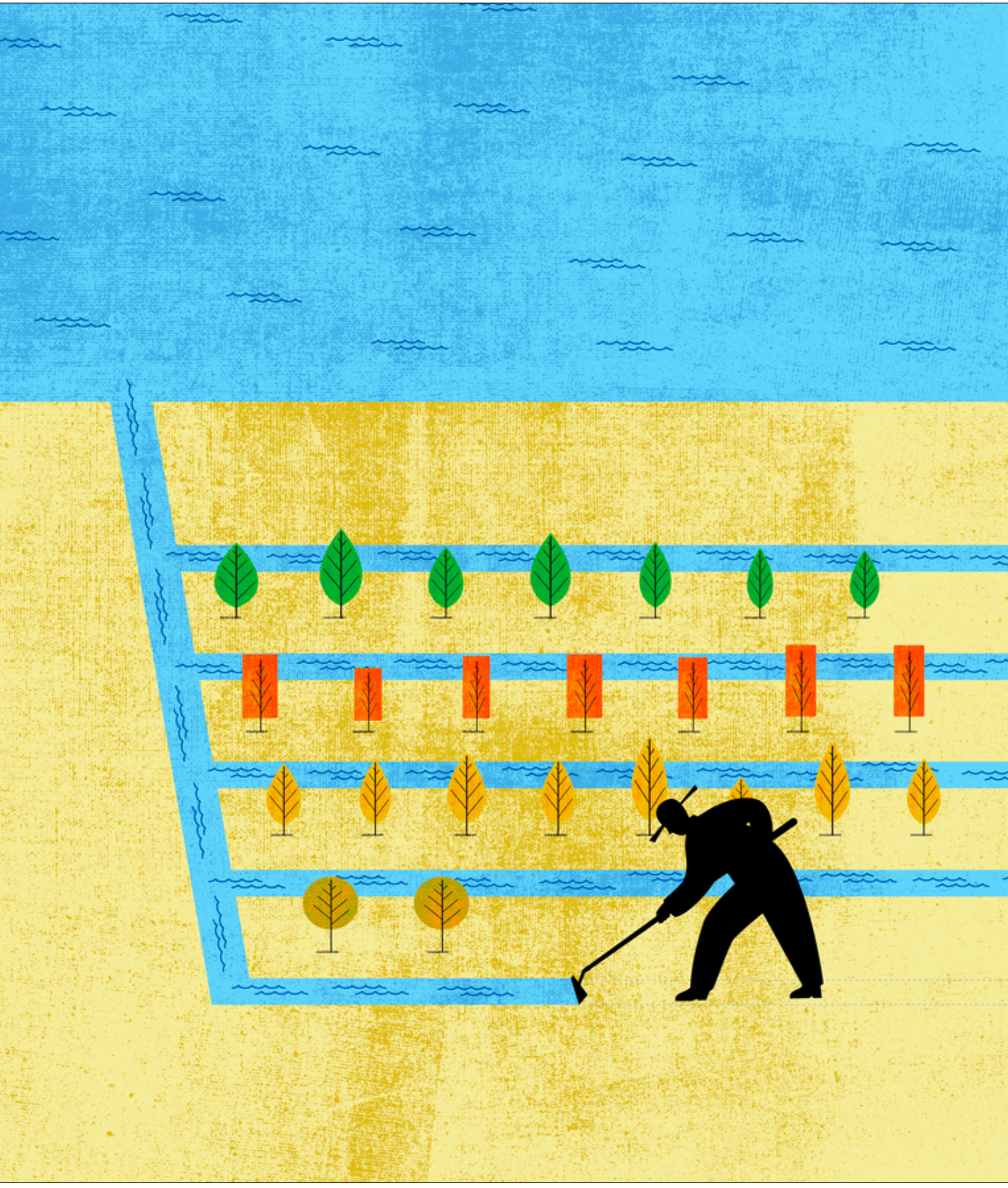


SPECIAL SECTION

Should We Rethink Reserves?

A Multimillion-Dollar Question

BY SHAYNE KAVANAGH, VINCENT REITANO, AND PETER A. JONES

While *Fund Balance Guidelines for the General Fund* is one of GFOA's most often-cited best practices, there are many opportunities for reserve optimization beyond the one-size-fits-all guidance provided in the best practice. This series of articles brings what we've learned together with university research to describe new opportunities that will help local governments get the best value from their reserve strategies.

RESERVES VERSUS FUND BALANCE

"Fund balance" is an accounting term that describes the difference between assets and liabilities. "Reserves" is a budget and policy term that describes the fungible resources available outside of the budget for use if the resources appropriated inside of the budget are insufficient. There is an overlap between "fund balance" and "reserves," but the most important difference is that fund balance covers a broader range of resources. For example, fund balance could include prepaid inventories or receivables for delinquent taxes, neither of which is available for current spending.[1] This paper is focused on the budget and policy role of reserves.

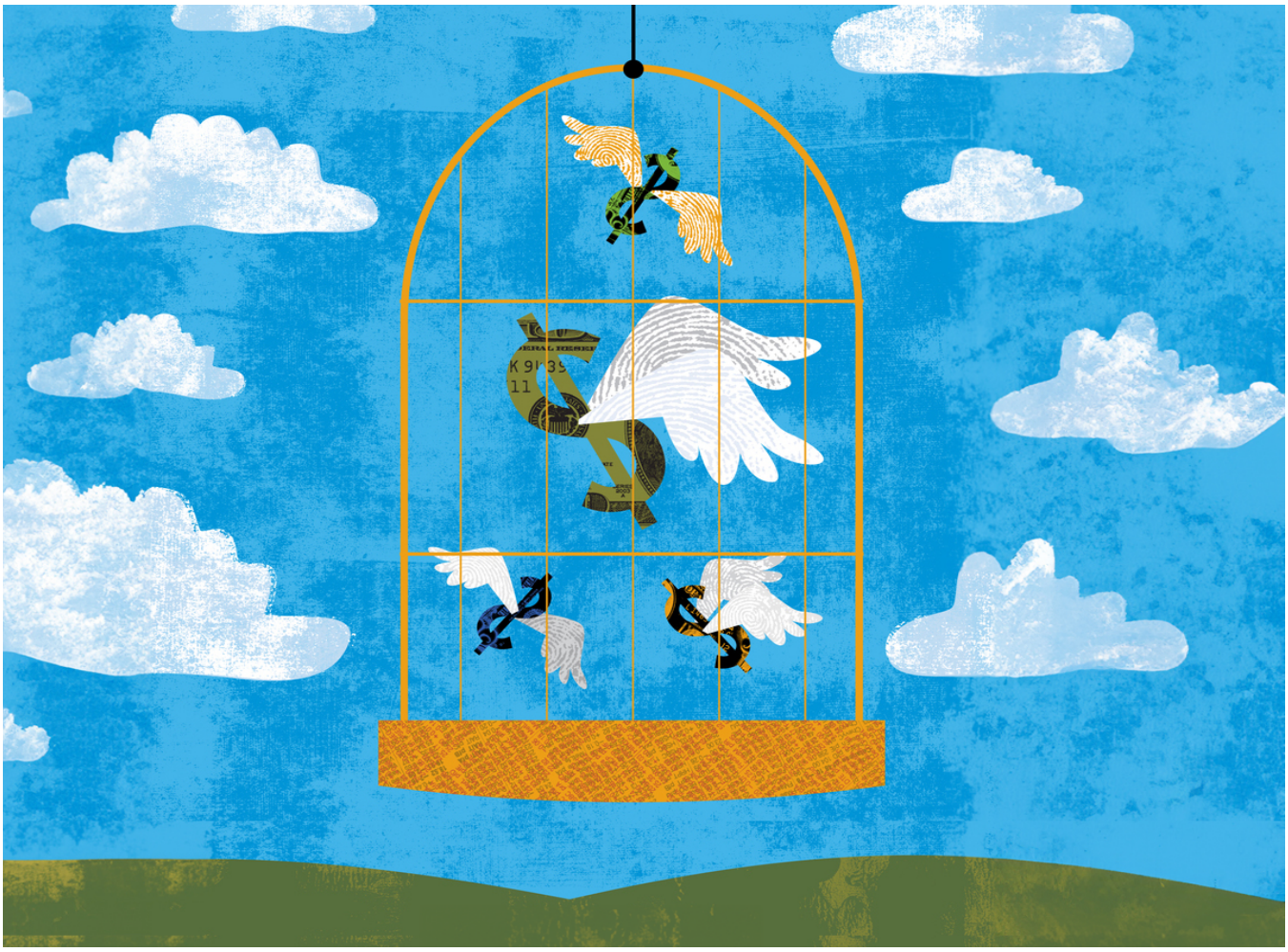
[1] The Governmental Accounting Standards Board (GASB) provides guidance on how to classify fund balances to differentiate between amounts that are more constrained or less constrained in their potential use. You can read more about these classifications in "GASB Statement No. 54, Fund balance reporting and governmental fund type definitions," available at GASB.org.

