BAM SM
BUILD AMERICA MUTUAL

WHITE PAPER

PUBLIC PENSION RISK SERIES

PENSION FUNDING ADEQUACY AND MUNICIPAL CREDIT ANALYSIS:

TECHNIQUES FOR IDENTIFYING A SIGNIFICANT CREDIT RISK

ABSTRACT

Determining whether municipal bond issuers have established a reasonable schedule for repaying unfunded pension liabilities is a key element of incorporating pension risk into overall municipal credit risk analysis[1]*. Under updated Governmental Accounting Standards Board (GASB) rules, issuers now provide a wealth of information that enables analysts to make these evaluations more accurate and useful. This paper discusses how funding adequacy can impact pension risk, and how analysts can utilize specific publicly available data to evaluate that risk and reach conclusions. It also presents examples from Build America Mutual's ("BAM's") analysis of data for 110 public pension plans*[2] *that illustrate how poor funding policies can correlate with various indicators of credit risk.*

Since fiscal 2001, State and local government pension plans in the United States have been subject to various forces that have resulted in a more or less steady decline in funding ratios[3], and even conservative estimates indicate that the total governmental unfunded pension liability is in excess of $1 trillion, or about 25%[4] of total municipal debt outstanding.

Survey data[5] illustrates the scope of the problem, and how it has worsened since fiscal 2001, when in aggregate public sector pension plans were essentially fully funded (see Figure A). In the chart, the blue bars are plan liabilities and the white bars are plan assets; note that at the end of fiscal 2017 the difference between the two bars, the unfunded liability represented on the chart, is about $1 trillion, and the funding ratio is 71.9%.

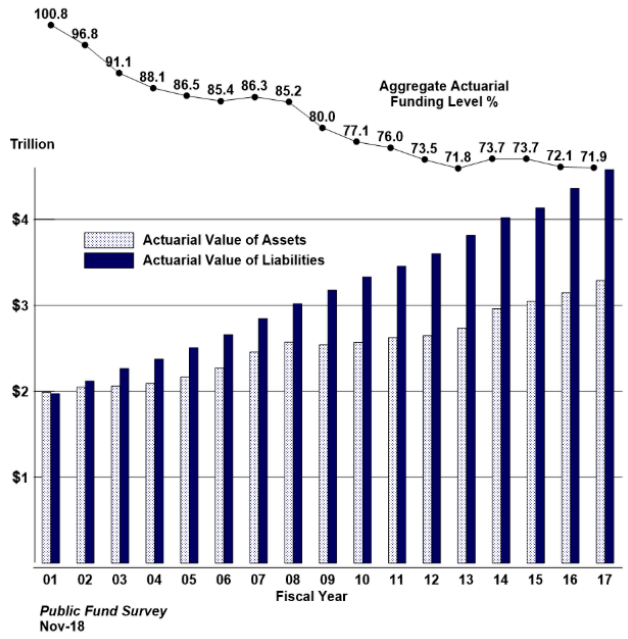
[1] This paper is written to address pension funding adequacy, but all of the analysis techniques presented can also be applied to other postemployment benefits (OPEB). For simplicity, OPEB will not be mentioned hereafter in this paper, but it is important to note that Build America Mutual's credit analysis incorporates risks related to both pensions and OPEB.
[2] BAM collects annual data on statewide cost-sharing multiple employer defined benefit pension plans, and consistent correlations among various indicators of pension risk have emerged. This paper's anaylsis is based on data from fiscal 2017, the most recent year for which a full dataset is available.
[3] The "funding ratio" is equal to pension plan assets divided by liabilities.
[4] According to Federal Reserve Board data, outstanding municipal debt was about $3.8 trillion as of March 31, 2019.
[5] Data from the Public Fund Survey, sponsored by the National Association of State Retirement Administrators (NASRA). The Survey contains data as of the end of fiscal 2017, on public retirement systems comprising about 85% of the U.S. state and local government retirement system community. Published November 2018.

