Rainy Day Funds and State Credit Ratings

Technical Appendix

Previous scholarship on this topic has centered on examining how various rainy day fund (RDF) designs affect credit ratings. These studies have not featured any analysis of reserve balances or focused on the specific effects that deposits and withdrawals from reserves have on ratings. In light of these limitations, Pew researchers set out to test the following hypotheses:

- Rainy day fund balances are a reflection of a state's fiscal flexibility during recessions. As such, they have a significant impact on a state's credit rating.
- The relationship between RDF balances and creditworthiness should be positive. Higher RDF balances indicate a greater availability of resources to supplement revenue during cyclical downturns, which each of the major rating agencies has identified as a credit positive.
- How states use their reserve funds should also be a significant predictor for determining whether state ratings will be upgraded or downgraded.
- The rating agencies consider RDFs as tools for states to help smooth the economic or revenue cycle. As a result, the agencies expect that rainy day funds should be used in a countercyclical fashion: deposits when revenue is above normal and withdrawals when it is below. This means that countercyclical use should have a positive relationship with credit ratings, while procyclical use will have a negative one.

Data

To evaluate these hypotheses, researchers constructed a unique dataset that recorded state credit ratings across all three major rating agencies (Moody's Investors Service, S&P Global Inc. and Fitch Ratings); broader measures of state economic performance, provided by the Bureau of Economic Analysis and the Philadelphia Federal Reserve Bank; state general fund revenue and expenditure data, drawn from the National Association of State Budget Officers' Fiscal Survey of the States; and accounting of rainy day fund deposits and withdrawals, as reported by state officials. These data were combined to produce a dataset recording credit ratings and rainy day fund use across 46 states from fiscal year 1994 through 2014.

Note that some tables and figures in the report provide data through 2016 and 2017. However, all statistical models were limited through fiscal 2014, as RDF use data for later years were not available.

State credit ratings

Data recording each state's respective credit ratings were collected from the major rating agencies through their websites and published credit history reports. State general obligation (GO) bonds represent the highest level of appropriations-backed debt that a state can issue, suggesting that these evaluations would provide the clearest representation for a state's general creditworthiness. As such, state GO ratings were designated to serve as

the primary issuance of interest. For states that do not issue GO debt, researchers examined the "senior-most tax-backed" issuance or Issuer Credit Rating offered by the agencies. Each state's ratings were examined using their respective fiscal calendars, with a "final rating" identified as the last rating a state held in a given fiscal year. These final ratings were used to comprise the annual data recording credit ratings.

It is well established that credit ratings do not shift at the annual level, instead moving at a lower level of temporal aggregation. As a result, one could argue that the decision to aggregate ratings to the annual level obscures some of the movement in ratings, as it is possible for states to experience a downgrade and then an upgrade to their prior position within a single fiscal year—a pair of rating actions that would not appear in the annually aggregated ratings. However, the decision to aggregate the ratings to the annual level is justifiable. First, the majority of states' credit ratings are stable over time. As denoted in Table 2 below, states averaged roughly three rating shifts from 1994 through 2014 (S&P, 2.5; Moody's, 3.1; Fitch, 3.2). Moreover, it is uncommon for a state's full credit rating, unlike its outlook, to be upgraded and downgraded in a single year. In most cases when multiple actions take place in a single fiscal year, they are in the same direction—two upgrades or two downgrades—as a state's fiscal condition improves or declines. Further, most states have relatively few rating changes (Table 2), with even fewer states experiencing multiple rating actions within a single fiscal year. Second, as a practical matter, this level of aggregation is necessary as state fiscal, economic, and RDF data are recorded annually.

Note that Table 1 below offers states' ratings through 2014 but that Table 2 presented in the report displays ratings through January 2017. This discrepancy is because statistical analyses were limited to fiscal 2014 due to limited availability of RDF deposit and withdrawal data. Colorado, Illinois, Kansas, and Montana are excluded from all analyses for not having a rainy day fund as of 2014, according to Pew's criteria.