Why We Should Rethink Reserves

It has long been thought that having substantial reserves is desirable—bigger is better. So why might we need to do some rethinking here? The reasons (which are consistent with many of those cited for GFOA's Rethinking Budgeting initiative[1]) take on special significance when applied to reserves.

An increasingly volatile and uncertain world. Reserves play a role in buffering local government from volatility; however, if volatility is increasing, we should reexamine how reserves are managed to ensure that local governments have an adequate buffer. For example, damages from natural disasters have been on the rise in recent decades. Reserves fund the response to natural disasters, and even if federal or state/provincial financial assistance is available, reserves fill the gap until assistance arrives, which can take months or even years.

Lower trust in government and experts. Local government stakeholders may be suspicious of large reserves, especially if they don't understand why the government is holding these resources instead of spending them on current services or cutting taxes. In the past, a finance officer's expert opinion, perhaps based on GFOA's best practices, might have been sufficient to justify reserves, but expert opinion may not be so readily accepted in the future.[2] Finance officers may need to provide justification for reserves that rely less on appeals to



expertise and more on the fundamental reasons why reserves are important.

Local governments are becoming more resource constrained. Local governments are expected to maintain a sizable reserve by "industry standards" and by bond rating agencies.[3] At the same time, local governments are facing more resource constraints, especially with employee healthcare and pension costs rising. For many governments, the increases in costs have consumed revenue increases, which may soon level off. GFOA's *Fund Balance Guidelines for the General Fund* best practice recommends that—at a minimum—general-purpose governments, regardless of size, maintain unrestricted budgetary fund balance in their general fund of no less than two months of regular general fund operating revenues or regular general fund operating expenditures. Moody's Rating Agency looks for fund balances of more than 35 percent of annual revenue to provide a AAA rating for general obligation debt. Long-term demographic trends point toward an aging population. Though the U.S. demographic outlook is not as dire as it is for other developed countries, an aging population still doesn't bode well for local government revenues.[4] Legislative constraints also limit revenue growth. For example, there is evidence that local government revenues do not recover as quickly from setbacks like recessions as they once did because of legislative constraints.[5] (In fact, some economists believe that the long-term growth trajectory of the United States will slow; indeed, the general trend has been slowing growth since the 1970s.)

Building reserves is a use of current revenues, and governments need to weigh the opportunity costs of doing so. Is it better to provide services today or to save the money for later?

Rising costs paired with stagnating revenue growth mean that local governments need to make efficient use of resources, including reserves. Building reserves is a use of current revenues, and governments need to weigh the opportunity costs of doing so. Is it better to provide services today or to save the money for later?

None of this suggests that local government reserves should always and everywhere be lower than they are today. Instead, we should look for more and better options to provide buffers to local governments than reserves have traditionally provided. For example, are there opportunities to make more cost-effective combinations of commercial insurance and reserves? This might not always lead to a decrease in reserves; in fact, it could call for reserves to be increased as part of a high-deductible insurance strategy for some perils to reduce the total cost of risk (insurance plus reserves).

Information technology makes rethinking reserves easier. Information technologies make it easier to analyze reserve strategies and optimize the strategy to the conditions faced by the government.

[1] See "Why Do We Need to Rethink Budgeting?" at gfoa.org/materials/why-do-we-need-to-rethink-budgeting.

[2] For data on declining trust in experts, see: Cary Funk, Alec Tyson, Brian Kennedy, and Courtney Johnson, "Scientists Are Among the Most-Trusted Groups in Society," September 29, 2020, Pew Research Center.

[3] GFOA's *Fund Balance Guidelines for the General Fund* best practice recommends that—at a minimum—general-purpose governments, regardless of size, maintain unrestricted budgetary fund balance in their general fund of no less than two months of regular general fund operating revenues or regular general fund operating expenditures. Moody's Rating Agency looks for fund balances of more than 35 percent of annual revenue to provide a AAA rating for general obligation debt.

[4] Michael A. Pisano, The Puzzle of the American Economy: How Changing Demographics Will Affect Our Future and Influence Our Politics (Praeger: 2017).

[5] See, for example, empirical research on state governments analyzing time to fiscal recovery following economic recessions: Christian Buerger,"The effect of economic downturns on state budgets: A counterfactual analysis of the great recession," *Applied Economic Letters*, 28(21), 2020.

Reserves: What and Why

Reserves are the liquid financial resources (typically cash and investments that can be turned into cash) that local governments do not include in the annual spending plan—resources that are held back from the budget and held in "reserve" for some other purpose. The most important purpose is to respond to significant, unplanned, and unavoidable costs or revenue losses such as a natural catastrophe or a recession. Another common purpose is as a sinking fund, or "piggy bank," for a large, nonrecurring, planned future, like purchasing a capital asset. Reserves also support a strong bond rating by signaling to investors that the local government has resources to pay back debt even with potential disruptions to its financial position.

How Do We Rethink Reserves?

We begin rethinking reserves by starting from "first principles"—that is, why do local governments have reserves in the first place? To reduce volatility and uncertainty in public finances. Uncertainty exposes a government to financial risks, so framing the reserve explicitly as a risk management tool and linking the reserve to concrete risks that decision-makers can appreciate is a great way to communicate why reserves are important. In examining the key risks that reserves guard against, we will see that there are many possible risks, and it is difficult, if not impossible, to buy commercial insurance to protect against many of them.

The risks we face

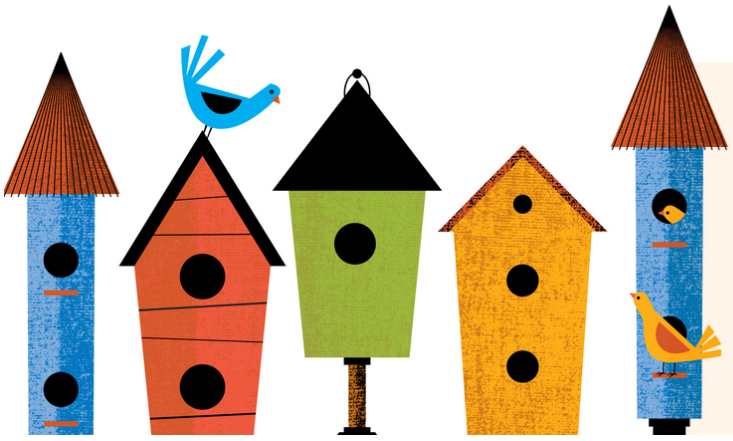
Cash flow risk is a concern, especially for governments where a major revenue source like property taxes is received only once or twice a year in large chunks, while expenditures occur evenly throughout the year. A similar problem can occur if large portions of state-shared revenue have to be authorized by the state each year through the state budget process. Delays in approving the state budget could result in delays in local government revenues. Reserves help smooth out resource availability and have important advantages over other options like tax anticipation notes, which can entail the risk of high-interest rates.

A big risk for many governments is revenue instability, with recessions being the major culprit. If a recession dramatically reduces revenue, then reserves can be used to help a government make a "soft landing." For example, in the City of Savannah, Georgia, sales tax was a large revenue source that was sensitive to the economy. The city, therefore, developed a sales tax stabilization reserve. When the Great Recession hit, the city was able to draw from the reserve and avoid layoffs.

There could be other sources of revenue instability, too. Perhaps a major revenue source is subject to changes in the political environment, as in the case of some state-shared revenue. Or a local revenue source might be subject to periodic reapproval by the voters. In one city, the potential for the closing of a major industrial employer was a risk because the city relies heavily on a local income tax.