What does this mean for municipal credit analysis? With unfunded pension liabilities at a high level, it's logical to conclude that the annual costs to pay them off over time would be high as well. Pension contribution dollars compete in the same government (bond issuer) budgets with dollars needed to pay debt service. And sometimes that competition gets so fierce that something has to give: government services, pension contributions, or debt service. While solvent municipal issuers generally prioritize debt service payments over pension contributions, that treatment has been reversed in some recent municipal bankruptcies[6].

Drivers of the Change in Unfunded Pension Liabilities

Figure A:

Aggregate U.S. Public Sector Pension Plan Funding
(2001 - 2017)



What factors have driven this historical decline in funding ratios? The Center for Retirement Research at Boston College (CRR) reported the sources of changes in unfunded liabilities for 150 plans in its Public Plans Database for the period 2001 to 2013[7].

60.4%	Investment return lower/ (higher) than assumed
23.7%	Contribution lower/(higher) than normal cost + interest on UAAL[8]
2.4%	Actuarial experience worse/ (better) than expected
-0.8%	Benefit Changes
7.2%	Changes to assumptions and methods
7.1%	Other
100%	**TOTAL**

[6] Stockton and San Bernardino, CA, and Detroit, MI, are examples.
[7] "How Did State/Local Plans Become Underfunded?" by Alicia H. Munnell, Jean-Pierre Aubry, and Mark Cafarelli, January 2015
[8] "UAAL" means unfunded actuarial accrued liabilities; if contributions are less than normal cost plus interest on UAAL, it means that negative amortization is taking place: allowing the UAAL to grow because contributions are too low.

One observes from the CRR data that the main drivers of the change in unfunded pension liabilities over the study period[9] were lower-than-expected asset returns and insufficient contributions.

As noted in the first white paper of this series, "Asset Allocation and Demographics" (May 2018), relating to investment and demographic risks, understanding the drivers of past increases in pension underfunding is important in understanding future pension risks. With respect to bond issuers whose financial reports are compliant with GASB Statements No. 67 and 68[10], there is now a wealth of information available to credit analysts seeking to make risk judgements about public sector pensions. This paper will explain how analysts can use that publicly disclosed data about pension plans to identify and quantify how inadequate contributions can contribute to an issuer's overall pension funding shortfall, and then draw conclusions relative to overall pension-related credit risk.

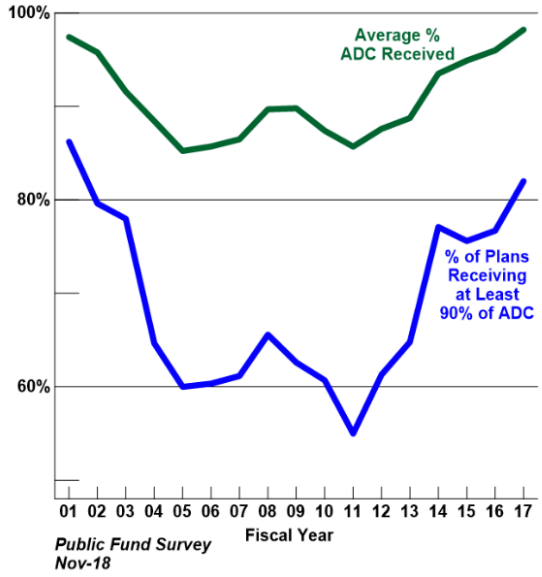
History of Insufficient Contributions

Budgets are "sticky." Recall from Figure A, the funded ratio in FY 2001 was slightly north of 100%, which implies that actuarially determined funding contribution requirements at the time were relatively low[11] compared to today. As funding ratios declined over time, pension plan contribution requirements rose in order to fund the growing gap between pension assets and liabilities. Some plan sponsors were slow to respond by raising their budget appropriations for pension contributions.