Table 1

State General Obligation Credit Ratings, 2014

State	Moody's	S&P Global	Fitch
Alabama	Aa1	AA	AA+
Alaska	Aaa	AAA	AAA
Arizona	Aa3	AA–†	Not rated
Arkansas	Aa1	AA	Not rated
California	Aa3	A	A
Colorado	Aa3	AA	AA
Connecticut	Aaa	AAA	AAA
Delaware	Aa1	AAA	AAA

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State	Moody's	S&P Global	Fitch
Florida	Aaa	AAA	AAA
Georgia	Aa2	AA	AA
Hawaii	Aa1	AA+†	AA+
Idaho	Aaa	AAA†	AAA
Illinois	Aaa	AAA†	AAA
Indiana	Aa2	AA–†	A+
Iowa	Aa2	AA	AA
Kansas	Aa2	AA	AA
Kentucky	Aaa	AAA	AAA
Louisiana	Aa1	AA+	AA+
Maine	Aa2	AA–	AA
Maryland	Aa1	AA+	AA+
Massachusetts	Aa2	AA	AA+
Michigan	Aaa	AAA	AAA
Minnesota	Aa2*	AA†	Not rated
Mississippi	Aa2	AA	AA+
Missouri	Aa1	AA	AA+
Montana	A1	A+	A+
Nebraska	Aaa	AA+	Not Rated
Nevada	Aa2	AA	AA+
New Hampshire	Aa1	AA	AA+
New Jersey	A1	A+	A+

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State	Moody's	S&P Global	Fitch
New Mexico	Aaa	AA+	Not rated
New York	Aa2	AA	AA
North Carolina	Aaa	AAA	AAA
North Dakota	Aa1	AAA†	Not rated
Ohio	Aa1	AA+	AA+
Oklahoma	Aa2	AA+	AA+
Oregon	Aa1	AA+	AA+
Pennsylvania	Aa2	AA	AA
Rhode Island	Aa2	AA	AA
South Carolina	Aaa	AA+	AA+
South Dakota	Aa2*	AA+†	AA+
Tennessee	Aaa	AA+	AAA
Texas	Aaa	AAA	AAA
Utah	Aaa	AAA	AAA
Vermont	Aaa	AA+	AAA
Virginia	Aaa	AAA	AAA
Washington	Aa1	AA+	AA+
West Virginia	Aa1	AA	AA+
Wisconsin	Aa2	AA	AA
Wyoming	Not rated	AAA†	Not rated

Note: All ratings are through fiscal year 2014.

* Indicates that the state does not issue general obligation debt and that the rating reflects the "senior-most tax-backed rating."

† Indicates the use of an Issuer Credit Rating in place of an evaluation of general obligation debt.

Source: Moody's, S&P Global, Fitch ratings

To operationalize these ratings, they were converted into an ordinal scale with zero representing the lowest rating observed and a maximum value of eight representing an Aaa or AAA rating. As each of the rating agencies employs a similar rating scale, this scaling is effective and can be applied with little adjustment. It should be noted that these scales are not meant to allow for comparability across rating agencies; rather, they allow for a numerical representation of the ratings and the rating shifts.

Each shift in the rating, up or down, is reflected by a single point increase or decrease. For example, Hawaii was downgraded by both Moody's (from Aa1 to Aa2) and Fitch (AA+ to AA) in fiscal 2011 as a result of fiscal issues that produced negative balances according to generally accepted accounting principles. This downgrade is reflected as Moody's shifting from a 7 to a 6 and Fitch moving from a 6 to a 5.

Table 2

Movement in States' Credit Ratings, 1994-2014

State	Moody's		S&P Global		Fitch	
	Upgrades	Downgrades	Upgrades	Downgrades	Upgrades	Downgrades
Alabama	0	0	2	1	1	0
Alaska	3	0	2	0	2	0
Arizona	2	1	2	1	0	0
Arkansas	0	0	2	1	0	0
California	5	6	4	5	6	4
Colorado	---	---	---	---	---	---
Connecticut	1	0	2	3	0	1
Delaware	1	0	2	0	1	0
Florida	2	0	1	0	2	0
Georgia	1	0	0	0	0	0
Hawaii	2	1	3	3	3	1
Idaho	2	0	3	0	4	0

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State	Moody's		S&P Global		Fitch	
	Upgrades	Downgrades	Upgrades	Downgrades	Upgrades	Downgrades
Illinois	---	---	---	---	---	---
Indiana	3	1	2	0	4	0
Iowa	2	0	2	0	3	0
Kansas	---	---	---	---	---	---
Kentucky	1	1	2	1	1	1
Louisiana	6	2	5	1	4	1
Maine	1	2	2	2	3	2
Maryland	0	0	0	0	0	0
Massachusetts	3	0	3	1	3	0
Michigan	2	3	4	3	4	3
Minnesota	1	1	1	1	0	1
Mississippi	1	0	1	1	2	0
Missouri	0	0	0	0	0	0
Montana	---	---	---	---	---	---
Nebraska	2	0	0	0	0	0
Nevada	1	1	2	2	2	0
New Hampshire	1	1	1	0	2	1
New Jersey	1	4	1	4	1	4
New Mexico	0	0	2	0	0	0
New York	3	0	3	1	2	1
North Carolina	0	0	1	1	0	0

