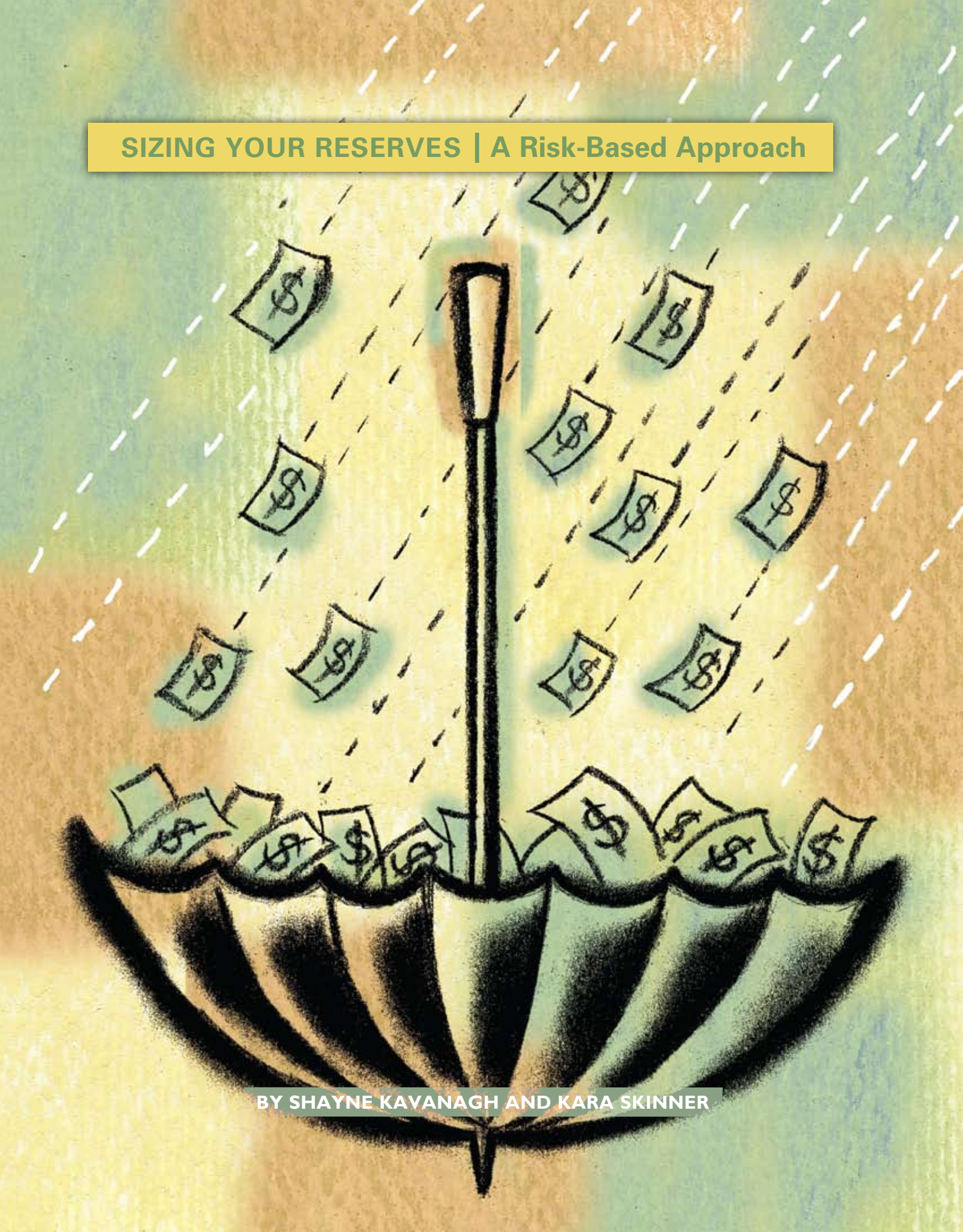
SIZING YOUR RESERVES | A Risk-Based Approach



BY SHAYNE KAVANAGH AND KARA SKINNER

City officials in Colorado Springs, Colorado, had been holding an on going conversation about the right level of reserves. The city's primary revenue source, at more than half of general fund revenues, is the sales tax, while the property tax constitutes less than 10 percent of revenues. This means that the city's revenue is subject to a greater degree of volatility than would perhaps befall a municipality with greater reliance on the property tax. Further, legislative tax and expenditure limits prevent the city from freely making changes to tax rates in response to changing financial conditions. On top of these fiscal limitations, the city is at risk for different types of natural disasters (wild fires, floods, blizzards), any of which would require a quick and decisive public safety response from the city government. Finally, the city has an aging capital infrastructure, particularly its bridges and storm sewers, and a significant failure in any of these assets could place an unexpected and large burden on the city's finances. These risks called for a financial hedging strategy — in other words, a deliberate and strategic amount of general fund financial reserves.