Historically, local governments haven't consistently used reserves to offset revenue losses from a recession.[1] This might be because of state and federal government support during the last two recessions, through the American Recovery and Reinvestment Act of 2009 and the American Rescue Plan Act of 2021. While these pieces of legislation were a major help to local government fiscal health, local governments should not expect similar support in future recessions. Recovery funds require Congress to pass major legislation, and the rise of political polarization and gridlock makes this far from guaranteed. And even if the federal government offers relief, future funding might have restrictions, and it will be impossible for local governments to predict how much money they might receive. Local governments should therefore prepare to handle the impacts of recession on their own. Reserves provide another option than spending cuts.

Another major risk category is natural disasters like earthquakes, wildfires, floods, and hurricanes, which can result in urgent needs like overtime for first responders or shelter, food, and supplies for displaced families. And disaster recovery includes unforeseen expenditures like the cleanup that follows the initial devastation. Sometimes, a local government will



Rethinking is Local

Each local government will need to decide how to best apply the ideas in this article to their circumstances. For example, a local government's "reserves" are commonly associated with the general fund. Yet, many of the same ideas presented in this article could apply to other funds, like enterprise funds.

have some of its costs reimbursed by the Federal Emergency Management Agency (FEMA) and/or state agencies. If this is the case, reserves are still important to cover the non-reimbursable costs—including lost revenue, fees, and increased operating costs—while also fronting the costs until reimbursement arrives. FEMA reimbursement for natural disasters takes an average of 18 months, in GFOA's experience.

Some extreme weather events might not be declared an "emergency" by national or state government, in which case the local government may be on its own. A common example of this is an extreme snow season that causes the local government to dramatically exceed its snow removal budget. Reserves could be used to fund the overage, and the money might be replenished by surpluses in times of light snow.

Man-made disasters are also a risk. The possibility of hazardous material spills that cost a lot to clean up, for example, can have a material impact on local finances. Cyberattacks are another example of a man-made risk that might have implications for reserves. Cyber insurance policies are becoming more expensive or totally unavailable to some governments, so a government might need to raise the deductible on a commercial policy or forgo a policy altogether. In this case, the government is either partially or fully self-insuring against cyberattacks, and reserves provide the financial backing. Capital infrastructure also presents risks that reserves can help mitigate. Debt is a powerful tool for local governments to finance infrastructure acquisitions, and reserves provide assurances to creditors that the government is not at unacceptable risk of default. Reserves can also be used to pay for capital assets directly (such as pay-as-you-go funding strategies).

Other risks not covered here might fall into categories of financial/economic, health crises, security, reputational, and more. Here are a few examples from governments GFOA has worked with to analyze their risk exposure. You might think of others that are relevant to your jurisdiction.

- **Financial/economic.** For governments with large pension liabilities, a reduction in the rate of return on pension investments could increase the annually required pension payment.[2] Reserves could be used to cushion the initial shock from a reduced rate of return and consequent increase in required annual contributions, but a government will, at some point, need to realign its annual spending to accommodate increased pension costs.
- **Public health.** The COVID-19 pandemic is an extreme example of the potential financial impact of a health event. Less extreme outbreaks could still have financial impacts. For example, local governments with public health responsibilities in urban areas could face large costs from local outbreaks of serious diseases like hepatitis.
- **Public safety.** Terrorism and civil disorder can cause a spike in public safety costs. Civil disorder events could become more difficult to insure against because social media can spread civil disorder beyond a local phenomenon.[3] In other words, civil disorder in one community can easily spread to others. Insurance companies try to avoid insuring risks where this kind of "domino effect" is in play.

Recognizing that reserves are essentially a tool for risk management leads to our next point on how to rethink reserves: adjust your mental model.

Adjusting your mental model: savings versus insurance

Mental models are the ways in which we see the world, and they guide how we make decisions. If public finance officers can give decision-makers a better mental model, they will make better decisions. The traditional mental model for reserves is a savings account, and this does have advantages. First, it's easily understood by people who are not public finance experts. Second, it has a seemingly obvious parallel to the personal lives of local governments' stakeholders. This is particularly true for the "sinking fund" function of reserves, as most people have experience with building up their personal savings to pay for some consumer expenditure or personal investment (for example, education, house, and car).

But this model has disadvantages as well. First, the analogy to personal

savings as a buffer against risk might not be as powerful as it seems. Personal savings rates have been in long-term decline.[4] Most consumers also start saving *reactively*, after an adverse event has occurred (such as a recession or pandemic). Obviously, this is not a viable strategy for local government reserves.[5] Given the reactive strategy that most savers adopt, it is not surprising that most Americans are well short of the amount of personal savings that personal finance experts recommend keeping for an emergency. Given the lack of emphasis on saving for an emergency, many people may now see personal savings more as a vehicle for saving up for future purchases than as a way to manage risk.[6] There is evidence that financial managers are more likely than the average person to view their own personal savings as a tool for managing risk. This means that the "savings account" metaphor for reserves may be more powerful in the minds of financial managers than it is for other people.

Second, the savings account mental model implies that having more in your account is better, but this is not always true of local government reserves. Local governments face opportunity costs that are different from those faced by private individuals. Reserves are resources that are removed from the private economy. It can be argued that excess reserves could do better for the community if those resources were put to work in the private economy. Even if excess reserves weren't returned to the private economy, one could make a good argument that the excess amounts should be used by the government to benefit the current generation of taxpayers (the ones who provided the money to create the reserve). Further, putting aside money to offset risk creates diminishing returns.

As a simple thought experiment, imagine a person had $10,000 in their savings account to offset personal risk. This is a healthy amount, but it is not hard to imagine circumstances where it would prove insufficient. Now imagine that a similar person had $1 million in their savings account. It is much harder to imagine the circumstances where this would be insufficient. Finally, imagine that each person was given an additional $10,000. It's easy to see how the additional money would be a big help for the first person, but it would be hard to argue that the second person would experience an equal gain in risk mitigation from building their savings further. The $10,000 creates greater marginal benefit for the first person than the second. The same logic applies to government.

If the savings account mental model has important limitations, what is the alternative? We propose insurance as a new mental model. This does not necessarily replace the savings account model but does supplement it by providing a new and better perspective on some of the most important purposes of a reserve.

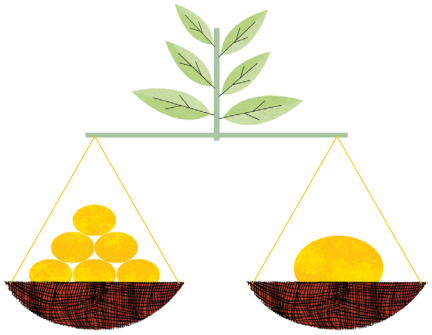
Insurance has an obvious parallel to people's personal lives. Given that local governments hold reserves to manage risk, insurance is an accurate analogy for reserves. Further, insurance is purchased before an adverse event occurs, much like reserves must be built up ahead of time to prepare for unpredictable adverse events.

Another advantage of insurance as a mental model is that it invites local governments to think about ways in which commercial insurance and self-insurance can work together to create an optimized risk financing strategy. Reserves are a self-insurance strategy, but commercial insurance policies (those purchased from a broker) can supplement reserves. For example, commercial insurance could be useful for protecting against low-probability but extreme-consequence events.

Using insurance as a mental model also implies that there is an optimal amount to have on hand. Non-experts can appreciate that it is possible to either over or under-insure the risks you face. Insurance also implies a point at which the "policy" should be used. Let's consider recessions as

Reserves as Insurance and the Elected Board

In a discussion with a city council about reserve strategy, one council member asked about the practical implications of spending the reserve. Using the "reserves as insurance" mental model, you would point out that lower reserves would be the equivalent of taking a lower limit (or higher deductible) on your insurance policy. The "reserves as savings account" mental model struggles with this question because of an increasingly prevalent view that savings exist to be spent.