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State	Moody's		S&P Global		Fitch	
	Upgrades	Downgrades	Upgrades	Downgrades	Upgrades	Downgrades
North Dakota	4	0	3	0	0	0
Ohio	1	0	2	1	2	1
Oklahoma	1	0	1	1	1	0
Oregon	3	1	2	1	3	1
Pennsylvania	1	0	3	1	2	1
Rhode Island	1	0	2	0	2	1
South Carolina	1	1	0	0	0	0
South Dakota	2	0	0	0	4	0
Tennessee	2	2	2	2	2	1
Texas	2	0	2	0	1	0
Utah	0	0	0	0	0	0
Vermont	2	0	2	0	2	0
Virginia	2	0	0	0	0	0
Washington	2	1	1	0	2	1
West Virginia	2	0	3	0	4	0
Wisconsin	1	1	1	1	2	2
Wyoming	3	0	0	0	0	0

Note: Values reflect the counts of credit upgrades and credit downgrades observed in annually aggregated data from 1994 through 2014. Colorado, Illinois, Kansas, and Montana are excluded from this analysis for not having a rainy day fund as of 2014, according to Pew's criteria.

Source: Pew analysis of general obligation credit ratings from Moody's Investors Service, S&P Global, and Fitch Ratings.

State RDFs and their use

To measure states' use of their reserve funds, Pew collected data from 46 states to obtain a detailed accounting of deposits, withdrawals, interest accruals, and balances for the 52 rainy day funds identified in *Building State Rainy Day Funds*. These data were obtained directly from state treasurers, comptrollers, departments of revenue, legislative fiscal offices, or other agencies charged with monitoring or managing the state's fund. Data were standardized into deposits, withdrawals, and ending balances in millions of dollars for each fiscal year from 1994 through 2014.

In cases where a state has two funds, such as Alaska or California, values were aggregated across funds to reflect their total reserve position. Because many states do not track their specific deposit or withdrawal actions closely, providing only ending balances for their fund each year, it is necessary to calculate net changes from year to year without knowing whether concurrent deposits and withdrawals took place. Additionally, several states have statutes that require certain percentages of their funds to be returned to or diverted from their general fund at the end of the fiscal year.

To address these issues, fund deposits and withdrawals are standardized by subtracting their total reserve withdrawals from their total deposits for each fiscal year to produce a measurement of each state's net RDF use. This captures the use of a state's RDF, reflecting active decisions by state policymakers to make deposits or withdraw funds according to their respective statutory guidelines.

Lastly, net RDF use data are normalized as a percentage of each state's total general fund expenditures using data from the National Association of State Budget Officers to control for the differences in the scale of various states' economies, revenues, and reserves.

Other fiscal, economic, and control variables

The rating agencies' methodologies identify several other factors that play an important role in determining states' creditworthiness. Pew researchers surveyed the existing literature and ratings methodologies to identify additional variables to supplement the credit rating and RDF use data.

State general fund revenues and expenditures are indicators of states' fiscal performance and are important measures that proxy for the state's position in the economic cycle. When revenue declines, state finances weaken and the likelihood of a credit downgrade has been found to increase. Because of this relationship, it is essential to control for state revenue. Both general fund revenue and expenditure data were drawn from the National Association of State Budget Officers' fall survey of the states for fiscal 1994 through 2014 and reflect only final, audited, actual figures reported by states.

In addition to state revenue, Pew researchers identified several other factors as having a significant relationship to states' credit ratings. Given that credit ratings assess the ability of states to meet their debt obligations, data recording long- and short-term debt obligations are collected from the Census Bureau's Annual Survey of Government Finances. In addition, state pension liabilities have been determined to play a significant role in determining states' creditworthiness. Unfortunately, pension funding ratio data are unavailable for the full period of examination. As a result, the share of the state population over the age of 65 is drawn from census data to serve as a proxy for the number of people making claims on the state's pension system. Lastly, to control for differences in scale across states, census data were also used to record state populations for inclusion in all statistical models.

