

**ANALYSIS**  
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## Stress-Testing States: COVID-19

### INTRODUCTION

The COVID-19 pandemic is set to inflict an unprecedented amount of stress on state governments throughout the country. In an effort to try to provide policymakers and other stakeholders with an estimate of the potential downside implications we have run two recession scenarios through our usual state budget stress-testing methodology. The results are equal parts shocking and encouraging.

# Stress-Testing States: COVID-19

BY DAN WHITE, SARAH CRANE AND COLIN SEITZ

**T**he COVID-19 pandemic is set to inflict an unprecedented amount of stress on state governments throughout the country. In an effort to try to provide policymakers and other stakeholders with an estimate of the potential downside implications we have run two recession scenarios through our usual state budget stress-testing methodology. The results are equal parts shocking and encouraging.

The amount of fiscal stress that states may be asked to absorb under the scenarios in this analysis is unprecedented, but so are the number of states who are actually prepared for such an eventuality. The two scenarios in question, our current baseline and S3 alternative forecast scenario at the time of this writing, hinge largely on the length of travel restrictions and business closures currently in place across the country to battle the outbreak.

Under these scenarios, a shrinking economy causes a fiscal shock of between \$158 billion and \$203 billion through the end of state fiscal year 2021. This amounts to between 18% and 23% of fiscal 2019 general fund revenues, materially more than we have previously stress-tested for using more traditional moderate and severe recession scenarios.

The encouraging takeaway is that state governments in the aggregate have never been more prepared for a downturn than they are at this moment. State rainy-day fund balances are actually large enough in 17 states to absorb the unprecedented levels of economic stress estimated in our baseline with relatively minor fiscal difficulty. Despite this level of resilience in a large number of states, there are still plenty of areas for concern. Under the baseline, for example, there are still 21 states that may have to go through the painful process of filling budget holes of 10% or more even after using all of their available reserve balances. Under the more severe S3 scenario, that number would balloon to 34 states.

## Stress-Test Findings

- » Five states have the reserves they need to fully absorb the economic stress of COVID-19.
- » Twelve states have most of the reserves they need to handle a recession on par with our baseline.
- » Thirty-three states would need to fill budget gaps of 5% or more, and 21 of those states would need to fill gaps of 10% or more.

This level of economic stress comes in addition to the unprecedented direct spending needs associated with fighting the virus itself. When the two sets of impacts, economic and virus specific, are combined it becomes clear that states in the aggregate will not be able to avoid severe spending cuts or tax increases without additional support from the federal government.

## Why we stress-test state budgets

In the wake of the Great Recession, the private sector became acutely aware of the necessity of planning for economic downturns. Indeed, the U.S. government and financial regulators in some cases have moved to require the private sector, specifically banks, to publicly stress-test for a rainy day. These same principles can be redirected to government with the aim of protecting budgets and the economy.

Moody's Analytics pioneered the concept of stress-testing the public sector in the wake of the Great Recession, and more recently we have taken to releasing annual state stress-testing exercises each fall.<sup>1,2</sup> As stress-testing has become more commonplace in the public sector in recent years, so have state and local government levels of preparedness. This paper provides an out-of-cycle update to those estimates to gauge the potential fiscal shock that could be in store for states in the COVID-19 economy.

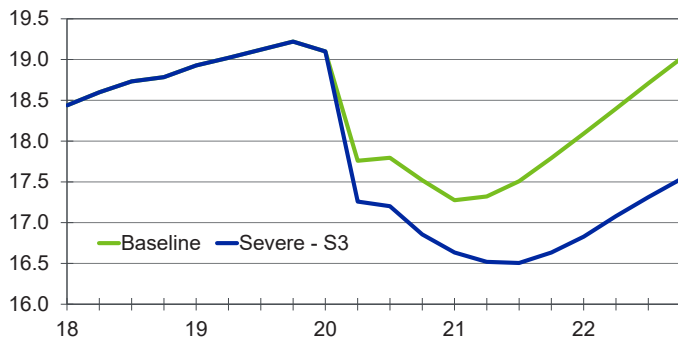
The mechanics of stress-testing are relatively simple and depend on the use of alternative economic scenarios. Scenarios are fed through two sets of quantitative models estimating state revenues and spending needs, with no qualitative overlays applied to the results. Such a model-driven approach does ignore a variety of qualitative factors that will come into play as state policymakers ultimately address COVID-19-related shortfalls.

Therefore, the figures represented in this analysis are intended to help measure the potential magnitude of fiscal stress that states will experience, and are not a direct reflection of a state's ability to weather that level of stress. Furthermore, the projections included in this analysis were performed by Moody's Analytics, not Moody's Investors Service. Therefore, the content of this analysis should

1 Dan White, "Stress-Testing State and Local Reserves," Moody's Analytics Regional Financial Review (August 2014).  
2 Crane and Seitz, "Stress-Testing States 2019," Moody's Analytics Regional Financial Review (October 2019).

## Chart 1: Varying Levels of Stress

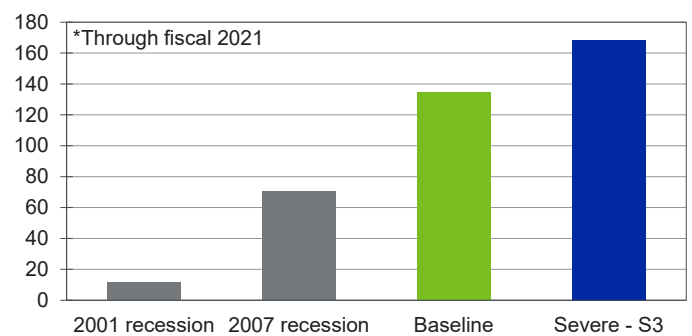
U.S. real GDP, \$ tril



Sources: BEA, Moody's Analytics

## Chart 2: Revenues Across Scenarios

Aggregate revenue declines, \$ bil



Sources: NASBO, Moody's Analytics

not be misconstrued as having any bearing on past, current or future ratings actions. For a more detailed description of the methodology and assumptions behind these fiscal scenarios, please see Appendix B.

### Measuring economic shock

As part of our standard monthly forecasting process, Moody's Analytics generates a variety of alternative economic scenarios to accompany the U.S. and regional baseline forecasts. This exercise focuses on two recession scenarios, our baseline and a more severe S3 scenario. The severity of each depends largely on the length of time that travel restrictions and business closures remain prominent throughout the country. Our economic baseline assumes

#### Baseline Scenario - Moderate Stress

- » Deep recession in first half of 2020 followed by modest rebound. Travel and business restrictions in effect through late second quarter.
- » Peak jobless rate of 13% in 2020Q2. Peak-to-trough real GDP decline of 10%.