In Figure B[12], the downward slope of the curve from fiscal 2001 through fiscal 2005 illustrates this behavior. It was relatively easy to budget for a high percentage of the actuarially determined contribution (ADC) when funding requirements were relatively low. As ADCs rose, political leaders faced the choices of cutting other spending or raising other revenues in order to maintain their pension funding policies, and the more immediate priorities – providing government services and paying other fixed costs – often took precedence. Economic turmoil in 2008 and 2009 gave rise to hardships that forced leaders to continue prioritizing providing services and other costs over paying pension contributions. ▶

Figure B:

Funding of Actuarially Determined Contributions
(2001 - 2017)



[9] Even though some five years have passed since the end of the CRR study period in 2013, there is no reason to believe that insufficient pension contributions are a less-significant driver of pension underfunding today.
[10] GASB 67 and GASB 68 pertain to financial reporting for pensions.
[11] Actuarially determined contributions to pension plans usually consist of two parts: a "normal cost," which pays for the active employee population's current year's benefit accrual, and an amortization payment to systematically pay for unfunded liabilities. If a plan is 100% funded, it means that the amortization part of the contribution is zero, resulting in a relatively low actuarially determined contribution.
[12] Public Fund Survey, NASRA, November 2018

As economic recovery began to take hold, leaders began to recognize the need to confront the underfunding of their pension plans and began raising contributions, as we can see in Figure B as the upward sloping line beginning in FY 2011. To reduce unfunded pension liabilities, either liabilities need to be reduced as a result of benefit reforms, or assets must be increased by way of funding reforms. As we can see in Figure B, beginning in FY 2011 many employers opted for funding reforms, or a combination of benefit and funding reforms, to reduce unfunded pension liabilities.

The contribution trend since FY 2011 is undoubtedly a positive one. However, BAM's analysis of public pension plan disclosures reveals many cases in which the ADCs themselves are inadequate, so even issuers who contribute 100% of the stated funding requirement may not be doing what is necessary to stop pension liabilities from growing.

Why is Insufficient Pension Funding a Risk?

BAM's analysis of the risks posed by pensions focuses on the likelihood that pension costs will rise to a level that will crowd out an issuer's ability to pay its debt service costs during the time we will insure the timely payment of interest and principal on their bonds. All of our pension risk analysis is geared to determining whether certain factors increase or decrease the risk of "crowd out."

Under a sound funding policy, an employee's pension will be "paid for" during his or her career. This makes sense for both employees and taxpayers, because pensions are a form of deferred compensation that is earned for services rendered. Because of poor funding policies, however, many governments do not fully fund members' pensions while they are working. This means that current contributions not only need to cover the funding of current employees' pension accruals, but also the portions of retirees' pensions that should have been funded in prior years (during the retirees' active working lives). Pension plans with high percentages of retired employees versus active members generally face greater funding strain related to legacy pension liabilities.[13] The accumulated effect of insufficient funding over a long period of time can lead to unsustainable funding requirements.

The money to pay for pension benefits must come from a combination of employer contributions, employee contributions, and investment income on plan assets.[14] The employer must decide on a funding policy to determine how much money to contribute each year to the pool of funds[15] that will pay benefits. The funding policy decision, then, is a judgment about the level and timing of payments by the employer that will provide the money that will be paid to retirees and other plan beneficiaries. In other words, it's not a question of *if* the money needs to be paid to the pension fund, but *when*. If contributions are too low today, contributions will have to be higher in the future to pay benefit obligations. In addition, money not deposited into the pension fund today loses the accumulation of investment income on those assets, which means that contributions will have to be even higher in the future to make up for the loss of that income.

In short, today's inadequate pension contributions increase the likelihood that contributions in the future will crowd out a government employer's ability to pay its debts — our primary pension-related credit concern.

[13] Pension contributions are often expressed in terms of percent of payroll to be contributed. When one observes high contribution rates (say, over 20%), it's likely that a poor historic funding policy combined with a large number of retirees in the plan is a key reason.
[14] Although pension benefits, even those accrued, may be modified in bankruptcy, this discussion does not address that outcome, and assumes that the rules, laws and regulations governing the level of benefits provided to pension plan members remain as is. Judgments about credit quality related to the possibility of future plan changes will be addressed in a future white paper.
[15] An unfunded plan, or pay-as-you-go plan, would not employ a pool of assets. That, in and of itself, is a funding policy decision.