The scale of revenue, rainy day fund, and debt totals varies wildly from one state to another. To maximize comparability across states, all financial variables were converted into a percentage of total general fund expenditures. This data transformation represents the way most reserves are viewed by state lawmakers and offers a convenient way to normalize variables across states. An added benefit of this transformation is that coefficient values for the rainy day fund balance, rainy day fund use, general fund ending balance, long-term debt, and short-term debt are all directly comparable in the models, as all variables are scaled the same.

Methodology

Calculating the revenue cycle

In assessing whether states are engaging in countercyclical use of their reserves, the first challenge is to produce an estimate of the economic or revenue cycle. To do this, a Butterworth filter was used to identify the trend in annual general fund revenue. This filter was selected over possible alternatives for two reasons. First, this approach relaxes the need for overly restrictive assumptions to be imposed by Pew researchers regarding the frequency or amplitude of the cycle. For instance, a Hodrick-Prescott filter requires the researcher to designate the λ term, which can significantly alter the resulting trend estimate. Second, Butterworth filters are estimated recursively, providing greater consistency and accuracy in trend estimates at the start and end of the series.

To ensure the quality of the Butterworth filter estimates, Hodrick-Prescott filters were also estimated with varying λ terms for comparison. In each case, the Hodrick-Prescott filter produced results similar to the Butterworth filter. However, the trends estimated by the Butterworth filter were used for the reasons stated above.

To capture the countercyclicality of rainy day fund use, Pew researchers compared each state's actual general fund revenue against an anticipated revenue value, as estimated by the Butterworth filter, for each fiscal year. In years where revenue was above the trend, researchers recorded a value of 1. In cases where actual revenue was perfectly on trend, those years were coded as zeroes. All years where observed revenue was below its trend expectations were classified as -1. These classifications resulted in a new variable that provided a simplified measure of the directional deviations from the revenue trend for each state-year in the data.

States' net rainy day fund use was then multiplied by this new revenue deviation variable. The multiplicative properties of positive and negative values between net RDF use and revenue deviations combine to produce a new "valenced" rainy day fund use variable which captures not only how much states were depositing or withdrawing, but also whether those actions were taken countercyclically. The valenced RDF use variable values and interpretations are displayed in Figure 1 below. The expectations for how each type of RDF use will be viewed by the rating agencies are offered in bold.

Figure 1

Valencing Net Rainy Day Fund Use

		Countercyclical use	
		Above trend (+)	Below trend (-)
Net RDF use	**Net deposit (+)**	Depositing during growth period. This reflects responsible savings while limiting reliance on unsustainable revenue. **Credit positive.**	Depositing during revenue downturn, creating unnecessary budgetary pressure. **Credit negative.**
	Net withdrawal (-)	Withdrawing during growth years, indicating a "raiding" of the fund or reliance on reserves to fund recurring expenditures. **Credit negative.**	Withdrawing during revenue downturn or recession. Rainy day fund is being used to supplement revenues. **Credit positive.**

Source: Pew analysis of state rainy day fund use and general fund revenues. General fund revenue data are from the National Association of State Budget Officers' Fall Survey of the states and only reflect audited, actual revenue collections.

Modeling changes in state credit ratings

To better understand the relationship between rainy day fund use and state credit ratings, Pew drew on the work of Christine Martell et al. to serve as a methodological foundation. Their work reflects the most recent research on credit ratings identified by Pew. However, the model specifications applied by Martell et al. were determined to be inappropriate for Pew's research for two reasons.[1] First, Martell et al.'s models suffer from potential methodological problems. The inclusion of fixed effects in nonlinear models can introduce bias and can also result in inconsistent estimates.[2] Second, the hypotheses being evaluated in Pew's analyses speak to how a state's pattern of deposits and withdrawals might change its rating, not whether rainy day fund use corresponds to specific ratings.

In light of these concerns, Martell et al.'s models were used to identify a list of independent variables for consideration but were not replicated directly. Pew researchers opted to dichotomize the credit rating data into two annual measures recording credit upgrades and downgrades. A series of six fixed-effects logit models were estimated using these measures as dependent variables to assess the effect of rainy day fund balances and use on whether a state receives a credit upgrade or downgrade. This approach benefits by examining the impact of rainy day fund use on the probability a state's credit will be upgraded or downgraded—the primary fear voiced by state lawmakers.

