	4%	28 Las Vegas	11%	28 Wake (NC)	0%
29	UT	4%	29 Memphis	11%		
30	KS	4%	30 San Jose	11%		
31	OR	3%	31 San Antonio	11%		
32	AR	3%	32 Yonkers	11%		
33	IA	3%	33 San Francisco	10%		
34	TN	3%	34 Birmingham	10%		
35	AZ	3%	35 Albuquerque	10%		
36	ND	3%	36 Miami	10%		
37	RI	3%	37 Brookhaven	10%		
38	LA	3%	38 Wichita	9%		
39	MN	3%	39 Norfolk	9%		
40	WY	3%	40 Newark	9%		
41	FL	3%	41 Jacksonville	9%		
42	SD	3%	42 Akron	8%		
43	VA	3%	43 Nashville	8%		
44	IN	3%	44 New Haven	8%		
45	OH	2%	45 Seattle	8%		
46	MS	2%	46 Glendale	8%		
47	NE	2%	47 Tampa	7%		
48	WI	2%	48 Virginia Beach	7%		
49	ID	2%	49 Worcester	7%		
50	OK	0%	50 Portland	7%		
			51 Corpus Christi	6%		
			52 New York City	6%		
			53 Kansas	6%		
			54 Salt Lake City	6%		
			55 Hartford	5%		
			56 Oklahoma City	5%		
			57 Richmond	5%		
			58 Louisville	5%		
			59 Ft. Lauderdale	5%		
			60 Baltimore	5%		
			61 St. Louis	5%		
			62 Anchorage	5%		
			63 Charlotte	5%		
			64 Detroit	4%		
			65 Boston	4%		
			66 Orlando	4%		
			67 Huntsville	4%		
			68 Scottsdale	3%		
			69 Fargo	3%		
			70 Reedy Creek (Dis	3%		
			71 Raleigh	3%		
			72 Frisco	3%		
			73 Denver	3%		
			74 Indianapolis	2%		
			75 Washington, D.C	2%		
			76 San Diego	0%		
			77 New Orleans	0%		

IPOD ratio = % of municipality's revenues required to pay the sum of interest on net direct debt, the municipality's share of unfunded pension and retiree healthcare liabilities, and defined contribution plan payments; assuming 6% plan return and 30 year level dollar amortization. Source: J.P. Morgan Asset Management, Center for Retirement Research at B.C., City CAFRs, Moody's. FY 2015.