The savings account mental model implies that having more in your account is better, but this is not always true of local government reserves.

an example. Recessions are the most important source of financial instability for local governments, so reserves can play a crucial role in counteracting downturns in economic cycles. But there is little evidence that local governments use reserves during times of economic recessions. In the Great Recession, the 30 largest U.S. cities used their fiscal reserves, but only 25 percent of the 600 smaller cities studied drew down their reserves (the remaining cities cut spending).[7] Failure to use reserves likely caused distress to the community in the form of interruption to public services. While local governments should consider spending cuts during a revenue downturn, a strong reserve can help avoid the most damaging spending cuts.

The insurance mental model is not without its disadvantages. Insurance can be an abstract and difficult concept to grasp, even in our personal lives. This means that people sometimes don't make optimal personal decisions about insurance, just as they make suboptimal decisions about personal savings. Another disadvantage is that the analogy becomes more complicated when considering commercial insurance and intergovernmental aid. Taking these other risk management tools into account is necessary for an optimal risk management strategy, but the trade-off is additional complexity.

Developing a more comprehensive perspective

The reserves as insurance mental model addresses the risk management function of reserves well. The reserves as savings account mental model addresses the "sinking fund" function of reserves, so we do not suggest discarding the savings account mental model entirely. Rather, putting these two models together offers a more comprehensive perspective on the role of reserves (see Exhibit 1).

With better mental models in place, we are positioned to think about the actions we can take.

[1] See, for example, the following journal articles empirically examining local government expenditure stabilization: Justin Marlowe, "Fiscal slack and counter-cyclical expenditure stabilization: A first look at the local level," *Public Budgeting & Finance*, 25(3), 2005; and Win Wang and Yilin Hou, "Do local governments save and spend across budget cycles? Evidence from North Carolina," *American Review of Public Administration*, 42(2), 2012.

[2] For research examining the relationship between public pensions and reserves retained in budget stabilization funds, see Travis St. Clair, "The impact of budget stabilization funds on state pension contributions," *Public Budgeting & Finance*, 33(3), 2013.

[3] This was the view an insurance industry expert expressed at an educational event hosted by GFOA in 2022.

[4] From 1960 to the early 1990s, personal savings rates were around or above 10 percent but then sharply dropped, reaching a low of around 3 to 4 percent in 2005 to 2008. Savings increased after the 2008 Great Recession, averaging around 7.5 percent until the COVID-19 pandemic, when it jumped to historically high levels. After the pandemic, savings rates dropped dramatically, plummeting to the all-time lows of 2005 to 2008.

[5] For a few more recent examples of research analyzing government savings patterns over time, and in relation to the business cycle, see: Nathan Barrett, Jacob Fowles Peter Jones, and Vincent Reitano, "Forecast bias and fiscal slack accumulation in school districts," *American Review of Public Administration*, 49(5), 2019; and LaShonda M. Stewart, John A. Hamman, and Stephanie A. Pink-Harper, "The stabilization effect of local government savings: The case of Illinois counties," *Public Budgeting & Finance*, 38(2), 2017.

[6] For example, according to a survey conducted by Bankrate in 2021, 46 percent of Americans are saving for a specific financial goal such as a home purchase, vacation, or education, while only 28 percent are saving for an emergency fund.

[7] For examples of how to empirically analyze reserves, see: Marlowe and Wang and Hou. For a study of the 30 largest U.S. cities: "America's big cities in volatile times: Meeting fiscal challenges and preparing for the future," The Pew Charitable Trusts, 2013. For a study of 600 municipalities, see the "Fiscal slack, reserves, and rainy-day funds" chapter (by Justin Marlowe) of *Handbook of Local Government Fiscal Health* (Jones & Bartlett Learning: 2014).

EXHIBIT 1 | **COMBINING THE RESERVES MODELS**

Reserves as Insurance		Reserves as Savings Account		
Addresses reserve's role in guarding against risks like revenue instability, catastrophic events, and cashflow instability.	+	Addresses reserve's role in accumulating cash to pay for future costs that would not be affordable within a single year's revenue. A capital asset is an example of such a cost.	=	**Savvy Financial Strategy**
Provides a lens that encourages new and savvy ways to manage risk across the government.		Provides a lens that encourages multiyear financing strategies for large costs.		

Actions We Can Take to Rethink Reserves

Local government finance officials have a number of strategies to help them rethink reserves. In rough order of importance, they are: risk-based reserve analysis, comprehensive reserve policies, optimizing the combination of commercial insurance and self-insurance, optimizing investment strategies, pooling risk, and understanding bond ratings and reserves.

Risk-based reserve analysis

GFOA strongly recommends that local governments adopt a formal policy describing how much they will strive to maintain in their reserve fund. The question, of course, is "how much is enough?" The reserves as insurance model would say it depends on what your risks are.

The first step toward a risk-aware reserve target is to think of it as a range instead of a single point. For example, a government might decide its policy is to maintain reserves between 15 and 25 percent of annual revenue, rather than equal to 20 percent of annual revenue. A range has several advantages over a single point:

- Risks are difficult or often impossible to estimate exactly. A range expresses that a government requires a margin of error to operate within. Conversely, a single point leaves ambiguity over whether actual reserves are too high or too low. To take our example: if the government's policy was based on a single point (20 percent) and the actual reserves were at 17 percent of revenue, would that be acceptable? What if reserves were 27 percent? Would that be too high? The single-point policy is not clear about boundaries the government should stay within.[1] If the policy were based on a range, we'd know 17 percent was acceptable, but 27 percent was too much. This feature of ranges not only helps decision-makers discuss reserve strategies, but it might also help with explaining reserve strategy to the public.
- A range accommodates different risk appetites. The "right" level in reserves will be a function of the risks a government faces and of local officials' willingness to bear those risks. A range can accommodate the views of risk-averse elected officials and less risk-averse officials. They can find grounds for compromise by negotiating a floor and ceiling that accommodates different appetites for risk.
- A range better supports the ongoing management of reserves. Reserves fluctuate from year to year. If the reserve stays in range, there is little need to revisit it, whether the actual reserve is too high or low relative to the policy. If the reserve falls outside the range, it suggests a clear course of action (as in, do something to get it back in range). This helps make sure that reserves stay where they need to be to manage risks.
- A range includes a lower limit, communicating that being a good steward of the community requires a minimum amount of reserves. It also communicates that there is an upper limit on the usefulness of reserves and a point at which excess resources should be devoted to some other purpose.

The next step in developing a risk-aware reserves policy is to analyze the risks the local government is subject to. A risk analysis can take place at varying levels of sophistication, but a qualitative or subjective risk assessment is the most accessible approach. A local government can review categories of risks, like those described earlier in this section, and then assess their exposure in each category and consider if their reserve target accommodates that exposure. GFOA has developed a simple template to facilitate this kind of review.[2]

The City of Berkeley, California, illustrates how the template can be used. The city's budget staff led its risk assessment and included participation from the Public Works, Police, and Fire departments. The city determined that the greatest exposure was "extreme events and public safety concerns," particularly earthquakes, fires, landslides, floods, hazardous material spills, and terrorism. Other important exposures included "expenditure volatility," due to upcoming large expenditure obligations that did not have a funding source, and "other funds' dependency on the general fund." The city's general fund was a backstop for other city operations funded by other sources, so the city would rely on the general fund if these operations were to encounter unplanned, unavoidable expenditures or revenue interruptions. By reviewing all the risks on GFOA's template, Berkeley determined that it faced a moderate to high level of risk, and that 25 to 35 percent of annual revenues would be reasonable to buttress the effect of routine downturns in the economy and respond quickly and decisively to major emergencies.

The advantage of a qualitative risk analysis is accessibility. Berkeley (and many other governments) have completed such an analysis within their own resources. A qualitative analysis also can be effective for acclimating the government to awareness of risk as part of its reserve strategy. Berkeley performed this analysis in 2016 to 2017, and it helped convince the city to commit to reexamining its risk exposure five years later—which the city is doing this year (using the more sophisticated chance-based approach that we'll describe later).

The disadvantage of a qualitative risk assessment is that the results are subjective. This means there is likely to be a gap between the reserve target suggested by the assessment and the optimal reserve amount, given the risks. There is no way to tell how accurate or inaccurate the subjective estimate might be, relative to the optimal amount.