Municipal governments are subject to a number of risks, often of highly uncertain probability and magnitude.

To help local governments determine the optimal level of reserves, the Government Finance Officers Association has been developing a risk-based approach to sizing reserves. A number of local governments have used the general framework (which has been described in the GFOA publication, *Financial Policies*) to make a determination as to the optimal reserve size for their circumstances.[1] In summer 2012, the GFOA was able to work with the City of Colorado Springs to apply the risk-based model. This article describes that process, including background on the project, the "triple-A" framework for analyzing risks, the application of the triple-A approach to Colorado Springs' risk factors, and, finally, what happened in Colorado Springs as a result of the analysis.

ANALYZING UNCERTAINTY: THE TRIPLE-A APPROACH

Municipal governments are subject to a number of risks, often of highly uncertain probability and magnitude, that require them to maintain reserves. Since these risks are impossible to predict, the best that anyone can do is to be prepared. The accomplished forecasting scientist, Spyros Makridakis, has suggested a "triple-A" approach for dealing with this kind of uncertainty.[2]

1. **Accept.** We have to accept that we are subject to uncertainty, including events that we haven't even imagined. For example, Colorado Springs experienced a severe downturn in sales tax revenues as a result of the 2001 dot-com bust and the 2007 Great Recession. Sales taxes are subject to severe downturns due to rare and unpredictable events. Further, because it is relatively easy to imagine scenarios that could cause the economy to suffer (e.g., European financial crisis, federal debt crisis, etc.), the economy is subject to other potentially dangerous unknowns that we cannot imagine.

2. **Assess.** Next, we must assess the potential impact of the uncertainty. History can provide a baseline reference. Looking at the sales tax declines Colorado Springs experienced after the dot-com bust and Great Recession, we see that a downward trend has persisted for as long as 25 months, and the greatest severity has been a 0.53 percent average monthly decline over the life of the downturn (during the Great Recession that started in December 2007).

3. **Augment.** The range of uncertainty that we really face is almost always going to be greater than we assess it to be, so we should augment that range. Many economists believe that the effects of the Great Recession — the baseline for Colorado Springs' worst-case monthly decline — would have been much worse without the interventions of the federal government (although the long-term impact of those actions is, of course, still unknown). What if continued gridlock in the federal political system (or other, unimagined, circumstances) were to prevent an effective mitigating response to the next crisis? As a rule of thumb, Makridakis suggests doubling your range of uncertainty if you have little historical data to rely on, or multiplying it by 1.5 if you have more.

The GFOA used the triple-A approach to analyze each of Colorado Springs' major risk factors — sales tax volatility, bridges and storm sewers, and natural disasters — and suggested reserve amounts based on that analysis. The city was subject to other risks, as well, but these were deemed to be of

secondary importance and were therefore analyzed less rigorously.[3]