Written in regression format, the models are as follows:

$$\Pr(\text{Upgrade}) = \propto + \beta_1 \text{ RDF Use} + \beta_2 \text{ RDF Balance} + \beta_3 \text{ GF Balance} + \beta_4 \text{ Long Debt} + \beta_5 \text{ Short Debt} + \beta_6 \text{ Population} + \beta_7 \text{ Over 65} + \epsilon$$

and

$$\Pr(\text{Downgrade}) = \propto + \beta_1 \text{ RDF Use} + \beta_2 \text{ RDF Balance} + \beta_3 \text{ GF Balance} + \beta_4 \text{ Long Debt} + \beta_5 \text{ Short Debt} + \beta_6 \text{ Population} + \beta_7 \text{ Over 65} + \epsilon$$

where $\propto$ is a constant; RDF Use is the net rainy day fund use, valenced to reflect the state's standing relative to the revenue cycle; RDF Balance is the rainy day fund ending balance; GF Balance is the ending balance for the state's general fund; Long Debt is the state's long-term debt obligations; Short Debt is the state's short-term debt obligations; Population is the natural log of the state's population; Over 65 is the percentage of the state's population over the age of 65; and ϵ is the error term. Note that RDF Use, RDF Balance, GF Balance, Long Debt, and Short Debt are all measured as a percent of total general fund expenditures, making their coefficient estimates directly comparable. These models are estimated using the same specification for each of the major rating agencies, resulting in separate upgrade and downgrade models for Moody's, S&P Global, and Fitch.

One clear omission from these models is a variable recording states' unfunded pension liabilities, which has been identified as a significant predictor of state credit ratings. The decision not to include pension liabilities was motivated purely by data availability. While the period of analysis examines fiscal 1994 through 2014, state pension funding ratio data are only available through the early 2000s. Including a pension funding variable would require excluding more than a quarter of the available data. The share of the state's population over 65 is inserted into the models to offer a proxy for the stress placed on states through pension obligations. Pew acknowledges that this proxy variable does not capture the state's funding ratio, but it does capture some of the budgetary pressures states face because of pension obligations.

The results of the models for credit upgrades are detailed in Table 3, and the results of the credit downgrade models are shown in Table 4. Note that each table reports the raw coefficient estimates from the fixed effect logit models. The calculation of an average marginal effect is not possible given the model specifications, as it would require the assumption that all fixed effects are equal to zero.

Table 3

Modeling the Likelihood of a Credit Upgrade

Variable	Model 1 – S&P	Model 2 – Moody's	Model 3 - Fitch
Valenced RDF use	0.036	0.017	-0.014
	(0.030)	(0.027)	(0.035)
RDF ending balance	0.020	-0.008	-0.008
	(0.017)	(0.014)	(0.019)
General fund ending balance	0.010	-0.007	0.005
	(0.024)	(0.023)	(0.035)
Long-term debt obligations	-4.010	0.580	5.986
	(4.895)	(4.272)	(4.473)
Short-term debt obligations	-19.401	-13.188	-48.509
	(66.233)	(56.017)	(70.330)
Log (population)	-4.942	-1.949	2.047
	(4.659)	(4.192)	(4.390)
Percentage of population >65	0.000	0.002	-0.001
	(0.003)	(0.002)	(0.002)
N	533	519	450
Likelihood ratio	8.45	2.54	2.88

Note: Values reflect conditional logit coefficients. Standard errors are clustered by state and are reported in parentheses. The number of observations differs across models due to differences in the number of states to experience upgrades for each rating agency.

*p < 0.10; **p < 0.05; ***p < 0.01.

Source: Pew analysis of general obligation credit ratings, rainy day fund use, and other economic variables.

Across all three models for credit upgrades, none of the variables are found to be statistically significant at the 0.01, 0.05, or 0.10 levels. However, as Table 4 illustrates, both the valenced RDF use and RDF ending balance were found to be statistically significant in some combination of the models for credit downgrades. Valenced RDF use achieves significance or near significance across all three models, and each estimated effect is in the direction expected by Pew following conversations with the rating agencies.

In more general terms, these results indicate that larger reserve balances and countercyclical use of rainy day funds appear to significantly reduce the likelihood that a state will experience a credit downgrade.