The level of sophistication is to quantify risks to reach a more objective estimate. This involves looking at historical experiences, the analogous experiences of other governments, and other sources of data to estimate the potential cost of the risks the government is subject to. A quantified approach might be needed when there is controversy about the right amount in reserves.

The easiest quantified approach to risk analysis is to build a model using single numbers to represent the potential impact of risks. To estimate the risk posed by recessions, for example, we might look back at past recessions to see the losses incurred. We would see that the 2008 Great Recession represents a particularly bad recession. Let's say revenues decreased by $5 million, which would suggest that we might need a $5 million reserve to be prepared for most future recessions. Outside studies and the experiences of other local governments can also help. The

The Problem of Unknown Unknowns

A limit of any risk analysis is that you can only analyze the risks you know about, or the "known unknowns." But there's always a chance of experiencing a loss from a totally unexpected source, or the "unknown unknowns." For instance, five years ago, not many governments would have anticipated the current tightening of the cyber insurance market, which might place pressure on local governments to partially or fully self-insure cyber risks. The COVID-19 pandemic is another example of an unknown unknown.

Both examples illustrate how to deal with unknown unknowns. First, a local government should periodically update the risk analysis. Cyber risk losses have been steadily increasing across all local governments for several years, so cyber risk should have been on the radar of local governments before the current tightening of the insurance market. Second, a local government should use reserves to cover multiple purposes. Though pandemics were not considered a high risk by most local governments prior to 2019, recessions certainly were. The economic slowdown caused by the COVID-19 pandemic could be considered a kind of recession. By grouping multiple risks together into the reserve, the reserve will be more likely to withstand the addition of previously unknown risks.

Town of Bluffton, South Carolina, used a publicly available university study that calculated the per capita cost of recovering from hurricanes at different storm category levels.[3] The town applied these numbers and adjusted for inflation after the study was completed to derive a figure that it used as the target number for its emergency recovery reserves.

The GFOA report, "A Risk-Based Analysis of General Fund Reserve Requirements," describes how to perform this analysis, including how to account for the possibility of historically unprecedented events.[4] The advantage of this "single-number" approach is that many governments should be able to perform the analysis using their own resources.

The single-number approach has an important disadvantage, though. Risks, by definition, are uncertain quantities. This approach represents these uncertainties as single numbers, which obscures the full range of risk that the government faces.

One of the most important consequences of obscuring the full range of risk is revealed in the way a total reserve goal is determined. A total reserve target is the sum of potential losses from each risk a government is subject to. But because risks are uncertain numbers, the sum is not as straightforward as adding the single-number estimates of risk together. The most important potential error is dramatically overestimating the size of reserve the government needs. An explanation is best provided with a GFOA video, "Adding Risks Together: The Surprising Truth."[5] For example, imagine that a local government is subject to three types of extreme events, where there is a 5 percent chance of each occurring in a three-year period. A simple summation would lead a government to prepare for a 5 percent chance of each occurring (5 percent + 5 percent + 5 percent). But since reserves can be used to respond to any extreme event, the optimal strategy is to think about the total risk from all extreme events at once. There is a small chance (less than 1 percent) of all three events occurring within a single three-year period (5 percent x 5 percent x 5 percent).

The town of Bluffton, South Carolina arrived at a target number for its emergency recovery reserves by using a publicly available university study that calculated the per capita cost of recovering from hurricanes at different category levels.

Because risks are uncertain numbers, the sum is not as straightforward as adding the single-number estimates of risk together. The most important potential error is dramatically overestimating the size of reserve the government needs.

The way to overcome the disadvantages of the single method is to evaluate the full range of risk, rather than condensing risk down to a single number. We will call this approach "chance-based" because we can use the full range of risk to determine the chance that any given reserve level will be adequate to protect against the risks in question. GFOA has worked with several local governments to develop chance-based reserve models, also known as probabilistic (or chance-based) simulations, using Microsoft Excel and open standards for computer simulation from ProbabilityManagement.org. These projects included working with elected officials to bring the results of the simulation into policy decisions. A full explanation of what chance-based simulation is and what it looks like is best accomplished with a video from GFOA's "Risk-Savvy Thinking about Reserves" series.[6] The advantages of simulation are many, including:

- It is the best way to estimate the potential of pooling risks inside of local government. (More on this later, but suffice to say, for now that risk pooling is a time-honored and powerful strategy for reducing the cost of risk.)[7]
- It will provide the best estimate of the range of optimal reserves for addressing the risks that are included in the analysis. It also provides a clear illustration of the decreasing marginal

benefit of accumulating too much in reserves and shows the point at which the marginal benefit decreases.[8]

- The simulation can address a multiyear timeframe. This is important because it isn't easy to increase reserve levels quickly.[9]
- A simulation can include forces that influence reserves outside of risk factors. For example, the simulation could include a local government's willingness to cut its expenditures instead of using reserves. Or the simulation could address how likely it is that a local government will generate budget surpluses that build up reserves and offset losses.[10]
- Simulations can highlight the full range of risk a local government is exposed to—from risks that could be easily self-insured all the way to catastrophic risks that are impossible to fully self-insure. This helps highlight the need for strategies like preventative investments and a robust disaster response strategy.
- Chance-based simulation is the method insurance companies use to develop policies, so it has proven to be best-suited to problems of insurance.

The major disadvantage of chance-based simulation is that it is more complex than the single-number analysis method. Though chance-based simulations can be conducted in Microsoft Excel,[11] GFOA isn't aware of any local government that has conducted a simulation of reserves without outside consulting support. Also, the results are often expressed in odds and probabilities, and though odds and probabilities are essential for the best understanding of risk, they are not the first language of many people. Thus, explaining the result of the simulation can be more difficult than a single-number analysis. That said, GFOA's experience is that it can be done—especially with the help of interactive models, like those you can see in the videos cited. In fact, we have yet to meet an elected official who could not grasp the essential ideas of a chance-based analysis.

RETHINKING RESERVE CHECKPOINTS

Develop a risk-aware reserves policy

- Express your reserves policy as a range of desired reserves, with a floor and a ceiling.
- Conduct a risk analysis to get a sense of how the risks you face affect the reserves you should hold. Any of the three methods presented would provide a reasonable basis for a more informed discussion with policymakers about why reserves are necessary and how much should be kept in reserves.
- Quantification of risk offers important advantages over subjective approaches—we described both "single-number analysis" and "chance-based simulation" methods of quantification. A quantified approach might be particularly useful when there is a strong sense among decision-makers that existing reserves are too high or too low.
- The single-number analysis is more accessible to local governments than a chance-based simulation; however, a chance-based simulation is better (and how insurance companies conduct their analysis). The choice between the two depends on factors such as a government's ability to pay for outside consulting support, a need for a more rigorous analysis, and the number of risks and size of reserves in question (more/bigger risks and reserves means more potential to make the best use of funds by optimizing the size of the reserve).

Develop a comprehensive reserves policy

A reserves policy is a method to "pre-commit" the organization to wise decisions about reserves. Rather than deciding on reserves strategies in the heat of a moment when a tough decision is required, a policy can be developed when the pressure is off. That policy then provides the boundaries for decision-making when difficult decisions need to be made about reserves. A policy should address the following: 1) why reserves should be accumulated; 2) how much should be accumulated; 3) what strategies should be used for accumulation; and 4) when and for what purpose reserves can be used.

Why? To protect the local government against risks ranging from weather events like flooding, earthquakes, wildfires, and snowstorms to man-made problems like lawsuits. Citing locally relevant risks and the notion of self-insurance as part of a policy can help answer the question of why reserves are needed.

A policy should also address the "savings account" role of reserves in saving up for larger projects. Differentiating the "insurance policy" role of reserves from the "savings account" function could help decision-makers be savvier with their reserve strategies.

A policy can also discuss strategies to use for accumulation. This could be as formal as formulas tied to any yearly surplus or even a formal budget allocation to hold back some amount of a year's revenue for building a reserve. A policy could also allow for a less structured approach by encouraging surpluses and one-time revenue to be used to build the reserve if the government is below its target range. In fact, a government could apply some of the same risk savviness we've been discussing in these articles to its forecasting in order to estimate the size of surpluses that could be produced by a given spending plan.[12]

A policy should also address how reserves can be used—most importantly, discouraging the government from using

reserves for ongoing expenditures (such as hiring more employees). Reserves are not an ongoing resource. An exception might be made for supporting continuity of public services in the face of a revenue interruption like a recession. This would be temporary, until revenues recover or until expenditures can be restructured to be affordable under the revenues that are available.