#### S3 Scenario - Severe Stress

- » Travel and business restrictions last into the third quarter, delaying recovery and causing more long-term disruptions.
- » Peak jobless rate of 17%. Peak-to-trough real GDP decline of 14%.

that those restrictions begin to lift toward the end of the second quarter. The more severe scenario, akin to our current S3 forecast, assumes the same restrictions remain in place well into the third quarter (see Chart 1).

What makes these scenarios unique relative to previous stress tests is not necessarily the magnitude of economic disruption but the timing of it. In most economic contractions, demand begins to fall off gradually as supply continues to expand. This fundamental mismatch in the economy results in supply being reduced, and jobs and incomes lost, almost as if the economy runs out of gas. This usually lasts for a period of up to five or six quarters, and in the case of the Great Recession, even longer.

However, the current set of scenarios is more comparable to someone just pulling the plug on the economy. It is not that sufficient demand was not there, it is that many of the physical activities that drive economic growth became infeasible overnight or outright illegal. Because, by our preliminary estimates, up to a third of the economy was suddenly pulled off line through travel restrictions and business closures, the severe amount of economic stress being experienced is equally sudden and unprecedented.

### Measuring fiscal shock

The results of our analysis using baseline and severe COVID-19

scenarios reveal that the unique nature of the economic disruption will cause state budgets to undergo some historic levels of stress. Through the end of fiscal 2021, the combined fiscal shock of lower revenues and higher spending needs from a smaller economy could be between \$158 billion and \$203 billion, or 18% to 23% of their general fund budgets, respectively (see Table 1). In some states, this would be equal to around twice the level of fiscal shock absorbed during the Great Recession. At least in modern times, we cannot find an example of such large amounts of potential stress over such a short time.

Revenue declines account for the lion's share of stress, as usual, across each of the two scenarios. Within the context of past downturns, the level of overall stress can be seen more clearly (see Chart 2). The level of aggregate revenue declines resulting from the Great Recession is generally estimated at about 10% of overall general fund budgets. It is likely that this figure underestimates the true level of stress experienced by states, as it is comprised of some of the tax increases imposed during and after the Great Recession by states to keep their budgets afloat. However, even under that assumption we

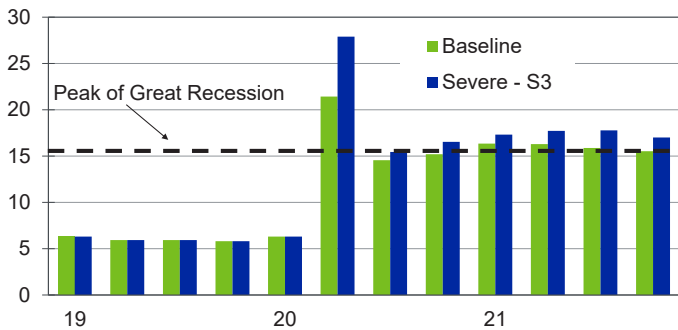
Table 1: Summary of Potential Economic Impacts

	Baseline		Severe - S3	
	\$ bil	% of GF	\$ bil	% of GF
Revenues	130.4	14.8%	172.1	19.5%
Medicaid	27.4	3.1%	31.2	3.5%
Fiscal shock	157.8	17.9%	203.3	23.0%

Source: Moody's Analytics

### Chart 3: Unemployment Drives Medicaid

Number of unemployed people in the U.S., mil



Sources: BLS, Moody's Analytics

can safely estimate that the level of revenue stress set to be imposed on state budgets in the years ahead will surpass those levels seen during the Great Recession.

Increased Medicaid needs make up a much smaller, but still material, portion of fiscal stress. Increases in unemployment are the predominant driver, historically, of increases in Medicaid spending. For this reason, Medicaid needs are likely to again be more severe during and after COVID-19 than they were during the Great Recession (see Chart 3). However, the exact degree is clouded by comparison issues. The actual level of stress experienced by states during the last downturn was lessened considerably by federal stimulus. During the Great Recession, the federal government increased its program-matching funding, or Federal Medical Assistance Percentage, by an average of more than 10% to states. Couple this stimulus with data anomalies related to implementation of the Affordable

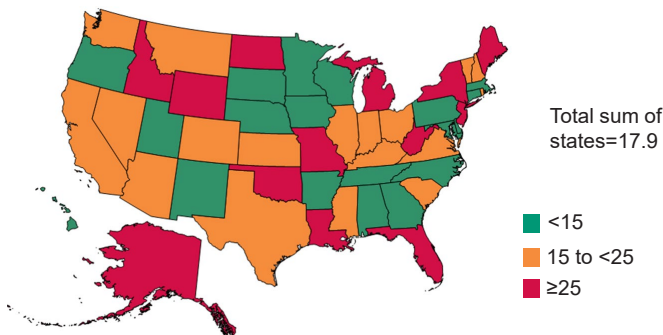
Care Act after 2010, and it becomes almost impossible to disentangle the actual amount of stress that state Medicaid programs would have undergone if not for federal intervention.

The projections of potential stress in this analysis do not explicitly account for the relatively small FMAP increases already enacted in part two of the federal fiscal stimulus. However, without additional funding on par with what was in place during the last downturn, increased Medicaid needs will be a much larger weight on state budgets during the coronavirus pandemic.

As in previous exercises, the distribution of potential shock across different states is broad, owing to each state's unique tax and industrial structure (see Chart 4). In general, those states relying on more volatile revenue streams, for example oil and gas severance taxes or very progressive forms of personal income taxes, see greater levels of fiscal stress in each of the two scenarios. Likewise,

### Chart 5: Stress Levels Vary Considerably

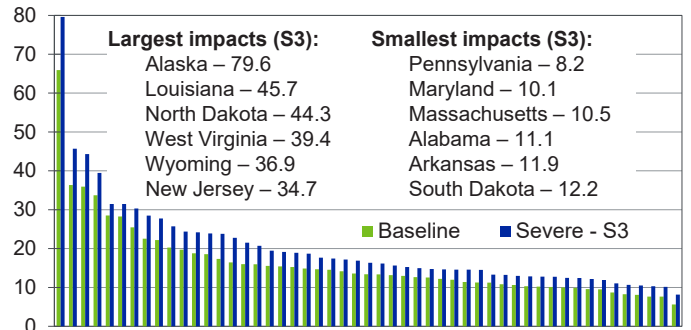
Fiscal shock under baseline assumptions, % of est 2019 revenues



Sources: NASBO, Moody's Analytics

### Chart 4: Wide Range of Tax Outcomes

Estimated revenue losses, % of 2019 general fund revenues



Source: Moody's Analytics

Louisiana and New Jersey among the most representative examples.