Table 4

Modeling the Likelihood of a Credit Downgrad

Variable	Model 1 – S&P	Model 2 – Moody's	Model 3 - Fitch
Valenced RDF use	-0.366**	-0.288**	-0.248†
	(0.172)	(0.121)	(0.154)
RDF ending balance	-0.311**	-0.126	-0.187
	(0.155)	(0.121)	(0.143)
General fund ending balance	-0.119	-0.184**	-0.122
	(0.075)	(0.084)	(0.090)
Long-term debt obligations	-11.098	1.038	-3.862
	(7.773)	(8.352)	(7.151)
Short-term debt obligations	86.789	270.884**	235.584**
	(88.779)	(112.296)	(110.722)
Log (population)	16.202*	-2.135	8.392
	(9.693)	(8.193)	(10.737)
Percentage of population >65	-0.001	0.000	0.000
	(0.003)	(0.003)	(0.004)
N	225	279	232
Likelihood ratio	19.65***	22.68***	15.85**

Note: Values reflect conditional logit coefficients. Standard errors are clustered by state and are reported in parentheses. The number of observations differs across models due to differences in the number of states to experience downgrades for each rating agency.

*p < 0.10; **p < 0.05; ***p < 0.01.

† The p-value here is 0.107, placing it on the verge of marginal significance.

Source: Pew analysis of general obligation credit ratings, rainy day fund use, and other economic variables.

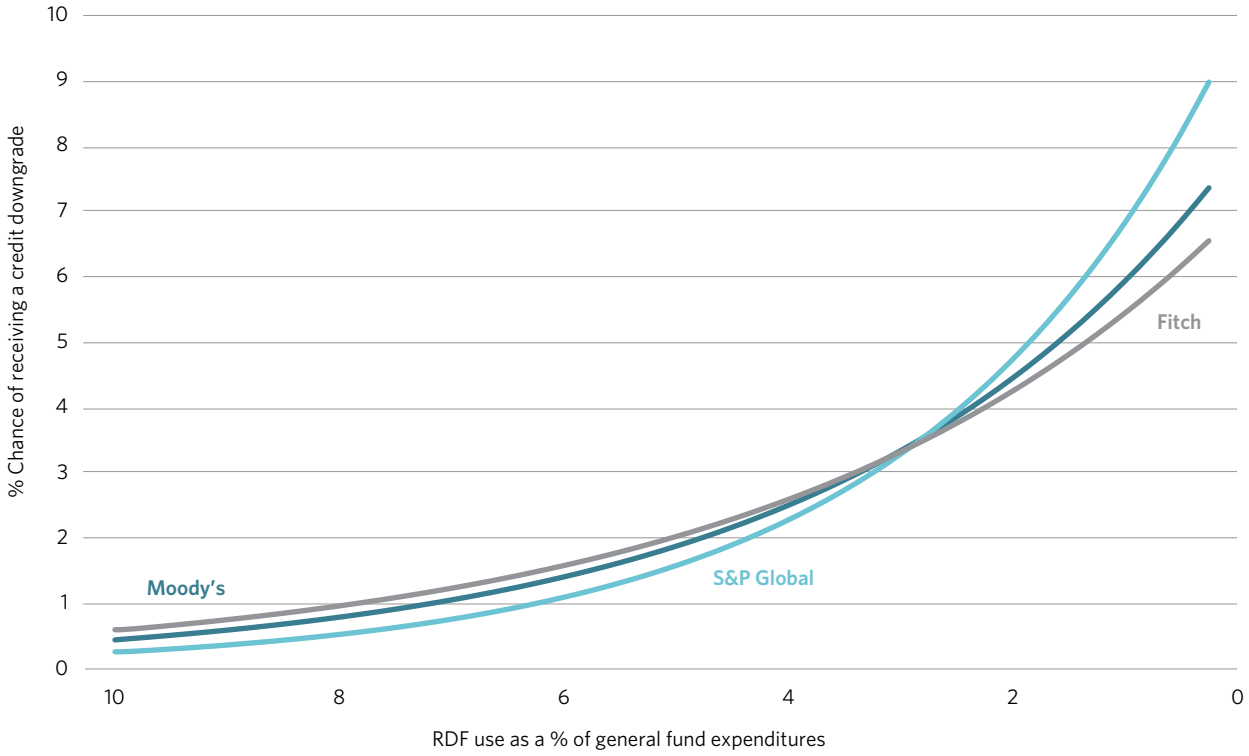
Model simulations

To better illustrate the effects that rainy day funds have on the likelihood that a state will receive a credit downgrade, four sets of predicted probabilities were generated using out-sample data. In each case, California—the state with the most movement in its credit rating—served as the foundation for the prediction datasets. Values for general fund ending balance, long-term debt, short-term debt, population, and population over age 65 are all set at California's mean values from fiscal 1994 through 2014. These variables were all held constant to