SALES TAX VOLATILITY

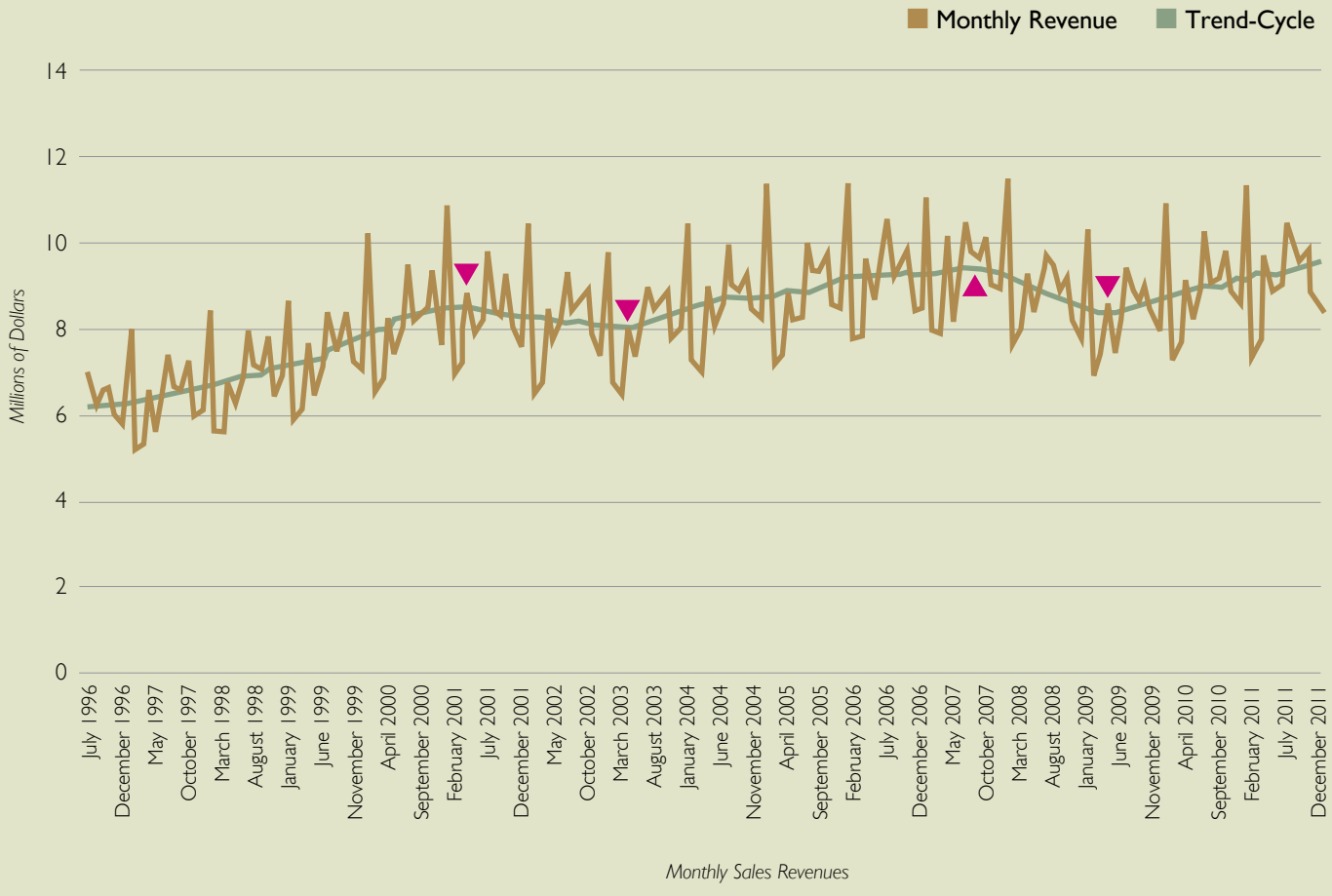
Initially, the GFOA analyzed monthly sales tax revenues going back to 1996 to determine the degree and, critically, the type of volatility the sales tax is subject to: economic, seasonal, or random variation. The GFOA's analysis showed that more than 90 percent of the variation in Colorado Springs' sales tax revenue could be explained by fundamental economic trends and business cycles.[4] This meant that risk due to economic downturns should be the focus of the analysis.

An unexpected economic shift could have serious ramifications for city revenues. Exhibit 1 shows a "trend-cycle" line for sales tax (which factors out seasonal volatility)[5] overlaid on monthly sales tax revenues. The red arrows show the beginning and endpoints of significant downtrends. The first one started in April 2001 and lasted until May 2003, when the trend cycle declined 6.6 percent over 25 months, or about 0.25 percent per month. The second started in July 2007 and lasted until April 2009, when the trend cycle declined 11.2 percent, or a bit more than 0.5 percent per month.

An unexpected economic shift could have serious ramifications for city revenues.