As past stress tests have demonstrated, those states that rely on more stable forms of tax revenue such as sales taxes or flat income taxes generally experience less volatility in their overall budget balances. However, what proves to be most important in escaping unusually high levels of fiscal stress under these COVID-19 scenarios is a state's industrial mix.

The states that see the least amount of stress relative to their peers are those states with higher concentrations in healthcare and education, both industries that have been relatively immune from an employment standpoint thus far in the downturn. States such as Pennsylvania and Massachusetts stand out as the most representative samples in this cohort (see Chart 5). Complete details on each state can be found in the tables composing Appendix A.

#### Measuring preparedness

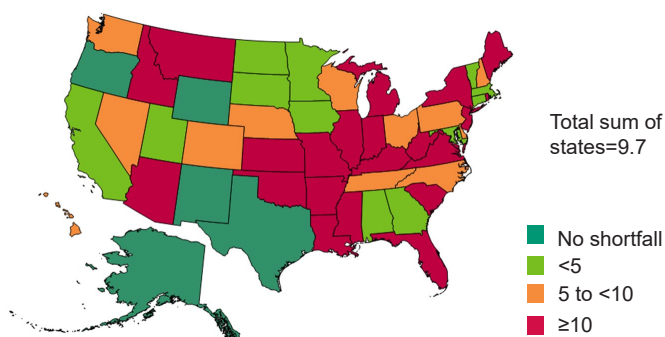
While examining the total amount of potential stress on state budgets is extremely helpful, it is important to do so within the context of states' abilities to absorb that stress. There are many factors that contribute to a state's ability to do so—some qualitative and some quantitative. This analysis will focus strictly on quantitative measures, particularly how much states have set aside in reserves.<sup>3</sup>

states with a heavy concentration in those industries most affected by the COVID-19 shutdowns, such as tourism, finance and energy, see greater levels of economic stress that translate into greater budget volatility. This combination of factors makes for a diverse group of states, with Alaska,

<sup>3</sup> For more information on the combination of qualitative and quantitative factors affecting states' abilities to absorb fiscal stress, please see: Emily Raimos, et al., "Fiscal Stress Test: Ability to Withstand Next Recession Depends on Reserves, Flexibility," Moody's Investors Service: Sector In-Depth (April 21, 2016).

## Chart 6: Inescapable Shortfalls

Shortfall net of reserves under baseline, % of 2019 revenues



Sources: NASBO, Moody's Analytics

The most encouraging part of this analysis is the realization that many states have been diligently preparing for this moment for the better part of a decade, and that preparation is about to pay off. Despite the unprecedented level of stress set to hit state budgets, at least 17 have the reserves available to navigate this downturn by incurring relatively limited amounts of spending cuts or revenue increases (see Chart 6). This has the potential to pay tremendous dividends from an economic perspective. Not having to make extraordinary fiscal adjustments in the midst of a recession helps states to add stability to their economy, and can provide a stable platform from which to build a sound recovery.

Unfortunately, not all state reserves are created equal, and at least 21 states are likely to have the unenviable task of filling budget holes of 10% or more. Having to take drastic fiscal action at a time when the local economy can least afford it can have devastating impacts for a state, often making it less competitive to its neighbors and forcing it to play catch-up throughout the next business cycle. On a national scale, these state fiscal actions will also take a toll.

At the end of last fiscal year, the National Association of State Budget Officers estimated that states had approximately \$72 billion set aside in combined rainy-day reserve funds. This means that under the scenarios considered in this analysis, assuming states actually draw down 100% of their reserves in the next 15 months, aggregate shortfalls would cause budget cuts of 10% to 15% (see Table 2).

However, it is unlikely that states would choose to, or in many cases be able to, draw down all of their reserves in a little over

## Table 2: Summary of Potential Shortfalls from Economy

	Baseline		Severe - S3	
	\$ bil	% of GF	\$ bil	% of GF
Fiscal shock	157.8	17.9%	203.3	23.0%
Reserves	72.3	8.2%	72.3	8.2%
Shortfall	(85.5)	(-9.7%)	(131.0)	(-14.8%)

Sources: NASBO, Moody's Analytics

one fiscal year. This fact coupled with the direct costs of battling COVID-19 mean that the actual shortfall for states in the aggregate

will be much greater than our estimates of the economic impacts alone.

### Important considerations

Though the results of this exercise are relatively clear-cut, they do need some context. These results are based on projections using Moody's Analytics economic scenarios and historical state budget data from the National Association of State Budget Officers. Some of the data were preliminary at the time of collection, and therefore may differ slightly from final audited numbers eventually reported by states. Furthermore, the way in which certain funds or reserves are accounted for may differ significantly from one state to the next, causing some of the findings in this report to differ from what has been reported by individual states.

This report is meant to inform policymakers and other key stakeholders about the overall magnitude of potential fiscal and ultimately economic risks associated with COVID-19, and should not serve as a substitute for states performing their exercises to gauge their own respective shortfalls. States themselves will always have access to better and more granular fiscal data, and should be conducting similar types of scenario analysis on their own budgets to inform specific policy decisions in their states.

Risks around these numbers are considerable, owing to the large degree of uncertainty around the timing and progression of the COVID-19 pandemic. Several other exogenous risks also cloud the outlook as to the actual amount of fiscal stress that states can expect, but in the aggregate we feel that these risks are roughly balanced.

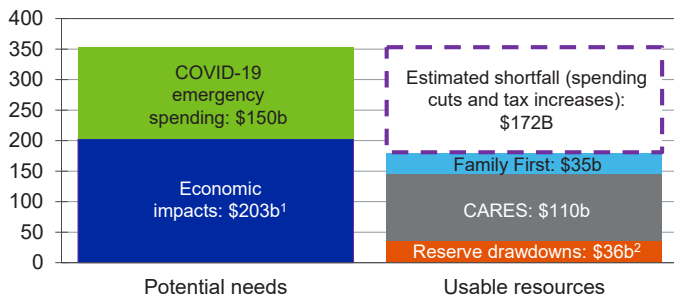
The mandatory spending projections included in this analysis are particularly laden with risk, as some are unique to COVID-19. For example, this analysis does not explicitly account for the small increase in federal Medicaid assistance already enacted as part of the second stimulus bill. This alone would make the Medicaid shock estimates in the analysis overly pessimistic. However, that risk is balanced by several other factors, including the unique health system impacts associated with COVID-19, and the strained administrative capacity within most state social services programs due to present conditions. Furthermore, the exclusion of minor spending categories such as unemployment insurance may take on greater importance in these scenarios given the record levels of unemployment insurance claims in recent weeks.