isolate the effects of the rainy day fund use and balance variables. In each prediction dataset, Pew researchers artificially shifted the rainy day fund variables across a range of values to illustrate how their effects would play out. They then estimated the predicted probability that a state would receive a credit downgrade using these simulated datasets. The results are displayed in Figures 2 through 5. Note that Figures 4 and 5 here match Figures 1 and 2 from the report.

Figure 2

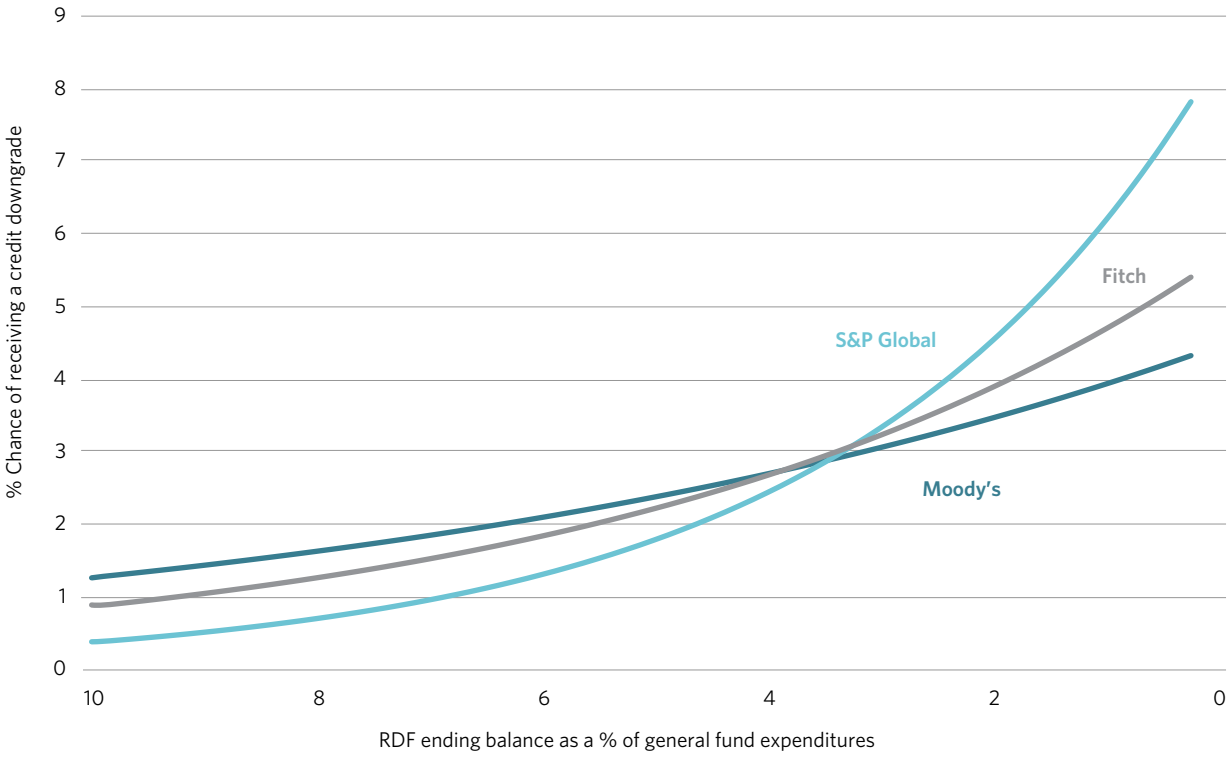
Rainy Day Fund Use Only Scenario



Source: Pew analysis of state rainy day fund use and general obligation credit ratings.

Figure 3

Rainy Day Fund Ending Balance Only Scenario



Source: Pew analysis of state rainy day fund use and general obligation credit ratings.

In both Figures 2 and 3, the predicted probabilities reflected the shift one would expect to see in a scenario where only RDF use or RDF ending balance changes. These are not realistic scenarios, as RDF use will change the RDF ending balance. But they are illustrative because they show the estimated effect of each variable in isolation.