Once the level of risk is assessed, it must be augmented. The GFOA and the city had a good deal of data, making a 1.5 multiplier appropriate. The result was a 0.8 percent monthly decline as the probable worst-case scenario, which translates to a potential 20 percent decline in sales taxes over 25 months. However, the city would presumably reduce its

Exhibit 1: Sales Tax Monthly Revenue and Trend Cycle



spending in the event of such a severe downturn, so a reserve large enough to cover the entire amount of the revenue decline wouldn't be necessary. The Colorado Springs budget office estimated that the budget could be reduced by a little less than $10 million without creating a major disruption to services, which meant that the city should maintain a reserve of at least $13 million to fill the remaining revenue gap and to help it make a "soft landing" in the case of a major revenue decline.

> General fund reserves may be needed to repair or replace an asset that fails unexpectedly.

BRIDGES AND STORM SEWERS

General fund reserves may be needed to repair or replace an asset that fails unexpectedly. In Colorado Springs, two asset classes were deemed to be at the greatest risk for failure, due to the condition of the city's asset stock: bridges and storm sewers. Risk is defined as the product of probability of failure and the consequences of failure. In this case, the probability of failure was based on a bridge sufficiency index provided by city staff. A lower index score indicates a bridge that is in worse condition and ultimately a higher risk (probability) to fail. (See Exhibit 2.) Consequence is based on cost — the higher the replacement cost of an asset, the higher the consequence to the city if that asset were to fail.[6] As Exhibit 2 shows, 13 bridge structures were identified as having a high risk rating (those in the red area, which have a total score of 8-10, adding the scores from each axis). These bridges have an estimated replacement cost of $22,752,672, which averages out to about $1.75 million per bridge. A reserve that covers one or two bridges should be adequate, but using the triple-A rule of doubling our expectation for uncertainty, it would be prudent to prepare for the premature failure of three of these bridges. This would require reserves of $5.25 million.

The city also manages 406 miles of storm lines. No installation dates or condition assessments were available for any of them, but the estimated replacement cost for all storm sewers is a bit more than $588 million. Since the information needed to assess risk of failure is not available, the best that can be done is to make an assumption. About 10 percent of the total dollar value of the city's bridge inventory is in the higher risk category, so that was chosen as a reasonable number for the storm sewer estimate; this would translate to $58 million. Approximately 20 percent of the high-risk category was recommended as a reserve amount for the bridges, which would equate to $11.6 million for the storm sewers.

Exhibit 2: Risk Profile for Bridges and Culverts

Consequence of Failure	0	1	2	3	4	5
High / 5		34 Assets $97,543,123.50	6 Assets $14,341,650.00	8 Assets $17,801,817.00	1 Assets $1,544,010.00	No Assets N/A
4		39 Assets $25,177,155.00	7 Assets $6,959,355.00	No Assets N/A	2 Assets $1,772,910.00	2 Assets $1,633,935.00
3		48 Assets $18,897,532.50	5 Assets $3,852,240.00	4 Assets $1,345,308.00	2 Assets $412,344.00	No Assets N/A
2		64 Assets $13,759,009.50	14 Assets $5,716,803.00	7 Assets $711,121.50	1 Asset $741,195.00	3 Assets $1,353,675.00
1 / Low		104 Assets $20,381,443.50	35 Assets $8,967,537.00	13 Assets $2,933,257.50	9 Assets $889,242.00	77 Assets $1,090,359.00

Possibility of Failure: Low … High

NATURAL DISASTERS

Colorado Springs is subject to natural disasters that pose a significant threat to life and property, especially wildfires and floods. Wildfires are the most important risk — in fact, the 2012 Colorado wildfire occurred when this analysis was originally being conducted and was, at the time, the largest wildfire in Colorado history. It affected approximately 12,000 acres and burned 347 homes. A response to large wildfires can be expensive, requiring police and fire personnel to suppress the fire and evacuate people. Reimbursement from the Federal Emergency Management Agency is not immediate and does not typically cover all the costs of responding. Further, a fire is likely to interrupt the city's sales tax revenue.

> Leading municipalities often find it helpful to segment their reserves into different categories, making the purpose of the reserve more transparent.

The city estimated costs for the 2012 fire at $3.75 million in personnel time, mutual aid costs, and other direct expenses. This estimate covers the actual firefighting within the city limits and the emergency protective measures taken (e.g., evacuation, security, activation of the emergency operations center, etc.). The expenses eligible for a 75 percent FEMA reimbursement are estimated at $2.15 million. The FEMA-ineligible expenses combined with the 25 percent of unreimbursed expenses comes to $2.14 million — although at least some of this amount is expenses that the city would have incurred regardless of the fire, such as on-duty firefighters.