A policy that addresses these points helps foster a better and shared understanding of reserves in relation to the maintenance of public services amid the risks the government faces.

Finance officers will also have to consider how to describe the reserve relative to the "fund balance" figures that are included in the annual financial report. Governmental Accounting Standards Board (GASB) Statement No. 54, *Fund Balance Reporting and Governmental Fund Type Definitions*, provides a series of categories of fund balance that must be reported. The finance officer can make the link between the reserve (as in, a budgetary/financial planning strategy) and fund balances (as in, an accounting mechanism). Reserves can be shown as part of the "assigned" or "committed" categories of fund balance. In this way, decision-makers can see the reserve in the financial statements and differentiate it from other forms of fund balance, especially forms that are unavailable for use as self-insurance. This might be the case with fund balances that are being put aside for spending on a future project, for example.

Finance officers could positively influence how stakeholders think about reserves by developing a comprehensive policy that describes why reserves are important to the community amid a budgetary shortfall or other contingency, the range of reserves it is prudent to maintain, and transparency on how reserves (a budgetary strategy) connect to the total fund balance available in financial reports.[13]

RETHINKING RESERVE CHECKPOINTS

Develop a comprehensive reserves policy

- A reserves policy is a way to "pre-commit" the organization to wise decisions about reserves.
- A policy should address why reserves should be accumulated, how much should be accumulated, what strategies should be used for accumulation, and when and for what purpose reserves can be used.
- The finance officer should strive for transparency in how reserves (a budgetary policy) are reflected in the reporting of fund balances in the annual financial report (an accounting mechanism).

Optimize the combination of commercial insurance and self-insurance

Commercial insurance is a valuable complement to reserves. A useful analogue is self-insurance programs for employee healthcare, which have been shown to provide potential savings for employers, compared to commercial insurance.[14] But few governments would self-insure every last dollar of potential loss. Instead, self-insured governments often purchase "stop loss coverage," where a commercial insurance policy kicks in after a certain size of loss is reached. This spares the government the cost of covering extremely large losses and the cost of the more expensive premiums that would come with using commercial coverage for more routine losses.

A similar concept can be applied to the risks a reserve is "self-insuring" against. Reserves will be most useful for lower magnitude, higher frequency risks. Commercial insurance is most valuable when the losses from a catastrophic risk would be unaffordable.

The most straightforward example is purchasing higher-deductible insurance policies for liabilities that are commercially insured. This strategy is useful for insurance policies that have become more expensive because of market conditions. Insurance against cyberattacks is a prime example, with some governments experiencing 100 percent year-over-year increases in prices, as of mid-2023. For example, increasing costs increased the $1 million deductible with $15 million in coverage paid by Mecklenburg County, North Carolina (covering Charlotte and surrounding areas), to a $5 million deductible with $10 million in coverage.[15] The county has substantial general fund reserves, so it can "self-insure" the larger deductible and the lower limit.

Another application might be "parametric insurance." Parametric insurance policies pay out a set sum of money when a given condition comes to pass. For instance, a policy might pay out $10 million if hurricane wind speeds in the community reach 120 miles per hour.

Market conditions increased the deductible and decreased the coverage of the insurance policy held by Mecklenburg County, North Carolina, to protect against cyberattacks. Due to the county's substantial general fund reserves, it can "self-insure" the larger deductible and lower limit.

Parametric policies are in wide use in many other sectors but are a relatively new instrument for local governments. Parametric policies might be most useful for catastrophic events where a local government's reserve would be stretched to respond. Of course, federal and/or state assistance is often available for these kinds of events, but the reimbursement often takes more than a year to arrive.[16] Further, some costs of a catastrophic event may not be reimbursable by the state or federal government. For instance, if the tax base is so damaged that tax revenues do not recover quickly, the funds from a parametric policy could help fill the gap. Also, parametric policies provide full coverage as soon as the policy goes into effect, while it could take years to build up enough in reserves to cover the full impact of a catastrophic event. Parametric policies can also be designed around a specific geographic area. For example, perhaps a specific area of a city is particularly vulnerable to a certain kind of hazard. A policy could be developed to provide a payout for an occurrence of that hazard in that area, allowing the local government to provide additional support to the people who live there.[17]

You can read more about parametric insurance in the GFOA report "Parametric Insurance: An Emerging Tool for Financial Risk Management."[18] The report includes case studies of local governments that have purchased parametric policies and how insurance policies complement FEMA reimbursement.

RETHINKING RESERVE CHECKPOINTS

Optimize commercial insurance combined with reserves

- Consider if you have commercial insurance policies with a higher deductible that could be self-insured by reserves. The highest potential will usually be with policies where premium prices are going up substantially.
- Consider if a parametric insurance policy could supplement reserves. Parametric insurance might be particularly useful when a government finds that it is underinsured for a catastrophic risk. This is because parametric insurance can provide additional coverage immediately, while it could take years to build an equivalent reserve.

Optimize investment strategies

Insurance companies invest the monies collected from premiums to make substantial profits.[19] A government's reserves are basically premiums collected from the community to stabilize their government services against risk. The money held in reserves will be idle most of the time, so governments can adopt savvy investment strategies for it.

A risk analysis is essential for a savvy investment strategy. A government can divide its idle funds into tranches, with each tranche representing a different likelihood of the government needing to access the money for emergency purposes. As a simple example, let's assume a government has only two investment options: 1) short-term, lower earning; and 2) long-term, higher earning, where the term of the investment is three years. Let's assume a government does a risk analysis that suggests $10 million is a good ceiling amount for its reserve, and the government has $10 million in its reserve. The risk analysis also suggests there is only a 10 percent chance that the government would need to use more than $9 million of its reserve in the next three years. Decision-makers might conclude that putting $1 million in the second investment option is worth the risk. This leaves $9 million in the shorter-term, lower-earning investments, that provides greater ability to access the cash if the need arises. Research by one financial technology firm that helps local governments determine their investable resources suggests that large gains in investment returns are possible with a more risk-savvy investment strategy like the one described above. According to data provided by the firm, returns could improve by much as 35 to 40 percent more than what most governments get currently from the resources that comprise their reserves.[20]

Our example assumes a probabilistic risk analysis, but a less rigorous risk analysis could still help reach a similar conclusion. For example, if a less rigorous analysis suggests that $10 million is

A risk analysis is essential for a savvy investment strategy. A government can divide idle funds into tranches, with each one representing a different likelihood of the government needing to access the money for emergency purposes.

the ceiling amount for reserves, then we know that amounts closer to the ceiling are far less likely to be used than the "first dollar" that comprises the reserve. Thus, a government would still have the bulk of the $10 million invested in more liquid assets, while placing a smaller amount in a less liquid, higher return asset.

Our example also reveals a potentially sticky question. The decision to invest in any combination of assets with different risk/reward profiles will, at some point, depend on the subjective appetite for risk of the decision-maker. Going back to our example, who is to say that a 10 percent chance of needing more than $9 million is the objectively correct threshold for investing the remaining $1 million in longer-term securities? Perhaps some people would be comfortable with a 15 or 20 percent chance, while others may be uncomfortable with as high as 10 percent. These decisions will have to be discussed with the relevant decision-makers to come to a consensus. GFOA's experience has been that reaching an agreement is easier when the discussion is based on an objective analysis like a risk assessment. GFOA has done this kind of analysis with its own finances and found that reaching agreement on the preferred investment strategy was not that difficult, as the risk analysis provided objective criteria and data for decision-makers.

RETHINKING RESERVE CHECKPOINTS

Optimize investment of reserve funds

- Use a risk analysis to identify tranches of funding ranging from more likely to be needed to cover unplanned, unavoidable needs to less likely. The less likely tranches may be candidates for less liquid, higher-return investments.
- Convene a discussion with the relevant decision-makers to determine the level of risk the government is willing to take on with respect to investment liquidity versus the potential need to draw on reserves.