Assessing Adequacy of Funding Contributions[16]

Independent public pension actuaries generally observe that pension contributions are "adequate" when they are set at a level that is expected to pay down the plan's unfunded liabilities over a reasonable period of time.[17] Issuer financial disclosures that are compliant with GASB 67/68 contain significant data that can be used to make that determination. Some indicators include:

1. Is the Actuarially Determined Contribution being paid in full?

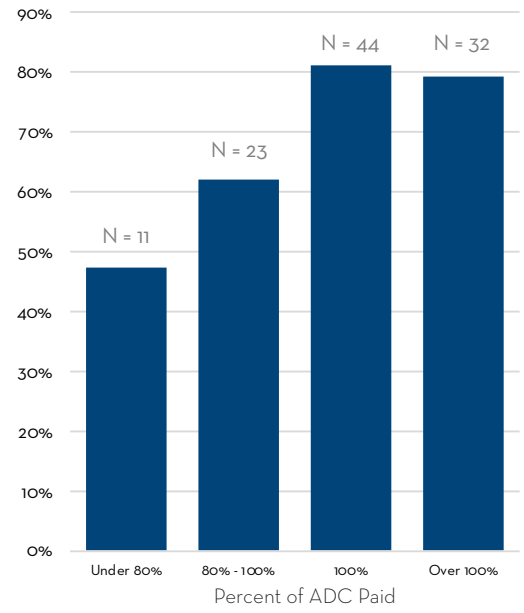
A GASB-compliant financial statement will include an exhibit in the Required Supplementary Information (RSI) section that shows the annual Actuarially Determined Contribution (ADC), and the amount the employer contributed toward the ADC.[18] The ADC itself may not be an adequate funding contribution, so an RSI exhibit which shows the amount being paid each year equal to each year's ADC may not be highly informative in assessing contribution adequacy. However, an RSI exhibit which shows actual employer contributions less than the ADC is a warning sign that actual contributions may not be adequate.

Figure C shows BAM survey results on how plan disclosed funding ratios[19] compare to percentages of the ADC contributed in fiscal 2017. While not necessarily a direct commentary on funding adequacy, there appears to be some correlation between higher percentages of ADCs contributed and higher funding ratios. Therefore, while we cannot conclude that contributing the ADC achieves funding adequacy, the data suggests that there is lower pension risk the higher percentage of the ADC that is contributed. ▼

Figure C:

BAM Survey Data:

Average Reported Funded Ratio Categorized by Percent of ADC Paid in 2017



BAM's pension risk analysis includes an adjustment for the percentage of the disclosed ADC paid. Some judgment is needed here, because the disclosed history of actual contributions versus the ADCs may show varying percentages of the ADC being paid over the years. But, generally speaking, the risk factor is as shown in Table 1 below. ▼

Table 1:

% of Disclosed ADC Paid	BAM Risk Level
Under 80%	High
80% + but under 100%	Elevated
100%	Nuetral
Over 100%	Low

Paying 100% of the ADC is risk-neutral because the ADC itself may or may not be an adequate contribution. Paying over 100% may indicate an intent by the issuer to raise the funded ratio. As noted above, though, paying less or significantly less than the ADC is a warning sign that contributions are inadequate, and hence, an indicator of elevated pension risk.

[16] This discussion is applicable to funded plans, i.e., those setting aside assets in a trust to help pay future benefits.
[17] See, for example, American Academy of Actuaries Issue Brief, "The 80% Pension Funding Standard Myth," July 2012.
[18] See, for example, GASB 68 paragraph 46, subparagraph c.
[19] Fiscal year-end fiduciary net position (market value of plan assets) divided by total pension liability, computed on a GASB 67 basis.