Floods are also a concern because they damage infrastructure, require a city emergency response, and require debris removal afterward. Colorado Springs' most severe floods were in 1935 and 1965; otherwise, smaller floods occur about 6 or 7 times in a 10-year period. The last flood that qualified as a FEMA disaster was in 1999. The city's cost for dealing with the flood of 1999 was $2,670,158. The federal share of the project was 75 percent, or approximately $2 million; the state share was 12.5 percent, or $333,770; and the city's share was the remaining 12.5 percent, or $333,770. In 2012 dollars, this would equate to about $3.67 million in total costs and $460,000 for the city's final share.

Although Colorado Springs faces risks from several types of extreme events that have the potential to cause loss of life and property and to disrupt business, these extreme events do not appear to constitute a catastrophic risk to the city's financial position. For example, a reserve of $4 million (compared to the city's $220 million in annual revenues) would be more than adequate to cover the cost of either the 2012 fire or a flood of similar severity to the 1999 flood, before FEMA reimbursement.

However, the triple-A approach warns that the city would do well to augment the level of risk it was preparing for, and given the very limited number of data points to inform the analysis, a higher multiplier was appropriate. To illustrate: Multiplying the city's total cost for the 2012 fire — $3.75 million — by 2 totals $7.5 million. Much of the cost for an extreme event would be reimbursed by other parties, however, and some of this figure would represent costs the city would incur, regardless (e.g., regular salaries for public safety personnel). Therefore, a $7.5 million reserve might be excessive. Analysis indicated that about a third of the costs for the most recent fire would have been incurred as the normal cost of doing business, and about half of the reimbursement from FEMA can be expected to be received within six months of the expenditure. Therefore, a reserve of $3.3 million might represent the minimum prudent reserve amount; it accounts for some of the costs the city would have to bear in responding to an extreme event that would be part of its regular budget, and for the significant portion of the costs that would be reimbursed quickly by FEMA. A reserve of $5 million might be a middle ground because it does not account for FEMA reimbursement (which is outside of the city's control), but considering the need for a hedge against floods (and blizzards), a reserve up to $7.5 million would be prudent.

PUTTING IT ALL TOGETHER INTO A RESERVE TARGET

To summarize the amounts of reserve our analysis suggested would be prudent for the city to maintain, based on an analysis of the risk factors (including the results for analyses that were not described in this article, due to the space limits):

About the City

The City of Colorado Springs is a community of 416,427 people, located about 70 miles south of Denver. At an elevation over 6,000 feet, Colorado Springs sits at the base of Pikes Peak, one of the most famous American mountains, and boasts of 300 days of blue skies each year. It is home to Garden of the Gods, the Air Force Academy, the U.S. Olympic Committee Headquarters and Training Center, and the world-famous Broadmoor Hotel.

- $13 million for the effect of uncertain economic conditions on sales tax, as described in this article.
- $7.5 million for the effect of uncertain economic conditions on other revenues. This accounted for uncertainty around building permit revenues and other minor revenue sources.
- $6.25 million for uncertainty regarding pension payments. This related to state policy affecting the state-run pension system the city participates in.
- $5.25 million for critical bridge failure and $11.6 million for critical storm sewer replacement, for a total of $16.85 million.
- $5 million to $7.5 million for extreme events, as described in this article.
- $2 million to $4 million for expenditure spikes from lawsuits. This was based on the exposure to actual lawsuits the city was subject to at the time, and an estimate of the potential damages and probability of incurring those damages.

Many cities express their reserve policy target as a single number (e.g., 16 percent of revenues). However, the GFOA has found that leading municipalities often find it helpful to segment their reserves into different categories, making the purpose of the reserve more transparent. For example, a reserve for "emergencies" and a reserve for "economic uncertainty" would provide more clarity about the purpose of the reserves than one all-encompassing reserve. The first three bullets above could comprise the budgetary uncertainty reserve, while the last three would form the emergency reserve, leading to the targets shown in Exhibit 3.[7]

This provided a total target of about 25 percent of general fund revenues.[8] This was acceptable to the mayor and council because it was based on a transparent assessment of the risks the city faced, and it provided a known, prudent level of extra "cushion" that took into account the impact of issues that were of pressing concern to the community (e.g., wildfire). A comparative analysis of the target with comparable cities showed that the target level of reserves was similar to the level of reserves actually maintained by other cities (it was slightly less).