City	Net direct debt ($mm)	Reported Net Pens. Liabiliity ($mm)	Reported Net OPEB Liabiliity ($mm)	Reported Pension Funding ratio	Reported OPEB Funding ratio	Current Pension contrib. vs ARC	Current OPEB contrib. vs ARC	Pension duration	Liability weighted Pension discount rate	Liability weighted OPEB discount rate
Akron	$ 658	$ 192	$ 183	79%	0%	100%	48%	11.0%	8.14%	3.00%
Albuquerque	$ 624	$ 375	$ 100	81%	16%	46%	101%	13.4%	7.75%	5.00%
Anchorage	$ 1,135	$ 537	$ 218	66%	36%	100%	115%	11.3%	7.92%	6.67%
Atlanta	$ 935	$ 1,240	$ 1,120	69%	0%	100%	57%	12.5%	7.45%	4.00%
Austin	$ 1,344	$ 1,760	$ 1,449	67%	0%	101%	29%	12.6%	7.59%	4.21%
Baltimore	$ 1,285	$ 1,478	$ 791	72%	34%	102%	180%	11.0%	7.75%	7.00%
Baton Rouge	$ 417	$ 508	$ 988	71%	0%	100%	33%	10.8%	7.49%	4.00%
Birmingham	$ 484	$ 605	$ 161	63%	0%	51%	51%	12.0%	5.27%	3.80%
Boston	$ 1,339	$ 1,417	$ 2,053	60%	9%	100%	102%	15.6%	7.75%	7.50%
Bridgeport	$ 648	$ 368	$ 1,003	68%	0%	100%	47%	13.1%	7.29%	4.50%
Brookhaven	$ 573	$ 9	$ 355	98%	0%	100%	31%	11.6%	7.50%	4.00%
Buffalo	$ 304	$ (167)	$ 3,550	105%	0%	100%	42%	11.6%	7.76%	4.00%
Charlotte	$ 1,487	$ (15)	$ 245	101%	18%	92%	85%	11.4%	7.39%	7.75%
Chicago	$ 11,391	$ 33,846	$ 803	23%	0%	52%	91%	13.9%	5.07%	3.04%
Cincinnati	$ 554	$ 1,495	$ 192	60%	73%	66%	124%	11.5%	6.15%	6.47%
Cleveland	$ 727	$ 639	$ 413	80%	29%	100%	100%	11.1%	8.11%	4.43%
Columbus	$ 1,645	$ 1,323	$ 692	73%	25%	100%	100%	10.9%	8.15%	4.36%
Corpus Christi	$ 575	$ 255	$ 12	75%	0%	81%	116%	12.7%	7.18%	3.90%
Dallas	$ 1,883	$ 5,602	$ 460	54%	0%	90%	55%	13.2%	5.69%	4.00%
Denver	$ 1,396	$ 949	$ 124	75%	0%	96%	100%	10.7%	7.85%	4.00%
Detroit	$ 2,031	$ 1,330	$ 2	80%	58%	100%	100%	9.6%	7.53%	7.00%
El Paso	$ 1,188	$ 418	$ 153	83%	0%	100%	29%	13.1%	7.66%	4.50%
Fargo	$ 537	$ 72	$ -	70%	0%	97%	na	12.4%	7.66%	NA
Fort Worth	$ 812	$ 1,529	$ 766	58%	7%	86%	42%	13.8%	6.98%	4.10%
Frisco	$ 685	$ 39	$ -	80%	0%	100%	na	18.4%	6.75%	NA
Ft. Lauderdale	$ 359	$ 118	$ 45	92%	21%	100%	120%	10.6%	7.52%	7.00%
Glendale	$ 567	$ 273	$ 69	60%	0%	100%	32%	10.6%	7.91%	3.50%
Hartford	$ 585	$ 329	$ 295	78%	6%	100%	62%	10.7%	7.76%	4.50%
Honolulu	$ 2,892	$ 1,307	$ 1,672	64%	7%	109%	76%	11.0%	7.75%	7.00%
Houston	$ 3,353	$ 5,574	$ 2,068	66%	0%	88%	19%	11.1%	7.74%	4.00%
Huntsville	$ 670	$ 166	$ 50	67%	16%	100%	100%	11.0%	8.00%	4.50%
Indianapolis	$ 1,278	$ 23	$ 166	98%	0%	122%	9%	15.4%	6.75%	3.60%
Jacksonville	$ 2,212	$ 2,614	$ 153	57%	0%	99%	25%	13.8%	7.25%	4.00%
Jersey City	$ 746	$ 1,101	$ 977	56%	0%	100%	21%	12.9%	5.90%	4.50%
Kansas	$ 1,660	$ 606	$ 98	80%	0%	108%	170%	12.7%	7.39%	4.50%
Las Vegas	$ 527	$ 457	$ 45	75%	23%	100%	71%	13.0%	8.00%	3.70%