2. Is there a "depletion date"?

Under GASB guidelines,[20] when determining the discount rate to use to calculate pension plan liabilities each year, the actuary must project plan liabilities, benefits and assets to each future year. When projecting forward plan assets, one item of data needed by the actuary is the annual employer contribution deposited. The contribution calculated by the actuary each projection year will generally be based on the employer's funding policy methodology.[21] At each future year in the projection, the actuary will compare the plan's assets and expected benefit payments. For future years in which there are plan assets sufficient to cover expected benefit payments, the discount rate will be based on the plan's assumed investment return rate.[22] Some plans' projections show that, at some future point, there are still plan liabilities, but plan assets have run down to zero—in other words, the assets have been fully depleted. The crossover point in the projection, at which plan assets have been fully depleted while there are still plan liabilities, we call the "depletion date." For future years in which there are no plan assets, the discount rate will be based on the yield or index rate on tax-exempt AA-rated (or higher) 20-year general obligation municipal bonds.[23] The blending of the two rates (i.e., the single discount rate that will produce the same discounted present value of benefits as the present value using the two discount rates) before and after fund depletion will be the discount rate used by the actuary for GASB 67/68 liability measurements.

Under a sound actuarial funding policy, there should always be assets in the plan as long as there is a plan beneficiary who could be due a benefit.[24] The occurrence of a depletion date is, therefore, a significant warning sign that contributions are not adequate. The consequence of a plan actually experiencing asset depletion is to transition to pay-as-you-go funding. Depending on the relative magnitudes of annual employer contributions and plan benefit payments, the employer might experience a significant sudden increase in cash requirements to fund the annual benefit payments. Obviously, this possibility is a significant credit concern. BAM's survey of 110 state-wide cost-sharing multiple employer pension plans included 15 that had a depletion date.

Not only is it important to know that a depletion date exists; it is also important to know when it is projected to occur. For example, a depletion date projected 20 years out is certainly less of a concern for assessing the pension risk for a 10-year bond than it would be for a 30-year bond.

A fully GASB-compliant pension footnote disclosure will include a description of the derivation of the discount rate used in the liability measurement, including the years in which plan assets are sufficient to fund benefit payments, and the year in which the assets are no longer sufficient.[25] That year is the depletion date. It can be observed that in some cases, the financial disclosures do not provide the specific depletion date, but the disclosure makes it clear that one exists. The footnote may simply state that plan assets are not sufficient to pay plan benefits in all future years. Even if the depletion date is not specifically disclosed, it is possible to estimate whether it is projected to occur in the near-term or long-term by comparing the blended discount rate with the plan's assumed rate of return on assets and the assumed 20-year AA bond rate (both rates are supposed to be disclosed, and anecdotally, they almost always are).[26] For example, if the blended discount rate is 6.82%, the assumed return on plan assets is 7%, and the AA bond rate is 3.5%, it would be reasonable to assume that the depletion date is far in the future, because the 7% rate has been used for most of the discounting to arrive at the blended discount rate.

BAM's pension risk analysis includes an adjustment for the number of years to the expected depletion date. Some judgment is needed here, because as noted above, the risk related to the timing of the depletion date is affected by the term of the bond BAM would insure. Furthermore, the issuer may participate in multiple plans where one or more have a depletion date, and others do not. But, generally speaking, the risk factor is as shown in Table 2 below. ▼

Table 2:

Number of Years to Disclosed Depletion Date	BAM Risk Level
No Depletion Date	Neutral
30 years or more	Elevated
Over 15 years, but less than 30 years	High
15 years or less	Severe[27]

[20] See, for example, GASB 68, paragraphs 26-31.
[21] In the absence of a clear funding policy, actuaries apply their professional judgment when projecting future contributions, including taking into account the most recent 5-year contribution history; see, for example, GASB 68, paragraph 28.
[22] The median assumed investment return rate for fiscal 2017 was 7.38%, per the Public Fund Survey published by NASRA November 2018.
[23] See, for example, GASB 68, paragraph 26. Anecdotally, BAM has observed rates in use for this purpose for FY 2018 financial disclosures generally in the 3.0% to 3.9% range.
[24] See, for example, Conference of Consulting Actuaries Public Plans Community, "Actuarial Funding Policies and Practices for Public Pension Plans," October 2014.
[25] See, for example, GASB 68, paragraph 42.
[26] It is uncommon to see an expected investment return that does not end in 0 or 5, like 7.25% or 7.0%. If an employer discloses a discount rate like 6.82%, analysts should be aware of the increased chance that it is a blended rate resulting from the presence of a depletion date.
[27] Under BAM pension risk analysis methodology, a "severe" risk judgment may cause an outright rejection of the bond for insurance unless there are clear mitigating factors that cause us to regard the risk as less problematic.