HOW THE ANALYSIS PLAYED OUT

Further events in Colorado Springs proved the value of the triple-A approach. The city worked hard to build its 2012

Exhibit 3: Categories of Reserves

Budgetary Uncertainty Reserve
$13 million for sales tax economic uncertainty +
$7.5 million for economic uncertainty in other revenues +
$6.25 million for pension payment uncertainty =
$27 million, or approximately 12.5% of general fund revenues as budgetary uncertainty reserve*

Emergency Reserve
$5.25 million for critical bridge failure and $11.6 million critical storm sewer replacement, for a total of $16.85 million +
$5 million to $7.5 million for extreme events +
$2 million to $4 million for expenditure spikes from lawsuits =
$27 million, or approximately 12.5% of general fund revenues as an emergency reserve

** Based on about $220 million general fund revenue, per 2012 budget estimates*

end-of-year unrestricted fund balance to 23.3 percent of the 2013 expenditure budget, nearly reaching its goal of 25 percent. However, a series of events changed that.

- Transit litigation settlement reduced the reserve to 19.2 percent of the 2013 amended expenditure budget (the reader will note there was an allowance for settlements in Exhibit 3).
- The burn scar left by the 2012 Waldo Canyon Fire placed the city at increased risk for flooding, so the mayor requested, and the City Council approved, a supplemental appropriation of $8.8 million from the reserves for emergency storm water capital projects to address the most critical flood risks. The City Council understood that a portion of the city's reserves are held to fund projects that will reduce a risk (in this case, massive flooding) that, if it occurred, would have to be remediated later, at even greater expense.
- The city was affected by the Black Forest fire, in an unincorporated populated area that borders the city. This fire was 50 percent more destructive than the 2012 Waldo Canyon fire, which had been the worst in Colorado history up to that point, measured by the number of homes destroyed. Fortunately, the city was prepared to handle the immediate response cost with its remaining reserves.

Ultimately, the city's reserves were reduced to 14.4 percent of the 2013 amended expenditure budget, still providing a hedge against the other risks it faces. The mayor and City Council understand, however, the importance of the reserves for responding to all of the city's risks and are working with staff to replenish the reserve as soon as is practical.

Notes

1. The GFOA best practice, *Appropriate Level of Unrestricted Fund Balance in the General Fund*, recommends that general purpose governments maintain an unrestricted general fund balance of no less than two months of regular general fund operating revenues or regular general fund operating expenditures. However, the document emphasizes that this recommendation is just a baseline and that governments must determine the optimal level of general fund reserves for their own particular circumstances.
2. See: Spyros Makridakis, Robin Hogarth, and Anil Gaba, *Dance with Chance: Making Luck Work for You* (Oxford: Oneworld Publications) 2009.
3. For details on how all risk factors were analyzed, see the full report about this project, "A Risk-Based Analysis of General Fund Reserve Requirements: A Case Study of the City of Colorado Springs," available at www.gfoa.org/research.
4. The GFOA used a method of data "de-seasonalization" known as multiplicative decomposition to arrive at this conclusion.
5. The trend-cycle line is calculated by taking a 12-month centered moving average of actual monthly sales tax revenue. For example, the moving average for January 2005 would be an average of August 2004 through July 2005. February 2005 would be an average of September 2004 through August 2005, and so on. A 12-month moving average smooths out seasonal variation, leaving only the trend cycle.
6. Further analysis could be conducted with city staff to refine asset replacement costs and review the risk rating to incorporate more factors (i.e., traffic count, location, major structures).
7. Targets were rounded to nearest whole numbers for ease of use in policy making.
8. While some of the risks are clearly independent, some are not. If the risks are independent (i.e., the occurrence of one has no bearing on the occurrence of another), an argument could be made for holding less in reserve than the sum of the subcomponents. But because the level of independence was very complex to estimate, it was decided not to assume any level of independence. Hence, the target is probably larger than the city would need at any one time.

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