Pool risk

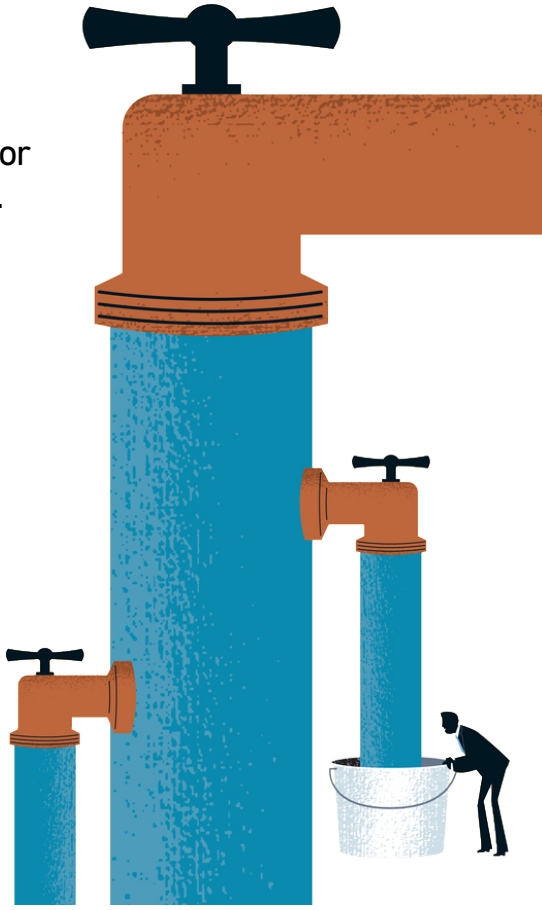
Risk pooling is widely recognized and a time-honored strategy for reducing the cost of risk, and it works because of diversification. Put simply, it is unlikely that a loss event will happen to all the pool participants at the same time. For a more in-depth explanation, see GFOA's Rethinking Revenues series video, "Why Pooling Reduces the Cost of Risk."[21]

Local governments often pool risk across multiple local governments (regional insurance pools). Local governments also pool risk inside their own organizations. Let's return to our example of employee self-insurance. Local governments do not set up separate self-insurance pools for each department or for each accounting fund. All employees fall under the same self-insurance program. This saves money because the total amount needed to insure the entire organization is less than you would need if you insured each department separately. This is an example of risk not adding up the way you might think. We also explain the concept in more detail in GFOA's Rethinking Reserves series video, "Adding Risks Together: The Surprising Truth."[22]

Similarly, local governments could realize some advantages from pooling reserves. There are many opportunities to apply pooling, though these opportunities entail varying degrees of difficulty.

The first and easiest way is to make sure there are no unrealized opportunities for pooling within the general fund. For example, some governments set up one reserve for economic uncertainty (such as recessions) and another for extreme events (such as natural disasters). These two reserves could be pooled because recessions and natural disasters are unlikely to occur at the same time, so a combined reserve should be more cost-effective. The combined reserve could still be labeled as a reserve for extreme events and economic uncertainty, to make the intent clear without keeping the two reserves separate. The most accurate way to judge the potential savings is a probabilistic risk analysis. Combining reserves to make the money in the reserves

Risk pooling is widely recognized and a time-honored strategy for reducing the cost of risk, and it works because of diversification.



more fungible could improve cost-effectiveness for the same reasons we described in our employee health plan self-insurance example.

Another possibility is to define policies for emergency interfund borrowing. The idea is that the total amount reserved across the entire government could be less if each fund did not have to prepare for the most extreme circumstance but could rely on financial backup from other funds in extreme cases.[23]

An option that could present some challenges also presents large potential payoffs: pooling reserves across funds. This has a large potential payoff because the amounts involved will be large. It can be challenging because monies may be segregated into different funds for legal reasons, creating practical barriers to operating such a pool. Pooling funds will be most effective when two conditions are met: 1) the funds involved do not have legal restrictions that make pooling impractical; and 2) the risks faced by funds are not overly similar. If the risk profiles of the funds are similar, then pooling will not be of great benefit because each fund will receive a shock when a given risk happens. But if the funds have substantial differences in their risk profiles, then pooling could be quite valuable. A given risk may give a shock to one fund but not the other, and the fund that was not shocked can support the fund that was.

Many local governments may be unwittingly pooling the reserve risks of several funds. In our work with local governments, we found that an important risk for the general fund is that it is often a de facto "backstop" for other funds. If those funds run into unplanned, unavoidable emergency financial needs, then the general fund is on the hook. Rather than building up separate reserves in each fund, it may be better to formalize the current state of affairs and enhance the pooled approach by pulling in the pool of other funds that have their own reserves.

GFOA is not the only entity to advocate for the potential of pooling reserves. In Moody's November 2022 "U.S. Cities and Counties [Bond Rating] Methodology," the company introduced a government-wide evaluation of fund balance into its rating methodology. The strength of fund balances and held cash combined across all funds is worth 30 percent of the foundational score when Moody's evaluates a government's creditworthiness.[24] Moody's found that the fund balances in different funds are often flexible enough that the funds can support each other. The company believes that there is enough potential for interfund support to justify evaluating across the entire government instead of fund by fund. This marks an evolution of Moody's approach, which was focused on specific funds.

Finally, let's address regional pooling. Local governments often participate in regional insurance pools, so why not regional arrangements for the risks the reserves guard against? The reason this may not provide as much benefit as one might expect is that the types of risks the reserves guard against (for example, natural catastrophes, recessions) affect the entire region. If all members of a pool are impacted at the same time by the same risk, then a pool loses its value. Another way to think about it is that a pool *within* government brings together funds that might have different exposures. A pool between governments brings together funds (such as, multiple general funds) that have the same exposures.

RETHINKING RESERVE CHECKPOINTS

Apply risk pooling to reserves

- If you have separate reserves in the general fund for different risks, combine those reserves.
- Develop a policy for emergency interfund borrowing.
- Consider pooling reserves across funds within your government. In some cases, you may already be de facto pooling the general fund with financially weaker funds. Improve your risk portfolio by adding other strong funds to the pool.

Understand bond ratings and reserves

A rationale for holding a greater amount in reserves is that it will support a strong bond rating, which will translate to lower interest costs on the money a government borrows. Reserves play an important role in the ratings process. According to Moody's Investors Service's rating methodology, available fund balance ratio[25] is worth 20 percent of the rating. Moody's also examines liquidity ratio[26] because fund balance is an accounting term that can include assets not available for current spending. The liquidity ratio constitutes an additional 10 percent of the rating methodology. Thus, fund balance and cash together comprise 30 percent of the total ratings methodology.

First, remember that "fund balance" and "reserves" aren't the same, though they are related. Fund balance includes a wider scope of resources, so it will be a larger number than reserves. With this in mind, we can see that fund balance/cash plays an important role in the ratings method. But what is considered a good level of fund balance? Moody's "AAA" rating (the highest) is associated with fund balances exceeding 35 percent of revenues. The "AA" rating is associated with fund balances between 35 and 25 percent, and the "A" rating with 25 to 15 percent. That said, while 30 percent of ratings evaluation is made up of fund balances and cash, 70 percent is not. Further, the Moody's documentation is clear that ratings analysts will consider local factors and other idiosyncrasies to arrive at the final rating—so it is possible to have fund balances/cash below the range for a given rating yet still achieve that rating, or even a better one.

We also examined rating methodology documentation from S&P Global. Though the specifics of their method are different, the general conclusion is the same: fund balances play an important, but not decisive, role in arriving at a final rating. A greater fund balance will contribute to a higher rating, but it may not be sufficient to guarantee a higher rating. Similarly, a lower fund balance is not guaranteed to consign a local government to a lower rating. Other factors weigh more heavily, and ratings analysts have some discretion in assigning ratings based on local context.

The next question to ask is if a higher bond rating is worth the cost to obtain it? A bond rating has a quantifiable benefit, which is the interest savings available at the next-highest bond rating. To the extent that greater fund balance (and greater reserves) can move a local government from one bond rating to the next, then it is possible to measure the benefit.