3. Can we expect that unfunded plan liabilities will be paid off in a reasonable time period?

BAM's credit analysis is aligned with market practice that contributions are adequate if they are expected to pay off the net pension liability ("NPL")[28] in a reasonable period of time. Under BAM's pension risk analysis methodology, we relate expected NPL pay-off periods to various levels of risk. See Table 3. ▶

Table 3:

Expected NPL Payoff Period	BAM Risk Level
Under 15 years	Low
15 - 30 years	Neutral
Over 30 years	Elevated
Negative Amortization (never)	High

BAM regards a net pension liability payoff period of 15 to 30 years as risk neutral because that timeframe roughly approximates the average future working lifetime of the population of a governmental pension plan. An under 15-year payoff period may indicate an intent of the issuer to accelerate plan funding. Amortizing liabilities, but with a payoff period greater than 30 years, indicates a risk that payments are carrying over to another generation of workers, and this likelihood is intensified if contributions are not expected to pay off plan liabilities (negative amortization). In BAM's survey of 110 cost-sharing retirement systems, negative amortization was common in fiscal year 2017. See Figure D.

It is important to note that a reduction in net pension liability during a single year does not mean that an employer's funding policy avoids negative amortization. (For example, if plan investments earn 30% in a year, most employers will experience a decrease in unfunded liabilities in that year—but contributions may still be inadequate).

BAM's survey showed that most plans experienced a decline in NPL during fiscal 2017, when the stock market delivered favorable investment returns even though negative amortization was prevalent. See Figure E, which depicts the lack of correlation between NPL payoff period and declines to the NPL during 2017.

Figure D:

BAM Survey Data:
Number of Plans Categorized by Net Pension Liability Payoff Period

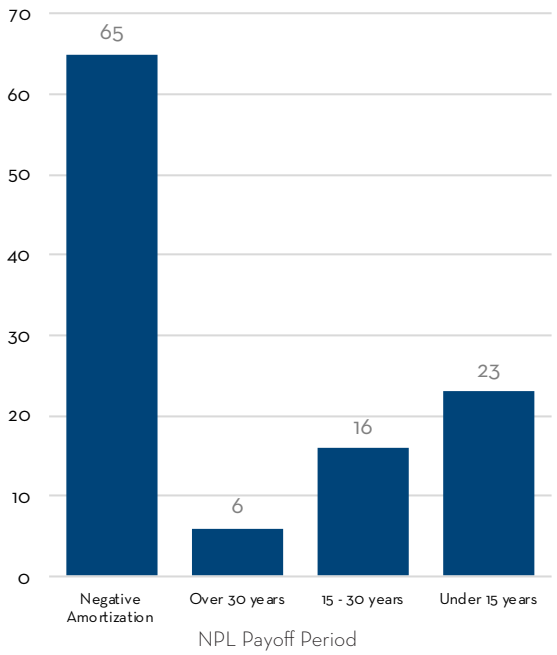
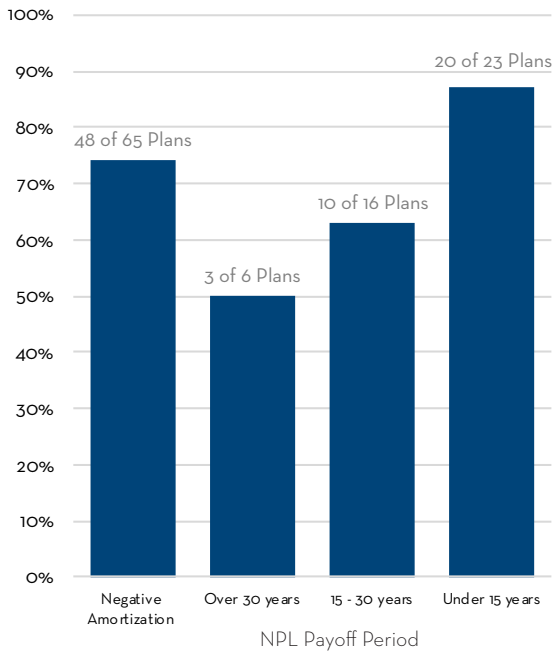