Los Angeles	$ 2,839	$ 7,602	$ 2,475	84%	67%	99%	100%	13.3%	7.50%	7.50%
Louisville	$ 492	$ 549	$ 16	51%	59%	100%	100%	14.8%	7.72%	7.50%
Lubbock	$ 1,035	$ 156	$ 179	82%	0%	100%	35%	13.1%	7.21%	4.25%
Memphis	$ 1,513	$ 386	$ 730	90%	2%	67%	106%	11.2%	7.50%	4.50%
Miami	$ 744	$ 768	$ 956	75%	0%	100%	16%	9.2%	7.45%	2.00%
Milwaukee	$ 1,057	$ 94	$ 976	98%	0%	93%	38%	11.2%	8.49%	4.50%
Minneapolis	$ 576	$ 576	$ 36	82%	0%	100%	67%	12.6%	7.90%	3.00%
Nashville	$ 2,582	$ 273	$ 2,786	94%	0%	115%	44%	11.4%	7.50%	4.50%
New Haven	$ 552	$ 647	$ 557	43%	0%	100%	77%	11.2%	8.00%	5.00%
New Orleans	$ 896	$ 961	$ 192	45%	0%	88%	100%	10.4%	6.46%	4.00%
New York City	$ 69,072	$ 51,999	$ 73,046	70%	4%	100%	4%	10.3%	7.00%	4.00%
Newark	$ 528	$ 1,364	$ -	55%	0%	100%	na	16.3%	5.59%	NA
Norfolk	$ 857	$ 477	$ 77	80%	0%	94%	70%	12.0%	7.00%	4.00%
Oakland	$ 924	$ 1,285	$ 860	72%	0%	100%	50%	12.4%	7.40%	7.28%
Oklahoma	$ 777	$ 258	$ 401	88%	9%	53%	52%	10.6%	7.50%	4.90%
Omaha	$ 881	$ 886	$ 401	48%	0%	96%	161%	11.4%	8.00%	3.00%
Orlando	$ 466	$ 230	$ 301	81%	23%	100%	100%	11.5%	7.88%	0.00%
Oyster Bay	$ 823	$ 11	$ 434	98%	0%	68%	26%	11.9%	7.50%	4.00%
Philadelphia	$ 3,984	$ 9,125	$ 1,773	50%	0%	78%	72%	10.2%	7.68%	7.80%
Phoenix	$ 2,345	$ 3,797	$ 295	52%	32%	100%	100%	12.0%	7.67%	7.00%
Pittsburgh	$ 498	$ 1,722	$ 507	45%	2%	118%	54%	10.3%	7.50%	4.25%
Portland	$ 615	$ (82)	$ 108	104%	12%	100%	67%	11.2%	7.75%	4.06%
Providence	$ 492	$ 1,132	$ 981	39%	0%	100%	49%	10.2%	8.01%	4.00%
Raleigh	$ 557	$ (22)	$ 140	103%	16%	100%	102%	11.6%	7.25%	7.00%
Reedy Creek (Disney)	$ 542	$ 16	$ 46	92%	0%	100%	100%	12.7%	7.65%	4.00%
Richmond	$ 727	$ 557	$ 120	69%	0%	100%	35%	11.7%	7.23%	3.78%
Sacramento	$ 395	$ 663	$ 357	77%	2%	100%	33%	13.5%	7.37%	4.50%
Salt Lake City	$ 353	$ 117	$ 1	89%	0%	100%	58%	13.6%	7.50%	3.50%
San Antonio	$ 2,272	$ 671	$ 733	86%	32%	100%	48%	13.6%	7.32%	6.18%
San Diego	$ 737	$ 1,714	$ 537	79%	18%	100%	77%	11.1%	7.25%	6.73%
San Francisco	$ 2,583	$ 1,828	$ 3,989	91%	1%	100%	48%	12.1%	7.58%	4.46%
San Jose	$ 1,105	$ 1,699	$ 1,143	75%	20%	100%	85%	14.0%	7.18%	6.05%
Scottsdale	$ 916	$ 272	$ 3	68%	0%	100%	24%	9.8%	7.95%	4.00%
Seattle	$ 1,040	$ 1,130	$ -	75%	0%	107%	na	14.2%	7.39%	NA
St. Louis	$ 969	$ 310	$ 491	86%	0%	113%	26%	10.0%	7.79%	3.00%
Tampa	$ 338	$ 83	$ 69	97%	0%	100%	57%	7.2%	8.37%	4.00%
Virginia Beach	$ 999	$ 969	$ 97	76%	35%	100%	100%	13.2%	7.00%	7.50%
Washington, D.C.	$ 9,494	$ 202	$ (201)	97%	120%	100%	100%	17.3%	6.50%	6.50%
Wichita	$ 490	$ 44	$ 35	96%	0%	100%	61%	11.6%	7.75%	4.00%
Worcester	$ 830	$ 403	$ 728	67%	0%	100%	50%	10.8%	7.63%	4.00%
Yonkers	$ 581	$ (125)	$ 2,093	103%	0%	100%	33%	11.7%	7.68%	4.00%