### Overall shortfalls

In previous downturns, based solely or even predominantly on economic considerations, this is where the analysis could end. States would measure their level of preparedness against the magnitude of fiscal stress that might come as a result of a shrinking economy and then plan accordingly. However, in the age of COVID-19, matters are a bit more complicated. In addition to the indirect economic implications for state budgets, policymakers must also contend with the direct costs associated with fighting the virus itself. Given the unprecedented nature of the crisis, coming up with exact estimates of what will need to be spent on everything from masks to ventilators to emergency personnel is virtually impossible at this stage of the game. For the purposes of this analysis, based on estimates that have been thrown out from various quarters, we will assume that those direct costs tally about \$150 billion through fiscal 2021 for states, slightly more than was recently appropriated as part of the CARES Act.

## Chart 7: Projected Shortfall Through FY21

State governments, \$ bil



- 1) Impacts through FY21. Impacts through FY22 could be at least another \$100 bil.
- 2) Assumes states will initially only draw on approximately half of their reserves.

Sources: NASBO, Moody's Analytics

This brings the total need for state governments under the most severe assumptions to at least \$353 billion through the end of fiscal 2021. Under current law and assuming that states actually draw down about 50% of their reserves, states are estimated to have resources of roughly \$181 billion to meet those needs. This leaves a shortfall over the next 15 months of approximately \$172 billion, or roughly a fifth of all state general fund spending (see Chart 7).

If we were to expand out to fiscal 2022, our estimate of total needs would increase to more than \$450 billion versus realistic resources of only \$181 billion, which leaves a 27-month forecast shortfall of close to \$300 billion.

### Takeaways

The economic fallout from the COVID-19 pandemic is set to impose incredible stress on state government budgets. This stress will be enough to outmatch even some of the most

well-prepared states, and the potential fiscal actions that policymakers may be forced to take in response will have significant consequences for the U.S. economy.

The total shortfall has the potential to be nearly \$200 billion—almost a full percentage point of GDP—through the end of state fiscal year 2021. However, the indirect and induced impacts will be much larger, especially in those states most affected. Without additional federal assistance, several states are projected to see potential general fund budget shortfalls of 30% to 40%, which will have to involve a reduction in basic government services. Additional knock-on effects are also likely to follow as a result of state spending cuts. One of the most troubling is the subsequent impact to local governments, most of which rely on state aid for an average of about one-third of their overall budgets. If and when state fiscal stress is pushed down to the local level, it is much more likely that we will experience an uptick in defaults or bankruptcies, each with their own negative economic impacts.

The only path toward limiting this potential damage to the economy is the inclusion of more aid to state and local governments as part of additional stimulus measures being

considered by the federal government. The aid provided to date will be extremely helpful toward addressing immediate healthcare and other emergency needs, but will do little to address the economic fallout set to hit state revenues and mandatory spending programs. This additional aid would need to be on par with, if not exceed, the amount of aid provided during and after the Great Recession.

Using realistic reserve assumptions, it will require at least \$200 billion in additional aid to state governments to get through the next state fiscal year without the weight of state budget cuts or revenue increases slowing economic growth. To get through fiscal 2022, that level of support to states grows to roughly \$300 billion.

Several existing channels of funding already exist to help facilitate the efficient transfer of funds across governments, such as through Medicaid and other social-benefit programs. This type of aid, particularly enhanced FMAP, would be an extremely efficient and timely way to get additional funds to state governments quickly as state policymakers begin to grapple with the budget impacts of COVID-19.

However, given the unprecedented amount of aid needed, not including the additional amount of aid that will need to go to local governments, traditional funding mechanisms are likely to prove insufficient to handle the amount of money necessary to avoid major shortfalls. Such an unprecedented level of aid will require an unprecedented method of execution. The sooner policymakers can enact such legislation the more time agencies will have to execute.