Figure E:

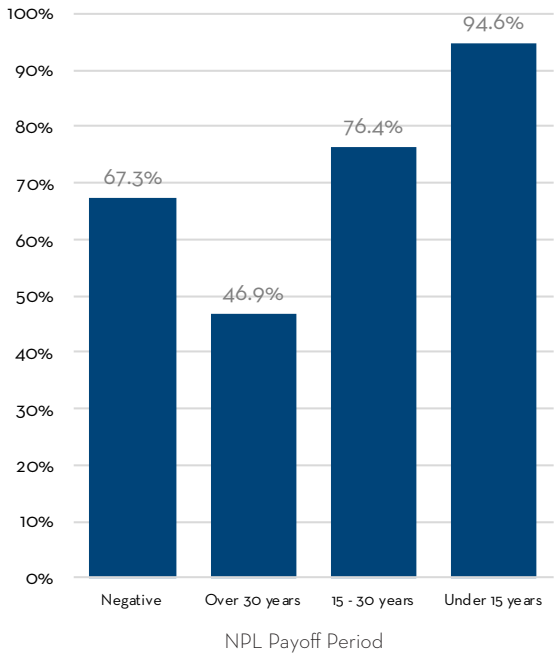
BAM Survey Data:
Percentage of Plans in Each NPL Payoff Period Category Disclosing a Decrease in NPL During Fiscal 2017



[28] Net pension liability is the GASB 67/68 terminology for unfunded pension plan liabilities.

Figure F:

BAM Survey Data:
Average Disclosed Funded Ratio for Each NPL Payoff Period Category



Earlier, it was mentioned that BAM's survey included 15 retirement systems with depletion dates; all 15 were experiencing negative amortization in fiscal 2017—a clear indicator of risk. Furthermore, Figure F shows that net pension liability payoff periods are correlated to funded ratios.[29] The fact that net pension liability payoff periods correlate to funded ratios reinforces the earlier observation that "budgets are sticky" and implies that most issuers' funding policies change infrequently.

The fact that there is a correlation between NPL payoff period and funded ratio (which is an indicator of the need for future contribution increases) suggests a strong correlation to pension risk.

GASB-compliant disclosures provide the tools to calculate the net pension liability payoff period, which can then be incorporated into the risk assessment:

- For a single or agent multiple employer plan, the data needed for that calculation is primarily found in the reconciliation of net pension liability, which is typically in the pension footnote (relating to the current reporting period) and the Required Supplementary Information section (providing a 10-year history) of the employer's financial statement.[30] The pay-off period of the net pension liability can be calculated specifically for that employer.

- For a cost-sharing multiple employer plan, the net pension liability reconciliation should be found in the Required Supplementary Information section of the plan's financial statement.[31] The net pension liability pay-off period is calculated for the plan as a whole and the finding applies to all participating employers.

Figure G below shows the example of the reconciliation of net pension liability that was provided in GASB 68.[32] The example in GASB 68 notes that the discount rate used to determine the total pension liability was 7.75%.

[29] The low average funded ratio of the greater than 30-year payoff period group is a quirk of the data due to the small sample size.
[30] See GASB 68 paragraphs 44 and 46, respectively.
[31] See GASB 67 paragraph 32.
[32] The example provided in GASB 68 and shown here is related to the net pension liability of a single or agent multiple employer pension plan.