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

City	Current IPOD ratio	Normalized IPOD: Interest	Normalized IPOD: Pension	Normalized IPOD: OPEB	Normalized IPOD: Total	Pension as % of Pension + OPEB	Remed: dedicated tax increases	Remed: discr spending cuts	Remed: incr worker contrib	Breakeven Pension return	Breakeven OPEB return
Akron	18%	10%	12%	3%	26%	78%	8%	9%	218%	8.4%	No solution
Albuquerque	13%	6%	16%	2%	23%	91%	10%	11%	242%	8.3%	10.0%
Anchorage	18%	8%	11%	4%	23%	74%	5%	5%	371%	8.6%	5.3%
Atlanta	33%	8%	31%	13%	52%	71%	19%	15%	329%	8.2%	No solution
Austin	26%	7%	31%	14%	51%	69%	26%	28%	287%	9.1%	Con<Serv
Baltimore	20%	4%	16%	5%	24%	76%	5%	5%	240%	9.1%	0.8%
Baton Rouge	28%	6%	23%	23%	52%	50%	24%	20%	525%	8.0%	Con<Serv
Birmingham	12%	6%	13%	3%	22%	83%	10%	8%	272%	Con<Serv	No solution
Boston	13%	2%	8%	7%	18%	51%	4%	4%	221%	7.2%	11.7%
Bridgeport	19%	6%	11%	16%	32%	41%	14%	11%	1245%	7.8%	No solution
Brookhaven	19%	11%	6%	12%	29%	33%	10%	10%	3640%	6.6%	Con<Serv
Buffalo	19%	1%	9%	22%	32%	29%	13%	47%	4771%	5.8%	No solution
Charlotte	17%	10%	8%	3%	21%	69%	5%	5%	108%	6.8%	13.5%
Chicago	35%	12%	49%	1%	62%	98%	27%	14%	428%	17.9%	-11.7%
Cincinnati	16%	5%	23%	4%	31%	87%	15%	15%	278%	9.3%	8.8%
Cleveland	19%	6%	24%	4%	35%	85%	16%	15%	207%	8.3%	16.2%
Columbus	19%	8%	22%	4%	34%	85%	15%	15%	243%	8.9%	18.7%
Corpus Christi	22%	11%	16%	0%	28%	98%	6%	7%	156%	7.6%	8.4%
Dallas	20%	7%	36%	2%	45%	94%	25%	30%	459%	11.1%	No solution
Denver	9%	4%	8%	1%	12%	93%	3%	3%	117%	7.4%	No solution
Detroit	23%	9%	18%	0%	27%	100%	4%	5%	330%	2.7%	7.0%
El Paso	26%	14%	25%	3%	41%	89%	16%	16%	200%	8.0%	Con<Serv
Fargo	25%	19%	9%	0%	28%	100%	3%	2%	109%	7.7%	NA
Fort Worth	21%	5%	30%	9%	44%	77%	24%	20%	549%	11.0%	No solution
Frisco	25%	19%	8%	0%	27%	100%	3%	4%	100%	7.3%	NA
Ft. Lauderdale	16%	5%	14%	2%	21%	89%	5%	6%	200%	7.1%	6.0%
Glendale	18%	10%	14%	2%	26%	88%	8%	9%	177%	9.7%	Con<Serv
Hartford	15%	5%	11%	4%	21%	74%	5%	4%	196%	7.3%	No solution
Honolulu	34%	13%	21%	18%	51%	54%	17%	21%	76121%	10.0%	32.8%
Houston	24%	7%	35%	8%	50%	81%	26%	23%	772%	10.0%	Con<Serv
Huntsville	17%	11%	9%	1%	21%	87%	4%	4%	204%	8.8%	10.3%
Indianapolis	14%	9%	5%	3%	16%	68%	2%	2%	130%	5.7%	Con<Serv
Jacksonville	31%	9%	29%	1%	39%	96%	9%	11%	304%	7.6%	Con<Serv
Jersey City	20%	7%	20%	15%	41%	57%	21%	29%	510%	10.0%	Con<Serv
Kansas	18%	9%	14%	1%	24%	96%	6%	7%	216%	7.8%	0.5%
Las Vegas	17%	5%	23%	1%	29%	96%	11%	15%	773%	8.8%	18.9%
Los Angeles	33%	3%	38%	10%	50%	79%	18%	19%	228%	7.2%	8.0%
Louisville	12%	4%	13%	0%	17%	98%	5%	5%	145%	8.3%	8.8%
Lubbock	42%	27%	19%	8%	54%	69%	12%	17%	237%	7.1%	Con<Serv
Memphis	23%	10%	18%	6%	34%	74%	11%	10%	247%	7.8%	43.5%
Miami	18%	5%	15%	8%	28%	64%	10%	11%	427%	7.2%	Con<Serv
Milwaukee	15%	6%	15%	9%	30%	63%	15%	16%	460%	7.7%	Con<Serv
Minneapolis	18%	6%	30%	1%	36%	98%	18%	13%	217%	8.3%	No solution
Nashville	21%	7%	9%	13%	29%	41%	8%	8%	880%	5.9%	No solution
New Haven	18%	5%	14%	7%	26%	69%	8%	7%	352%	11.6%	40.9%
New Orleans	21%	6%	12%	2%	21%	87%	0%	0%	-5%	5.8%	4.0%
New York City	19%	4%	11%	10%	26%	54%	6%	8%	615%	6.0%	Con<Serv
Newark	13%	4%	18%	0%	22%	100%	9%	11%	186%	8.8%	NA
Norfolk	19%	7%	19%	1%	28%	94%	9%	9%	224%	8.2%	No solution
Oakland	29%	7%	33%	11%	51%	74%	22%	22%	462%	8.1%	No solution
Oklahoma City	28%	8%	17%	8%	33%	68%	5%	5%	119%	5.8%	No solution
Omaha	26%	10%	29%	5%	44%	86%	17%	19%	286%	12.4%	No solution
Orlando	22%	5%	16%	4%	26%	78%	4%	6%	222%	7.3%	4.5%
Oyster Bay	21%	14%	6%	13%	34%	33%	13%	15%	4262%	7.3%	Con<Serv
Philadelphia	26%	5%	28%	5%	38%	84%	11%	9%	363%	9.6%	No solution
Phoenix	29%	9%	40%	2%	51%	95%	22%	18%	404%	11.2%	6.7%
Pittsburgh	33%	5%	39%	8%	52%	82%	20%	24%	333%	11.5%	No solution
Portland	26%	4%	9%	1%	32%	87%	7%	5%	10161%	Con<Serv	34.7%
Providence	21%	4%	19%	10%	32%	65%	12%	12%	534%	11.1%	No solution
Raleigh	14%	7%	6%	4%	17%	59%	3%	4%	83%	6.6%	8.5%
Reedy Creek (Disney)	32%	25%	7%	3%	35%	68%	3%	6%	371%	7.5%	3.9%
Richmond	17%	5%	15%	2%	22%	90%	5%	5%	171%	7.7%	Con<Serv
Sacramento	23%	4%	30%	8%	42%	78%	19%	18%	301%	7.9%	Con<Serv
Salt Lake City	21%	7%	19%	1%	27%	96%	6%	10%	1162%	7.1%	Con<Serv
San Antonio	21%	9%	16%	6%	32%	72%	11%	9%	237%	7.5%	17.2%
San Diego	24%	3%	19%	3%	24%	86%	0%	0%	8%	5.6%	10.6%
San Francisco	20%	3%	18%	9%	30%	67%	10%	14%	149%	6.6%	Con<Serv
San Jose	39%	6%	34%	9%	50%	79%	11%	12%	295%	6.9%	11.6%
Scottsdale	12%	8%	7%	0%	16%	99%	3%	6%	109%	9.0%	Con<Serv
Seattle	14%	4%	18%	0%	22%	100%	8%	8%	126%	7.8%	NA
St. Louis	26%	9%	15%	7%	31%	70%	5%	4%	346%	5.8%	Con<Serv
Tampa	14%	4%	15%	2%	21%	90%	7%	8%	214%	7.5%	Con<Serv
Virginia Beach	13%	4%	15%	1%	20%	93%	7%	10%	167%	8.2%	7.5%
Washington, D.C.	9%	6%	3%	1%	11%	71%	2%	1%	195%	Con<Serv	Con<Serv
Wichita	18%	9%	17%	1%	27%	93%	9%	8%	311%	7.6%	No solution
Worcester	18%	7%	10%	8%	25%	57%	7%	6%	259%	7.8%	No solution
Yonkers	18%	3%	13%	12%	28%	53%	11%	11%	2633%	6.5%	No solution