# Appendix A

**Table 1: Stress-Test Results - Baseline Scenario**

	Tax revenue shortfall		Medicaid spending increase		Combined fiscal shock	
	%	\$ mil	%	\$ mil	%	\$ mil
Sum of states	-14.8%	\$(130,445.17)	3.1%	\$27,391.74	-17.9%	\$(157,836.91)
Alabama	-8.3%	\$(769.80)	3.5%	\$327.36	-11.8%	\$(1,097.16)
Alaska	-65.9%	\$(1,768.73)	0.9%	\$23.12	-66.8%	\$(1,791.84)
Arizona	-13.5%	\$(1,501.05)	3.1%	\$343.71	-16.6%	\$(1,844.76)
Arkansas	-11.3%	\$(667.35)	1.9%	\$112.86	-13.2%	\$(780.21)
California	-14.9%	\$(20,513.23)	3.5%	\$4,779.60	-18.3%	\$(25,292.83)
Colorado	-11.5%	\$(1,444.35)	4.0%	\$504.75	-15.5%	\$(1,949.10)
Connecticut	-12.0%	\$(2,353.70)	1.5%	\$294.26	-13.5%	\$(2,647.96)
Delaware	-10.6%	\$(488.68)	1.5%	\$70.56	-12.2%	\$(559.24)
Florida	-18.8%	\$(6,391.69)	5.1%	\$1,744.26	-23.9%	\$(8,135.94)
Georgia	-10.0%	\$(2,553.36)	1.8%	\$454.23	-11.8%	\$(3,007.58)
Hawaii	-12.2%	\$(964.74)	1.2%	\$93.50	-13.4%	\$(1,058.24)
Idaho	-20.3%	\$(756.59)	3.3%	\$123.33	-23.6%	\$(879.92)
Illinois	-13.1%	\$(5,153.02)	2.7%	\$1,059.58	-15.9%	\$(6,212.59)
Indiana	-16.0%	\$(2,665.75)	3.1%	\$516.21	-19.1%	\$(3,181.96)
Iowa	-11.4%	\$(894.74)	2.6%	\$204.94	-14.0%	\$(1,099.68)
Kansas	-17.3%	\$(1,277.17)	1.8%	\$129.11	-19.1%	\$(1,406.28)
Kentucky	-15.6%	\$(1,789.98)	2.0%	\$233.79	-17.6%	\$(2,023.77)
Louisiana	-36.4%	\$(3,474.04)	2.1%	\$195.96	-38.4%	\$(3,670.00)
Maine	-19.7%	\$(756.00)	2.8%	\$108.92	-22.6%	\$(864.92)
Maryland	-7.6%	\$(1,391.09)	2.1%	\$385.44	-9.8%	\$(1,776.53)
Massachusetts	-7.7%	\$(2,673.66)	2.6%	\$895.05	-10.2%	\$(3,568.71)
Michigan	-18.6%	\$(1,929.25)	8.4%	\$872.36	-27.0%	\$(2,801.62)
Minnesota	-9.6%	\$(2,196.89)	2.5%	\$582.37	-12.1%	\$(2,779.26)
Mississippi	-14.5%	\$(840.04)	1.5%	\$88.33	-16.1%	\$(928.38)
Missouri	-22.5%	\$(2,156.37)	5.6%	\$534.49	-28.1%	\$(2,690.86)
Montana	-15.4%	\$(396.86)	1.2%	\$31.41	-16.6%	\$(428.28)
Nebraska	-12.6%	\$(618.65)	1.6%	\$79.27	-14.3%	\$(697.92)
Nevada	-13.4%	\$(572.71)	3.3%	\$140.31	-16.6%	\$(713.02)
New Hampshire	-9.5%	\$(153.90)	5.8%	\$94.00	-15.3%	\$(247.89)
New Jersey	-25.4%	\$(9,631.65)	1.8%	\$701.76	-27.2%	\$(10,333.41)
New Mexico	-11.2%	\$(879.89)	1.0%	\$77.30	-12.2%	\$(957.19)
New York	-25.5%	\$(17,964.68)	3.2%	\$2,263.71	-28.7%	\$(20,228.39)
North Carolina	-10.1%	\$(2,513.90)	2.9%	\$711.36	-13.0%	\$(3,225.26)
North Dakota	-35.9%	\$(688.47)	1.9%	\$37.07	-37.9%	\$(725.53)
Ohio	-8.7%	\$(2,938.86)	6.5%	\$2,200.20	-15.2%	\$(5,139.05)
Oklahoma	-22.2%	\$(1,706.42)	3.2%	\$247.05	-25.4%	\$(1,953.47)
Oregon	-8.1%	\$(929.79)	2.9%	\$333.91	-11.0%	\$(1,263.69)
Pennsylvania	-5.6%	\$(1,959.13)	4.0%	\$1,383.21	-9.6%	\$(3,342.35)
Rhode Island	-12.5%	\$(504.63)	3.1%	\$124.94	-15.7%	\$(629.57)
South Carolina	-16.0%	\$(1,407.94)	3.4%	\$296.72	-19.4%	\$(1,704.66)
South Dakota	-10.2%	\$(167.72)	1.4%	\$22.96	-11.6%	\$(190.68)
Tennessee	-10.8%	\$(1,624.35)	3.9%	\$588.37	-14.8%	\$(2,212.72)
Texas	-14.7%	\$(8,481.95)	2.2%	\$1,301.27	-16.9%	\$(9,783.21)
Utah	-10.3%	\$(777.37)	1.7%	\$129.03	-12.0%	\$(906.40)
Vermont	-14.1%	\$(239.40)	3.7%	\$62.48	-17.8%	\$(301.88)
Virginia	-13.0%	\$(2,780.91)	3.0%	\$637.75	-15.9%	\$(3,418.65)
Washington	-13.6%	\$(3,009.94)	2.2%	\$497.36	-15.8%	\$(3,507.30)
West Virginia	-28.2%	\$(1,343.26)	2.0%	\$93.48	-30.2%	\$(1,436.74)
Wisconsin	-9.9%	\$(1,716.99)	3.6%	\$627.56	-13.5%	\$(2,344.55)
Wyoming	-28.5%	\$(343.65)	2.6%	\$31.17	-31.1%	\$(374.82)