Let's get a sense of the interest rate differences between bond ratings. Exhibit 1 shows the differences between interest rates (percentage points) at different bond ratings from 1993 to 2022.[27] This shows a 90 percent confidence range, which omits outliers on both the high and low side. It is notable that the midpoint (median) is closer to the low side of the range, which usually means the differences between ratings are closer to the low value than to the high value.

What are the implications of the differences in interest rates? First, let's get a sense of the differences in the total cost of bond issue due to an interest rate difference. Imagine a 30-year, $200-million bond issue at 3 percent annual interest with a rating of A. The total cost of interest over the life of the bond issue would be about $106 million. If the same bond were to be issued with a rating of AA, let's assume it would enjoy an interest rate that is better by 0.20 percent (the midpoint on our table). In that case, the total interest rate paid over the life of the bond would be about $98 million, or a difference of about $8 million. This equates to an average of about $260,000 per year. Conveniently, the midpoint for changes between ratings in the other columns on our table is roughly half or double the midpoint in Exhibit 1, so it is easy to imagine the financial benefit at other bond rating levels.

The question of whether these benefits are worth the cost of accumulating more fund balance depends on several factors, such as:

- **How much debt a government issues.** If a government issues more debt, it will get more benefit from a lower interest rate (assuming it will issue the same amount of debt no matter its rating).
- **The duration of the payback period for the debt.** A longer payback period will result in the government paying more total interest over the life of the bond, giving a lower interest rate more impact.
- **How high a bond rating would be without accumulating a large amount in reserves.** For example, Exhibit 1 shows that the interest rate benefit between AAA and AA is much smaller than A and BAA. This means that, all else being equal, a government that can improve from BAA to A by accumulating fund balance would benefit more than a government that can go from AA to AAA.
- **The opportunity costs of holding fund balances and reserves.** Fund balances/reserves are not without

EXHIBIT 2 | HISTORY OF INTEREST RATE DIFFERENCES BETWEEN BOND RATINGS, 1993-2022

Percentage point differences from going from a higher to lower rating		AAA → AA	AA → A	A → BAA	
90% of the time, the difference is between these points.	Low	0.09%	0.10%	0.12%	
	Mid	0.11%	0.20%	0.38%	← Notice that the midpoint is closer to the low side of the range. This means most of the time the differences between ratings are closer to the low value than the high value.
	High	0.25%	0.62%	0.97%	

cost. Money held by the government is money taken out of the private economy. A less abstract opportunity cost is the public service forgone because this money isn't being spent. In a private firm, the opportunity cost of idle funds is, essentially, the rate of profit that could be made by directing the funds to a business opportunity. Unfortunately, there is not yet a widely accepted, useful way to measure the opportunity costs of idle funds in local government, so the cost of holding idle funds in local government is often underestimated.

- **Secondary benefits of a higher bond rating.** A higher bond rating might confer prestige to the local government, perhaps resulting in more trust and confidence from the public or making the locality more attractive to businesses.
- **How much additional risk coverage more reserves will buy.** This speaks to the marginal value accrued from accumulating more reserves. If the additional reserves are unlikely to be used, then the potential benefit from the standpoint of risk mitigation is low. That said, rating agencies are measuring fund balance and cash. A local government could also accumulate reserves as part of a sinking fund to pay for a special project. The monies in the sinking fund would count positively in the rating agency evaluation.

RETHINKING RESERVE CHECKPOINTS

Understand bond ratings and reserves

- Fund balances and cash are an important but not overwhelming determinant of bond ratings.
- Because accumulating and holding fund balances/cash is not without cost, governments should ask if a higher bond rating is worth the cost of holding. The cost versus benefit of a higher bond rating is a function of the amount and duration of debt the government issues, the likely improvement in interest rates available from a rating increase, the marginal improvement in risk management available from holding more reserves, and the opportunity cost of holding fund balance/cash.

Conclusion

Reserves help local governments manage risks by making resources available for unplanned, unavoidable expenditures and revenue interruptions. This makes reserves a form of self-insurance. We have advocated for local governments to treat reserves more like self-insurance, including using insurance metaphors to discuss and plan reserve strategies, using risk analysis to determine the size of the reserve, complementing reserves with commercial insurance strategies, pooling risks that reserves are used to cover, and more. This will help local governments make savvier financial decisions about how to manage risk and make their communities more prepared for a volatile and uncertain world.

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[1] Defining boundaries is essential to good financial public finance. See *Financial Foundations for Thriving Communities*, GFOA, May 2019.

[2] GFOA's general fund reserve calculation worksheet is available at gfoa.org/materials/general-fund-reserve-calculation-worksheet.

[3] Michael R. Boswell, Robert E. Deyle, Richard A. Smith, and E. Jay Baker, "A quantitative method for estimating probable public costs of hurricanes," *Environmental Management*, 23(3), April 1999.

[4] Shayne Kavanagh, "A Risk-Based Analysis of General Fund Reserve Requirements," GFOA, January 2013.

[5] See "Adding Risks Together: The Surprising Truth" at youtube.com/watch?v=soLvUKp8C4k. All the videos in this series are available at gfoa.org/risk-savvy-thinking-about-reserves-videos.

[6] See "About Chance Based (Probabilistic) Reserve Models" at youtube.com/watch?v=QDl2bYZ1dR4&t=25s. A series of videos about simulation is available at gfoa.org/risk-savvy-thinking-about-reserves-videos.

[7] See GFOA's Rethinking Reserves series video, "Why Pooling Reduces the Cost of Risk," at youtube.com/watch?v=IHEA9m0uoaU.

[8] To see how, watch GFOA's Rethinking Reserves video, "The Decreasing Marginal Benefit of Reserves" at youtube.com/watch?v=xjTJtP-yV5s.

[9] Watch GFOA's Rethinking Reserves video, "Multi-Year Analysis of Reserves," at youtube.com/watch?v=uZJftwcCods.

[10] The video on analyzing a multiyear time frame provides an illustration of how willingness to cut expenditures can be integrated into a simulation.

[11] Visit probabilitymanagement.org for resources on how to do this.

[12] See Shayne Kavanagh and Elizabeth Fu, "Speaking Uncertainty to Power: Risk-Aware Forecasting and Budgeting," *Government Finance Review*, April 2016, to see how one government did just that and use our mini stress test demonstration, available at gfoa.org/materials/mini-stress-test-demonstration, to conduct the same analysis featured in the article.

[13] Find GFOA's reserve policy template at gfoa.org/materials/reserve-policy-template.

[14] Shayne Kavanagh, "Smart practices for self-funded employee health insurance," *Government Finance Review*, October 2018.

[15] The county also negotiated several exclusions and limitations to the policy, which means the final price of the new policy isn't comparable to the old one.

[16] According to a sample of data obtained by GFOA, it takes 18 months, on average, for a local government to obtain FEMA reimbursement.

[17] Carolyn Kousky and Helen Wiley, "Improving the post-flood financial resilience of lower-income households through insurance," *Wharton Risk Management and Decision Process Center Issue Brief*, January 2021.

[18] Shayne Kavanagh and Elizabeth Fu, "Parametric Insurance: An Emerging Tool for Financial Risk Management," GFOA, January 2020.

[19] OpenAI's GPT 4.0 replied to an inquiry by saying "investment income accounts for about 25 to 30 percent of the profits of a typical property and casualty insurance company." Further, GPT showed that some insurance companies even derive most of their revenue from investments.

[20] Data obtained by GFOA from the firm three+one (which sells a software service that helps local governments optimize the amount of money invested in higher return instruments).

[21] The video is available at youtube.com/watch?v=IHEA9m0uoaU.

[22] The video is available at youtube.com/watch?v=soLvUKp8C4k.

[23] For more on how to develop a policy, see Shayne Kavanagh and Elizabeth Fu, "The Last Line of Financial Defense? Internal Loans in Emergency Situations," *Government Finance Review*, December 2019.

[24] Moody's separates "fund balance ratio" and "liquidity ratio," but both cover all funds. Also, the base score is a starting point, and Moody's analysts may adjust a final rating up or down based on contextual factors particular to the local government being evaluated.

[25] The formula is: Available Fund Balance + Net Current Assets/Revenue.

[26] The formula is: Unrestricted cash/revenue.

[27] Data sourced from SDC All Municipals, an online data portal from Refinitiv.