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

County	Net direct debt ($mm)	Reported Net Pens. Liabiliity ($mm)	Reported Net OPEB Liabiliity ($mm)	Reported Pension Funding ratio	Reported OPEB Funding ratio	Current Pension contrib. vs ARC	Current OPEB contrib. vs ARC	Pension duration	Liability weighted Pension discount rate	Liability weighted OPEB discount rate
Arundel (MD)	$ 1,133	$ 645	$ 2,400	73%	0%	100%	41%	12.3%	7.51%	3.84%
Baltimore (MD)	$ 2,825	$ 1,175	$ 1,649	68%	25%	100%	109%	11%	7.00%	7.00%
Bergen (NJ)	$ 1,158	$ 609	$ 1,094	55%	0%	100%	33%	14%	5.44%	4.50%
Bexar(TX)	$ 1,527	$ 176	$ 183	86%	0%	100%	38%	13%	8.10%	3.75%
Clark(NV)	$ 1,931	$ 1,804	$ 754	76%	0%	100%	93%	13%	8.00%	4.00%
Cook (IL)	$ 3,650	$ 12,878	$ 2,134	41%	0%	98%	21%	18%	4.50%	4.50%
Cuyahoga (OH)	$ 1,467	$ 366	$ 74	86%	62%	100%	100%	12%	8.00%	6.90%
Fairfax (VA)	$ 3,273	$ 4,185	$ 377	77%	46%	99%	137%	14%	7.29%	7.50%
Harris (TX)	$ 3,146	$ 724	$ 1,190	87%	0%	100%	36%	13%	6.10%	4.00%
Hennepin (MN)	$ 1,078	$ 436	$ 123	80%	0%	100%	64%	13%	7.90%	3.75%
Howard (MD)	$ 1,083	$ 184	$ 534	83%	9%	100%	53%	14%	7.52%	6.00%
King (WA)	$ 1,100	$ 795	$ 167	84%	0%	100%	43%	18%	7.50%	2.50%
LA (CA)	$ 1,668	$ 6,957	$ 26,804	87%	2%	100%	28%	13%	7.63%	3.75%
Loudoun (VA)	$ 1,149	$ 809	$ 210	75%	42%	100%	124%	14%	7.00%	7.04%
Mecklenburg (NC)	$ 1,558	$ 55	$ 947	99%	9%	99%	66%	11%	7.24%	4.38%
Miami-Dade(FL)	$ 4,552	$ 955	$ 460	92%	0%	100%	99%	13%	7.65%	4.00%
Montgom(MD)	$ 3,451	$ 840	$ 2,166	86%	18%	120%	91%	12%	7.50%	7.50%
Nassau (NY)	$ 3,241	$ 84	$ 4,961	98%	0%	100%	3%	12%	7.50%	3.25%
Pr.Georges(MD)	$ 1,639	$ 1,496	$ 5,380	61%	2%	100%	55%	12%	7.54%	4.72%
Riverside (CA)	$ 1,332	$ 1,780	$ 7	79%	84%	113%	282%	15%	7.64%	7.30%
Sacramento (CA)	$ 1,224	$ 693	$ 146	91%	0%	100%	36%	13%	7.50%	4.00%
San Diego (CA)	$ 1,048	$ 1,958	$ 164	83%	3%	100%	103%	13%	7.75%	7.75%
SanClara(CA)	$ 1,881	$ 2,447	$ 1,530	77%	29%	100%	95%	13%	7.50%	6.72%
Shelby(TN)	$ 1,389	$ 356	$ 1,388	94%	12%	100%	69%	12%	7.50%	4.23%
Suffolk (NY)	$ 1,527	$ 115	$ 4,879	98%	0%	100%	32%	12%	7.50%	4.50%
Union (NJ)	$ 1,056	$ 496	$ -	54%	0%	100%	na	13%	5.39%	NA
Wake (NC)	$ 2,234	$ 66	$ 786	99%	2%	100%	77%	11%	7.24%	1.45%
Westch. (NY)	$ 1,254	$ 57	$ 1,989	98%	0%	100%	37%	12%	7.50%	4.50%