Figure G:

Example of Net Pension Liability Reconciliation Found in GASB 68

Changes in Net Pension Liability

	Increase (Decrease)		
	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) – (b)
Balances at 6/30/X8	$ 2,853,455	$ 2,052,589	$ 800,866
Changes for the year:			
Service cost	75,864		75,864
Interest	216,515		216,515
Differences between expected and actual experience	(37,539)		(37,539)
Contributions—employer		79,713	(79,713)
Contributions—employee		31,451	(31,451)
Net investment income		196,154	(196,154)
Benefit payments, including refunds of employee contributions	(119,434)	(119,434)	-
Administrative expense		(3,373)	3,373
Other changes		8	(8)
Net changes	135,406	184,519	(49,113)
Balances at 6/30/X9	$ 2,988,861	$ 2,237,108	$ 751,753

To perform the risk assessment under BAM methodology, three calculations are needed: the contributions that would pay off the beginning-of-year NPL in 15 years and 30 years, and that would result in no change to the NPL during the year (the negative amortization threshold). These three amounts can then be compared to the sum of employer and employee contributions. The computed contributions are comprised of two parts: an amount to pay for the current year's pension accruals (the service cost[33]), and an amortization amount to pay down the NPL.

Using the chart in Figure G as an example, see the calculated contributions in Table 4 below. ▼

Table 4:

Amortization Period	Service Cost	Amortization of $800,866 the beginning of year NPL	Contribution = SC plus Amortization
15 Years	$75,864	$85,514	$161,378
30 Years	$75,864	$64,471	$140,335
Negative Amortization Threshold[34]	$75,864	$62,067	$137,931

In the Figure G example, the sum of employer and employee contributions is $111,164 ($79,713 plus $31,451), which is less than the negative amortization threshold.[35] Therefore, we conclude that, in this example, negative amortization is currently occurring. Had the sum of contributions in Figure G been greater than $161,378, we would deem the NPL payoff period to be under 15 years; had the sum been between $161,378 and $140,335, the NPL payoff period would be between 15 and 30 years; had the sum been between $140,335 and $137,931, the NPL payoff period would be greater than 30 years.

[33] The "service cost" is the same as the "normal cost"—a term used in actuarial funding methodologies and older GASB statements.
[34] Amortization is equal to interest at 7.75% (the discount rate in this example) on the beginning-of-year NPL.
[35] One might observe that the employer contribution ($79,713 in this example) in the NPL reconciliation is different from the employer contribution disclosed in the RSI table disclosing annual ADCs and amounts contributed toward the annual ADC. In such a case, the current fiscal year employer contribution from the ADC table should be used.

Conclusions

For each issuer that BAM considers for bond insurance, we conduct a comprehensive quantitative and qualitative analysis of pension-related risks. The quantitative aspect of BAM's pension analysis involves calculating a series of financial metrics on a conservative, comparable basis, from which we draw conclusions about the affordability and sustainability of pension promises over the time that we will insure a given bond. The qualitative aspect of BAM's analysis addresses various factors that we believe will increase or decrease the risk to BAM, but cannot be assessed solely by the use of quantitative metrics. The combination of BAM's quantitative evaluation of pension risk and the impact of qualitative factors on an issuer's overall pension risk profile is unique to each issuer. This paper, the second in a series, has focused on a key qualitative factor we analyze: funding adequacy. It also demonstrates that even qualitative pension-risk assessments are anchored in data and quantitative analytics. GASB-compliant financial disclosures provide a wealth of information regarding funding adequacy that allows readers to make judgements about the degree of credit risk inherent in an issuer's pension funding policy, which can be useful in projecting the possibility that pension liabilities will be a growing factor in the issuer's overall credit risk profile in the future.

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Les Richmond evaluates municipal pension and other postemployment benefit (OPEB) plans and liabilities as part of BAM's credit underwriting process for municipal bond issuers. He reviews approximately 500 plans per year and is an expert on public pension policies and funding trends across the U.S.

Prior to joining BAM in January 2013, Mr. Richmond worked as an actuarial consultant to large public and private sector clients for over thirty years. In this capacity, he provided consulting and actuarial valuation services on clients' pension and OPEB plans, and assisted with benefit design and financing, mergers and acquisitions, employee benefits litigation, and benefit aspects of collective bargaining.

Mr. Richmond is a member of the Advisory Committee to the National League of Cities' Public Sector Retirement Initiative. He is an Associate of the Society of Actuaries, an Enrolled Actuary, a member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He is a member of the National Federation of Municipal Analysts and the Municipal Analysts Group of New York. He holds a B.A. in Mathematics from Rutgers College.

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