Source: Moody's Analytics

**Table 2: Stress-Test Results - Severe S3 Scenario**

	Tax revenue shortfall		Medicaid spending increase		Combined fiscal shock	
	%	\$ mil	%	\$ mil	%	\$ mil
Sum of states	-19.5%	\$(172,106.53)	3.5%	\$31,155.04	-23.1%	\$(203,261.57)
Alabama	-11.1%	\$(1,030.17)	4.0%	\$368.30	-15.0%	\$(1,398.46)
Alaska	-79.6%	\$(2,135.58)	1.0%	\$26.75	-80.6%	\$(2,162.33)
Arizona	-16.2%	\$(1,805.64)	3.5%	\$393.38	-19.8%	\$(2,199.02)
Arkansas	-11.9%	\$(705.29)	2.3%	\$134.49	-14.2%	\$(839.78)
California	-18.9%	\$(26,124.14)	3.9%	\$5,415.01	-22.8%	\$(31,539.15)
Colorado	-15.0%	\$(1,885.74)	4.6%	\$577.08	-19.6%	\$(2,462.82)
Connecticut	-15.7%	\$(3,075.51)	1.7%	\$336.25	-17.4%	\$(3,411.76)
Delaware	-14.6%	\$(669.95)	1.8%	\$80.96	-16.4%	\$(750.92)
Florida	-23.9%	\$(8,138.13)	5.7%	\$1,949.38	-29.6%	\$(10,087.51)
Georgia	-13.0%	\$(3,320.28)	2.0%	\$513.02	-15.0%	\$(3,833.30)
Hawaii	-14.6%	\$(1,159.18)	1.3%	\$102.74	-15.9%	\$(1,261.92)
Idaho	-24.4%	\$(909.93)	3.8%	\$141.22	-28.1%	\$(1,051.15)
Illinois	-17.7%	\$(6,920.02)	3.1%	\$1,205.61	-20.7%	\$(8,125.63)
Indiana	-22.8%	\$(3,798.33)	3.5%	\$588.46	-26.3%	\$(4,386.79)
Iowa	-14.5%	\$(1,139.82)	3.0%	\$236.40	-17.5%	\$(1,376.21)
Kansas	-23.8%	\$(1,753.77)	2.1%	\$153.28	-25.9%	\$(1,907.05)
Kentucky	-21.5%	\$(2,475.37)	2.3%	\$268.73	-23.8%	\$(2,744.10)
Louisiana	-45.7%	\$(4,366.56)	2.4%	\$225.09	-48.1%	\$(4,591.65)
Maine	-25.7%	\$(985.55)	3.3%	\$125.59	-29.0%	\$(1,111.14)
Maryland	-10.1%	\$(1,846.71)	2.5%	\$449.32	-12.6%	\$(2,296.03)
Massachusetts	-10.5%	\$(3,668.84)	2.9%	\$1,014.61	-13.4%	\$(4,683.46)
Michigan	-24.2%	\$(2,512.78)	9.5%	\$983.21	-33.7%	\$(3,495.98)
Minnesota	-12.8%	\$(2,927.89)	2.9%	\$666.41	-15.7%	\$(3,594.30)
Mississippi	-17.4%	\$(1,007.29)	1.8%	\$104.99	-19.2%	\$(1,112.28)
Missouri	-30.3%	\$(2,900.40)	6.4%	\$613.98	-36.7%	\$(3,514.38)
Montana	-18.7%	\$(480.65)	1.4%	\$36.32	-20.1%	\$(516.96)
Nebraska	-16.3%	\$(800.00)	1.9%	\$92.52	-18.2%	\$(892.52)
Nevada	-16.9%	\$(723.61)	3.6%	\$155.14	-20.5%	\$(878.75)
New Hampshire	-12.5%	\$(201.90)	6.7%	\$108.37	-19.1%	\$(310.27)
New Jersey	-34.7%	\$(13,193.19)	2.1%	\$796.36	-36.8%	\$(13,989.54)
New Mexico	-15.0%	\$(1,170.04)	1.2%	\$91.73	-16.1%	\$(1,261.77)
New York	-33.8%	\$(23,823.23)	3.6%	\$2,542.57	-37.4%	\$(26,365.79)
North Carolina	-13.3%	\$(3,296.52)	3.2%	\$805.10	-16.5%	\$(4,101.63)
North Dakota	-44.3%	\$(849.27)	2.2%	\$42.70	-46.6%	\$(891.97)
Ohio	-12.7%	\$(4,304.98)	7.5%	\$2,535.47	-20.3%	\$(6,840.45)
Oklahoma	-27.7%	\$(2,133.99)	3.7%	\$284.76	-31.4%	\$(2,418.75)
Oregon	-12.4%	\$(1,431.73)	3.3%	\$379.75	-15.7%	\$(1,811.48)
Pennsylvania	-8.2%	\$(2,844.43)	4.6%	\$1,588.36	-12.7%	\$(4,432.79)
Rhode Island	-14.7%	\$(592.30)	3.5%	\$142.25	-18.3%	\$(734.55)
South Carolina	-19.5%	\$(1,713.93)	3.8%	\$333.31	-23.3%	\$(2,047.23)
South Dakota	-12.2%	\$(199.72)	1.6%	\$27.07	-13.8%	\$(226.79)
Tennessee	-14.6%	\$(2,188.31)	4.4%	\$666.05	-19.0%	\$(2,854.36)
Texas	-20.7%	\$(11,987.85)	2.6%	\$1,485.34	-23.3%	\$(13,473.19)
Utah	-13.2%	\$(996.76)	2.0%	\$147.42	-15.2%	\$(1,144.17)
Vermont	-16.2%	\$(273.44)	4.3%	\$71.93	-20.4%	\$(345.37)
Virginia	-15.3%	\$(3,275.96)	3.4%	\$726.78	-18.7%	\$(4,002.74)
Washington	-17.2%	\$(3,811.83)	2.5%	\$560.85	-19.7%	\$(4,372.67)
West Virginia	-39.4%	\$(1,876.18)	2.3%	\$108.42	-41.7%	\$(1,984.60)
Wisconsin	-12.9%	\$(2,229.23)	4.1%	\$716.58	-17.0%	\$(2,945.81)
Wyoming	-36.9%	\$(444.65)	3.0%	\$35.63	-39.9%	\$(480.28)

Source: Moody's Analytics



**Table 3: State Preparedness - Baseline Scenario**

% of fiscal 2019 revenues

	Rainy-day balances*	Total balances*	Fiscal shock moderate recession	Rainy-day surplus/shortfall**	Total balances surplus/shortfall**
Wyoming	138.3%	138.3%	-31.1%	107.2%	107.2%
Alaska	85.3%	67.7%	-66.8%	18.5%	0.9%
New Mexico	23.9%	45.7%	-12.2%	11.6%	33.5%
Texas	17.4%	25.6%	-16.9%	0.5%	8.7%
Oregon	11.2%	33.2%	-11.0%	0.2%	22.2%
Connecticut	12.8%	14.6%	-13.5%	-0.7%	1.2%
Georgia	10.9%	22.6%	-11.8%	-0.8%	10.8%
South Dakota	10.4%	11.5%	-11.6%	-1.3%	-0.1%
Minnesota	10.8%	24.2%	-12.1%	-1.3%	12.1%
Massachusetts	8.1%	19.1%	-10.2%	-2.1%	8.9%
Alabama	9.1%	17.7%	-11.8%	-2.7%	5.9%
Utah	9.2%	13.1%	-12.0%	-2.8%	1.1%
California	15.0%	19.9%	-18.3%	-3.4%	1.5%
North Dakota	34.4%	37.8%	-37.9%	-3.5%	-0.1%
Iowa	9.7%	13.4%	-14.0%	-4.3%	-0.6%
Vermont	13.2%	13.2%	-17.8%	-4.6%	-4.6%
Maryland	4.8%	10.2%	-9.8%	-4.9%	0.4%
Colorado	9.1%	18.1%	-15.5%	-6.4%	2.6%
Delaware	5.2%	25.8%	-12.2%	-7.0%	13.7%
Ohio	8.0%	12.5%	-15.2%	-7.2%	-2.7%
Nebraska	6.8%	21.9%	-14.3%	-7.4%	7.6%
North Carolina	5.1%	11.9%	-13.0%	-7.9%	-1.1%
New Hampshire	7.1%	18.9%	-15.3%	-8.2%	3.6%
Washington	7.5%	11.1%	-15.8%	-8.3%	-4.7%
Hawaii	4.8%	14.3%	-13.4%	-8.6%	0.9%
Nevada	7.7%	15.6%	-16.6%	-8.9%	-1.0%
Tennessee	5.8%	11.6%	-14.8%	-8.9%	-3.1%
Pennsylvania	0.1%	0.1%	-9.6%	-9.5%	-9.5%
Sum of states	8.2%	14.8%	-17.9%	-9.7%	-3.2%
Wisconsin	3.7%	10.0%	-13.5%	-9.8%	-3.5%
Mississippi	6.0%	6.1%	-16.1%	-10.0%	-10.0%
Arizona	6.4%	15.4%	-16.6%	-10.2%	-1.2%
Indiana	8.6%	13.6%	-19.1%	-10.5%	-5.5%
Arkansas	2.6%	7.6%	-13.2%	-10.6%	-5.6%
Virginia	3.7%	4.8%	-15.9%	-12.2%	-11.2%
South Carolina	6.0%	25.4%	-19.4%	-13.3%	6.1%
Idaho	10.0%	12.7%	-23.6%	-13.6%	-10.8%
Montana	2.4%	16.3%	-16.6%	-14.3%	-0.4%
West Virginia	15.8%	26.7%	-30.2%	-14.4%	-3.5%
Maine	8.1%	11.7%	-22.6%	-14.5%	-10.9%
Oklahoma	10.5%	14.5%	-25.4%	-14.9%	-10.9%
Rhode Island	0.6%	1.3%	-15.7%	-15.1%	-14.3%
Illinois	0.0%	1.2%	-15.9%	-15.8%	-14.7%
Michigan	11.1%	17.3%	-27.0%	-15.9%	-9.7%
Kentucky	1.1%	2.3%	-17.6%	-16.5%	-15.3%
Kansas	0.0%	15.0%	-19.1%	-19.1%	-4.1%
Florida	4.4%	10.8%	-23.9%	-19.5%	-13.1%
Missouri	6.8%	13.6%	-28.1%	-21.3%	-14.5%
New York	2.9%	13.1%	-28.7%	-25.8%	-15.6%
New Jersey	1.1%	5.4%	-27.2%	-26.2%	-21.8%
Louisiana	4.2%	4.2%	-38.4%	-34.2%	-34.2%