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

County	Current IPOD ratio	Normalized IPOD: Interest	Normalized IPOD: Pension	Normalized IPOD: OPEB	Normalized IPOD: Total	Pension as % of Pension + OPEB	Remed: dedicated tax increases	Remed: discr spending cuts	Remed: incr worker contrib	Breakeven Pension return	Breakeven OPEB return
Arundel (MD)	22%	4%	9%	14%	29%	39%	7%	7%	665%	4.2%	Con<Serv
Baltimore (MD)	24%	8%	8%	11%	28%	43%	4%	4%	194%	7.8%	7.8%
Bergen (NJ)	19%	10%	9%	13%	32%	41%	13%	17%	558%	9.9%	No solution
Bexar(TX)	26%	17%	16%	3%	36%	83%	11%	9%	277%	8.1%	Con<Serv
Clark(NV)	22%	5%	25%	3%	34%	88%	11%	11%	675%	8.5%	20.3%
Cook (IL)	11%	5%	21%	4%	30%	82%	19%	33%	577%	Con<Serv	Con<Serv
Cuyahoga (OH)	12%	7%	10%	1%	18%	91%	6%	6%	175%	8.0%	8.1%
Fairfax (VA)	16%	4%	20%	2%	25%	92%	9%	11%	239%	7.8%	5.8%
Harris (TX)	13%	7%	5%	4%	16%	57%	3%	4%	111%	6.4%	Con<Serv
Hennepin (MN)	9%	5%	8%	1%	14%	87%	5%	5%	187%	8.2%	Con<Serv
Howard (MD)	15%	6%	6%	7%	20%	49%	5%	4%	470%	7.2%	45.2%
King (WA)	21%	7%	31%	1%	39%	96%	18%	9%	301%	7.8%	No solution
LA (CA)	14%	1%	14%	14%	29%	50%	15%	14%	552%	7.0%	Con<Serv
Loudoun (VA)	12%	4%	10%	2%	16%	80%	4%	5%	179%	7.6%	6.2%
Mecklenburg (NC)	16%	6%	9%	5%	20%	62%	4%	4%	91%	6.6%	24.3%
Miami-Dade(FL)	13%	7%	13%	1%	21%	93%	7%	9%	463%	7.7%	14.8%
Montgom(MD)	26%	6%	8%	11%	30%	44%	4%	4%	264%	5.9%	13.9%
Nassau (NY)	17%	6%	7%	10%	23%	42%	6%	6%	2872%	6.4%	No solution
Pr.Georges(MD)	30%	5%	14%	25%	46%	36%	16%	18%	783%	8.0%	No solution
Riverside (CA)	11%	2%	19%	0%	21%	100%	10%	10%	246%	8.1%	3.4%
Sacramento (CA)	12%	3%	15%	1%	19%	97%	7%	7%	295%	7.4%	Con<Serv
San Diego (CA)	12%	1%	16%	1%	18%	97%	7%	7%	343%	7.7%	4.5%
SanClara(CA)	21%	4%	21%	9%	34%	70%	13%	16%	282%	8.2%	10.9%
Shelby(TN)	27%	7%	19%	12%	39%	61%	12%	16%	217%	7.4%	19.7%
Suffolk (NY)	14%	3%	10%	14%	26%	42%	12%	11%	3855%	6.9%	No solution
Union (NJ)	15%	9%	8%	0%	17%	100%	2%	2%	87%	8.1%	NA
Wake (NC)	27%	10%	11%	5%	27%	68%	0%	0%	-7%	5.3%	30.3%
Westch. (NY)	12%	4%	6%	11%	20%	36%	8%	7%	3259%	6.4%	Con<Serv

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

City	Funding Gap	Revenue growth 5y	Pop growth 10y	Pension as % of Pension + OPEB	Future pension fund ratio	Operating deficit	Risk Indicator
Akron	8%	4.2%	-0.9%	78%	69%	7%	33
Albuquerque	10%	2.1%	1.2%	91%	54%	5%	26
Anchorage	5%	-0.2%	0.6%	74%	63%	15%	30
Atlanta	19%	2.6%	0.5%	71%	68%	39%	98
Austin	26%	6.2%	2.6%	69%	67%	15%	56
Baltimore	5%	6.6%	-0.3%	76%	68%	14%	19
Baton Rouge	24%	2.3%	0.8%	50%	67%	34%	90
Birmingham	10%	1.5%	-1.3%	83%	51%	27%	62
Boston	4%	4.9%	0.9%	51%	65%	10%	(21)
Bridgeport	14%	2.6%	0.3%	41%	69%	29%	66
Brookhaven	10%	0.6%	0.1%	33%	86%	11%	41
Buffalo	13%	0.4%	-0.9%	29%	89%	-116%	49
Charlotte	5%	3.9%	2.3%	69%	86%	14%	(21)
Chicago	27%	4.2%	-0.7%	98%	15%	57%	121
Cincinnati	15%	2.7%	-0.9%	87%	49%	11%	78
Cleveland	16%	0.3%	-1.9%	85%	70%	21%	99
Columbus	15%	3.6%	1.1%	85%	65%	19%	59
Corpus Christi	6%	2.4%	0.9%	98%	66%	12%	39
Dallas	25%	1.9%	0.2%	94%	62%	4%	95
Denver	3%	5.0%	1.6%	93%	66%	-17%	(35)
Detroit	4%	-2.6%	-2.8%	100%	71%	12%	58
El Paso	16%	3.1%	0.9%	89%	76%	18%	68
Fargo	3%	1.0%	2.2%	100%	67%	37%	40
Fort Worth	24%	1.9%	2.7%	77%	59%	27%	78
Frisco	3%	7.9%	6.3%	100%	82%	1%	(14)
Ft. Lauderdale	5%	4.5%	0.3%	89%	81%	-9%	(5)
Glendale	8%	4.7%	-0.2%	88%	57%	1%	32
Hartford	5%	0.0%	-0.1%	74%	70%	37%	41
Honolulu	17%	1.1%	0.8%	54%	65%	14%	81
Houston	26%	2.7%	1.2%	81%	58%	27%	86
Huntsville	4%	0.0%	1.0%	87%	63%	20%	20
Indianapolis	2%	-3.6%	1.0%	68%	98%	8%	(18)
Jacksonville	9%	1.7%	0.9%	96%	62%	10%	69
Jersey City	21%	3.1%	0.3%	57%	67%	-6%	66
Kansas	6%	1.9%	0.5%	96%	79%	6%	24
Las Vegas	11%	1.8%	0.8%	96%	70%	-5%	49
Los Angeles	18%	2.2%	0.2%	79%	77%	18%	89
Louisville	5%	2.9%	0.9%	98%	59%	13%	10
Lubbock	12%	3.7%	1.4%	69%	78%	10%	51
Memphis	11%	3.9%	-0.3%	74%	69%	28%	72
Miami	10%	0.7%	2.1%	64%	67%	8%	27
Milwaukee	15%	-1.3%	0.0%	63%	77%	9%	61
Minneapolis	18%	3.8%	0.6%	98%	74%	34%	83
Nashville	8%	5.0%	1.5%	41%	88%	20%	8
New Haven	8%	2.0%	1.7%	69%	48%	25%	31
New Orleans	0%	3.9%	6.4%	87%	44%	16%	(14)
New York City	6%	4.1%	0.4%	54%	68%	-3%	8
Newark	9%	0.0%	0.0%	100%	72%	-6%	43
Norfolk	9%	0.6%	0.3%	94%	76%	11%	53
Oakland	22%	4.2%	0.2%	74%	71%	23%	88
Oklahoma City	5%	3.1%	1.7%	68%	61%	23%	35
Omaha	17%	2.9%	0.4%	86%	50%	14%	85
Orlando	4%	3.6%	2.0%	78%	73%	-6%	(12)
Oyster Bay	13%	4.2%	-0.1%	33%	76%	7%	46
Philadelphia	11%	0.7%	0.3%	84%	39%	34%	95
Phoenix	22%	0.3%	0.2%	95%	56%	34%	119
Pittsburgh	20%	2.7%	-0.9%	82%	57%	12%	103
Portland	7%	4.3%	1.2%	87%	88%	39%	34
Providence	12%	3.9%	0.0%	65%	43%	16%	65
Raleigh	3%	3.3%	2.5%	59%	91%	-19%	(49)
Reedy Creek (I	3%	8.1%	0.0%	68%	82%	-23%	16
Richmond	5%	2.5%	1.3%	90%	69%	17%	13
Sacramento	19%	3.1%	0.6%	78%	75%	22%	76
Salt Lake City	6%	6.0%	0.7%	96%	81%	-19%	6
San Antonio	11%	3.5%	1.0%	72%	80%	27%	45
San Diego	0%	3.5%	0.6%	86%	74%	-2%	1
San Francisco	10%	8.0%	0.8%	67%	81%	-7%	14
San Jose	11%	5.2%	0.9%	79%	75%	24%	59
Scottsdale	3%	-3.4%	0.4%	99%	61%	-47%	11
Seattle	8%	4.8%	1.5%	100%	76%	14%	7
St. Louis	5%	0.9%	-1.0%	70%	79%	34%	63
Tampa	7%	1.1%	1.0%	90%	76%	4%	13
Virginia Beach	7%	1.2%	0.4%	93%	76%	-20%	13
Washington, D	2%	6.0%	1.4%	71%	94%	26%	(36)
Wichita	9%	3.0%	0.9%	93%	83%	25%	39
Worcester	7%	1.6%	1.1%	57%	64%	21%	26
Yonkers	11%	3.5%	0.2%	53%	88%	14%	32