\* Rainy-day and total balances are estimated as of the end of fiscal 2019 by NASBO. All numbers are shown as a % of fiscal 2019 general fund revenues also estimated by NASBO.

\*\* The estimated shortfalls refer to the amount of fiscal shock that would not be covered by reserves under a severe recession scenario. A negative percentage means a state would not be able to make up for the entire fiscal shock associated with a severe recession.

Sources: NASBO, Moody's Analytics

**Table 4: State Preparedness - Severe S3 Scenario**

% of fiscal 2019 revenues

	Rainy-day balances*	Total balances*	Fiscal shock severe recession	Rainy-day surplus/ shortfall**	Total balances surplus/ shortfall**
Wyoming	138.3%	138.3%	-39.9%	98.5%	98.5%
New Mexico	23.9%	45.7%	-16.1%	7.7%	29.6%
Alaska	85.3%	67.7%	-80.6%	4.7%	-12.9%
South Dakota	10.4%	11.5%	-13.8%	-3.5%	-2.3%
Georgia	10.9%	22.6%	-15.0%	-4.0%	7.6%
Oregon	11.2%	33.2%	-15.7%	-4.5%	17.4%
Connecticut	12.8%	14.6%	-17.4%	-4.6%	-2.7%
Minnesota	10.8%	24.2%	-15.7%	-4.9%	8.5%
Massachusetts	8.1%	19.1%	-13.4%	-5.3%	5.7%
Texas	17.4%	25.6%	-23.3%	-5.8%	2.3%
Alabama	9.1%	17.7%	-15.0%	-5.9%	2.7%
Utah	9.2%	13.1%	-15.2%	-5.9%	-2.1%
Vermont	13.2%	13.2%	-20.4%	-7.2%	-7.2%
Maryland	4.8%	10.2%	-12.6%	-7.8%	-2.4%
Iowa	9.7%	13.4%	-17.5%	-7.8%	-4.1%
California	15.0%	19.9%	-22.8%	-7.9%	-3.0%
Colorado	9.1%	18.1%	-19.6%	-10.5%	-1.5%
Delaware	5.2%	25.8%	-16.4%	-11.1%	9.5%
Hawaii	4.8%	14.3%	-15.9%	-11.2%	-1.7%
Nebraska	6.8%	21.9%	-18.2%	-11.4%	3.6%
North Carolina	5.1%	11.9%	-16.5%	-11.5%	-4.6%
Arkansas	2.6%	7.6%	-14.2%	-11.6%	-6.6%
New Hampshire	7.1%	18.9%	-19.1%	-12.0%	-0.2%
North Dakota	34.4%	37.8%	-46.6%	-12.2%	-8.8%
Washington	7.5%	11.1%	-19.7%	-12.2%	-8.6%
Ohio	8.0%	12.5%	-20.3%	-12.3%	-7.7%
Pennsylvania	0.1%	0.1%	-12.7%	-12.7%	-12.7%
Nevada	7.7%	15.6%	-20.5%	-12.8%	-4.9%
Tennessee	5.8%	11.6%	-19.0%	-13.2%	-7.4%
Mississippi	6.0%	6.1%	-19.2%	-13.2%	-13.1%
Wisconsin	3.7%	10.0%	-17.0%	-13.2%	-7.0%
Arizona	6.4%	15.4%	-19.8%	-13.4%	-4.4%
Sum of states	8.2%	14.8%	-23.1%	-14.9%	-8.3%
Virginia	3.7%	4.8%	-18.7%	-15.0%	-13.9%
South Carolina	6.0%	25.4%	-23.3%	-17.2%	2.2%
Rhode Island	0.6%	1.3%	-18.3%	-17.7%	-16.9%
Indiana	8.6%	13.6%	-26.3%	-17.7%	-12.7%
Montana	2.4%	16.3%	-20.1%	-17.7%	-3.8%
Idaho	10.0%	12.7%	-28.1%	-18.2%	-15.4%
Illinois	0.0%	1.2%	-20.7%	-20.7%	-19.5%
Maine	8.1%	11.7%	-29.0%	-20.9%	-17.3%
Oklahoma	10.5%	14.5%	-31.4%	-21.0%	-16.9%
Michigan	11.1%	17.3%	-33.7%	-22.6%	-16.4%
Kentucky	1.1%	2.3%	-23.8%	-22.7%	-21.6%
Florida	4.4%	10.8%	-29.6%	-25.3%	-18.8%
Kansas	0.0%	15.0%	-25.9%	-25.9%	-10.9%
West Virginia	15.8%	26.7%	-41.7%	-25.9%	-15.0%
Missouri	6.8%	13.6%	-36.7%	-29.9%	-23.1%
New York	2.9%	13.1%	-37.4%	-34.5%	-24.3%
New Jersey	1.1%	5.4%	-36.8%	-35.8%	-31.5%
Louisiana	4.2%	4.2%	-48.1%	-43.8%	-43.8%

\* Rainy-day and total balances are estimated as of the end of fiscal 2019 by NASBO. All numbers are shown as a % of fiscal 2019 general fund revenues also estimated by NASBO.