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

County	Funding Gap	Revenue growth 5y	Pop growth 10y	Pension as % of Pension + OPEB	Future pension fund ratio	Operating deficit	Risk Indicator
Arundel (MD)	7%	4.0%	1.1%	39%	70%	17%	16
Baltimore(MD)	4%	3.6%	0.5%	43%	68%	17%	19
Bergen(NJ)	13%	2.1%	0.6%	41%	69%	-3%	43
Bexar(TX)	11%	4.9%	2.0%	83%	75%	28%	44
Clark(NV)	11%	2.6%	1.6%	88%	71%	23%	56
Cook(IL)	19%	8.3%	-0.2%	82%	65%	-47%	47
Cuyahoga (OH	6%	2.2%	-0.6%	91%	75%	20%	30
Fairfax(VA)	9%	3.1%	1.0%	92%	75%	-3%	15
Harris(TX)	3%	11.5%	2.1%	57%	89%	-23%	(60)
Hennepin (MN)	5%	2.5%	0.9%	87%	73%	8%	(7)
Howard (MD)	5%	5.0%	1.4%	49%	77%	27%	(15)
King(WA)	18%	2.0%	1.8%	96%	80%	57%	76
LA(CA)	15%	3.5%	0.0%	50%	79%	15%	48
Loudoun(VA)	4%	5.2%	3.8%	80%	76%	-9%	(48)
Mecklenburg (I	4%	3.3%	2.5%	62%	88%	10%	(31)
Miami-Dade(FL	7%	1.2%	1.1%	93%	82%	-2%	6
Montgom(MD)	4%	3.3%	1.0%	44%	85%	22%	18
Nassau(NY)	6%	2.0%	0.1%	42%	86%	14%	17
Pr.Georges(MI	16%	3.0%	0.7%	36%	63%	16%	70
Riverside (CA)	10%	4.7%	2.1%	100%	80%	10%	0
Sacramento (C	7%	2.1%	0.8%	97%	82%	4%	8
San Diego (CA	7%	2.5%	1.0%	97%	76%	2%	2
SanClara(CA)	13%	6.3%	0.8%	70%	74%	6%	39
Shelby(TN)	12%	1.0%	0.2%	61%	84%	5%	62
Suffolk(NY)	12%	2.9%	0.0%	42%	86%	18%	39
Union (NJ)	2%	3.3%	0.9%	100%	68%	-9%	(11)
Wake (NC)	0%	4.1%	2.8%	68%	88%	16%	(18)
Westch. (NY)	8%	0.6%	0.3%	36%	86%	21%	19

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

Note: operating deficit shown as a positive number; operating surplus shown as a negative number

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