\*\* The estimated shortfalls refer to the amount of fiscal shock that would not be covered by reserves under a severe recession scenario. A negative percentage means a state would not be able to make up for the entire fiscal shock associated with a severe recession.

Sources: NASBO, Moody's Analytics

# Appendix B – How We Stress-Test State Budgets

## Simplifying assumptions

To perform the stress tests, several simplifying assumptions were made. First, state balanced-budget requirements were assumed to hold true. State and local governments, in general, are not permitted to issue long-term debt for operations. There are some practical ways around this, particularly with regard to public pensions and other post-employment benefits, but for the purposes of this exercise, we assume that state spending habits are constrained by the amount of revenue collected.

Second, the levers used to stress state budgets are limited to changes in general fund revenues and Medicaid spending. As revenues decline during a recession, subnational governments have less to spend, even as there is more demand for government services. To avoid having to drastically cut spending or raise taxes, governments would need to hold in reserve at least enough funds to make up for declines in revenue and meet higher demands for services. These services obviously extend beyond Medicaid. Funding demands for other general fund programs would also increase, along with programs that typically fall outside the state general fund such as unemployment insurance. However, these programs pale in comparison with the scope of Medicaid in terms of their state general fund impact. Therefore, the recessionary effects estimated on the spending side of the ledger in this exercise should be considered a lower bound. More precise spending effects could be estimated by individual states, both for social-services programs and discretionary needs such as education, by injecting more detailed spending data into the process.

Third, because the current Moody's Analytics baseline already includes a

near-term economic contraction from the effects of COVID-19, it proved inadequate for true stress-testing purposes. As a result, the forecasts in this paper will be compared with a more optimistic pre-COVID-19 scenario from the beginning of March. This scenario is akin to what most states would have relied on as a baseline prior to the more serious travel and business disruptions put into place over the past few weeks.

As in our previous stress-testing exercises, alternative scenarios for revenues will be judged compared with the underlying rate of inflation. Though state policymakers may have originally included more revenue growth in their fiscal 2020 and fiscal 2021 budgets, it is more realistic to compare changes in revenue with the previous year's figures plus inflation as opposed to a potentially optimistic or inconsistent baseline revenue forecast. This gives us a true measure of how much funding would be necessary to strictly maintain current levels of real spending and avoid disruptive fiscal corrections during and after a recession.

## Modeling methods

General fund revenues were forecast using Moody's Analytics proprietary state revenue models. These models rely on ordinary least squares regression techniques to tie underlying forecasts for major economic variables to future changes in state revenues. The regressions are based on historical general fund revenue data reported by the National Association of State Budget Officers in its semiannual *Fiscal Survey of the States* publications and attempt to control for past legislative tax changes, which can distort historical revenue data during economic downturns. These forecasts are prepared using an individual regression equation for each state,

allowing the use of specific economic drivers custom-tailored to each state's specific tax and industrial structure.

Spending needs were forecast using Moody's Analytics proprietary Medicaid models. This is accomplished through OLS regression techniques tying forecasts for measures of underlying economic growth, specifically the number of unemployed people in the economy, to future levels of Medicaid enrollment. Enrollment forecasts are married to costs per enrollee to develop a full estimate of future state Medicaid spending needs. Costs-per-enrollee forecasts are taken from the CMS Annual Actuarial Report on the Future of Medicaid, and individual state costs are assumed to maintain their current relationship to the national average throughout the forecast.

The Medicaid projections assume a current law baseline, meaning that no new states are assumed to expand their Medicaid programs during the forecast period. Similarly, the forecasts included in this analysis do not explicitly account for the enhanced FMAP provisions recently enacted as part of federal stimulus legislation.

## More information

More information regarding the theory and practice of stress-testing public sector entities can be found in the following two papers:

- White, "Stress-Testing State and Local Reserves," Moody's Analytics Regional Financial Review (July 2014).
- Crane and Seitz, "Stress-Testing States 2019," Moody's Analytics Regional Financial Review (October 2019).

## About the Authors

**Dan White** is the director of government consulting and public finance research at Moody's Analytics. In this role he oversees economic research with an emphasis on fiscal policy and municipal market impacts. He regularly presents to clients and conferences, and has been featured in a number of print, radio and televised media outlets, ranging from Bloomberg Television to the Wall Street Journal. Dan also works closely with a number of governments and policymakers in an advisory role, and teaches as an adjunct professor of economics at Villanova University.

Before joining Moody's Analytics, Dan worked as a financial economist for the State of New Mexico, where he forecast revenues and analyzed a wide range of policy issues concentrated around economic development, public investment and debt management. Dan holds an MA in economics as well as undergraduate degrees in finance and international business from New Mexico State University.

**Sarah Crane** is an economist at Moody's Analytics, where she conducts government consulting and regional economic research with an emphasis on fiscal policy and economic development. In this role she produces revenue forecasts for a variety of state and local governments, and she regularly presents to clients and conferences. She also oversees several regional economic modeling projects and works closely with a number of governments and other organizations in an advisory role.

Before joining Moody's Analytics, Sarah worked as an economic researcher for the American Road and Transportation Builders Association in Washington DC, where she evaluated issues related to transportation infrastructure and the transportation construction industry. She earned an MA in economics from American University and holds an undergraduate degree in communications from Boston University.

**Colin Seitz** is an associate economist at Moody's Analytics. He covers the economies of Maryland and several U.S. metropolitan areas, as well as Belgium and Luxembourg. He is also involved in various labor economic consulting projects and works closely with a number of governments and economic development boards in an advisory role.

Colin's most recent research focused on developing a quality of life indicator for metropolitan areas. Using data from a variety of sources focused on the economy and well-being, he created estimates of quality of life across nearly all the metropolitan areas in the U.S. Colin has also done research on trade in Latin America and economic impact assessments of natural disasters. He has a bachelor's degree in economics from Haverford College.

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