Figure 4 displays a scenario in which changes in RDF use and balance are directly proportional to one another. The data feature an initial RDF balance of 10 percent of general fund expenditures. This balance is reduced in 0.25 percentage-point increments, while valenced RDF use also decreases by 0.25 percentage-point increments. This reflects a more realistic scenario in which changes in the RDF ending balance are the result of withdrawals being made during growth years. As noted in the report, this behavior would raise flags for the rating agencies because it would indicate a potential problem with the state's spending practices or its ability to meet ongoing expenditures.

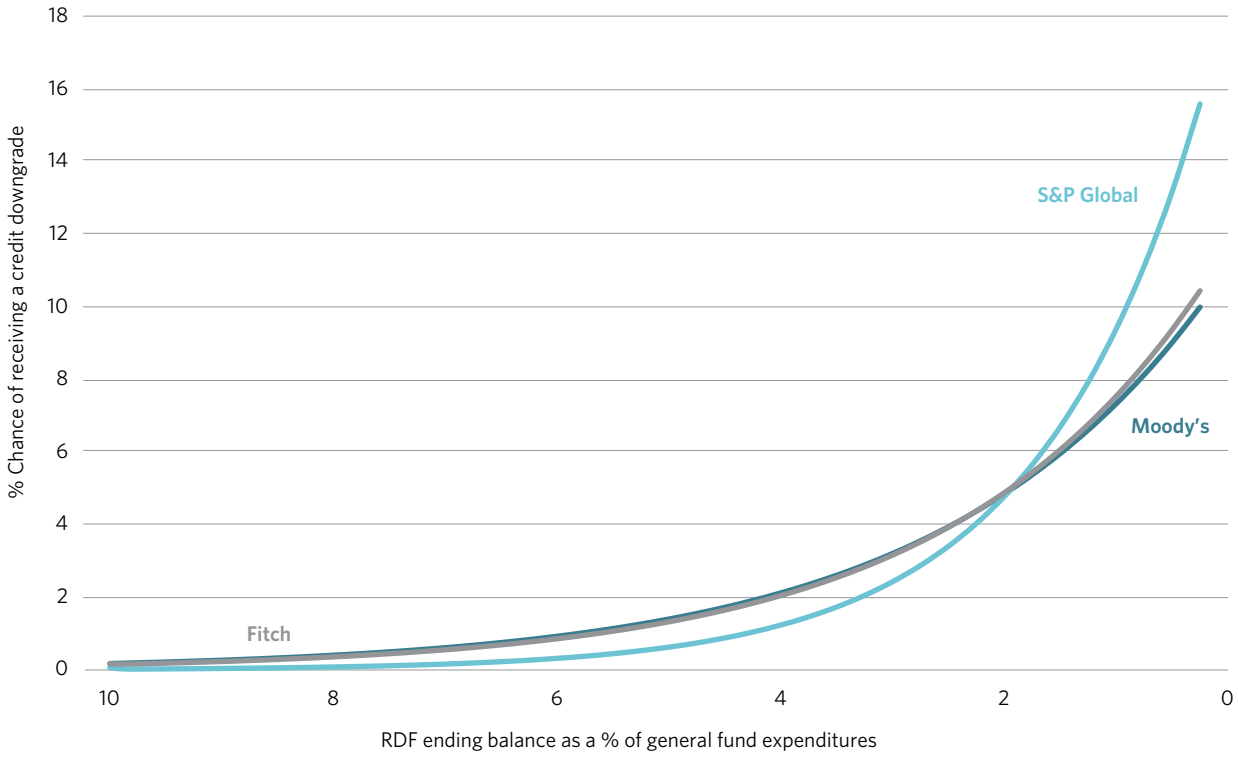
The results illustrate the low probability that a state will receive a credit downgrade if it holds a significant balance in its rainy day fund. However, as the balance decreases in response to the withdrawals, the probability of a credit downgrade increases significantly for all three rating agencies. These results support the rating agencies' assertions that rainy day funds should not be drawn upon during periods with above-normal revenue.

Figure 5 illustrates a scenario in which both RDF use and balances are again proportional to one another. The difference between this scenario and the previous one is that here valenced RDF use increases in response to a

declining RDF balance. This scenario represents a state making withdrawals from its reserves when revenue is below the trend line—during a revenue shortfall or downturn.

Figure 4

Withdrawals During Revenue Growth Years Scenario



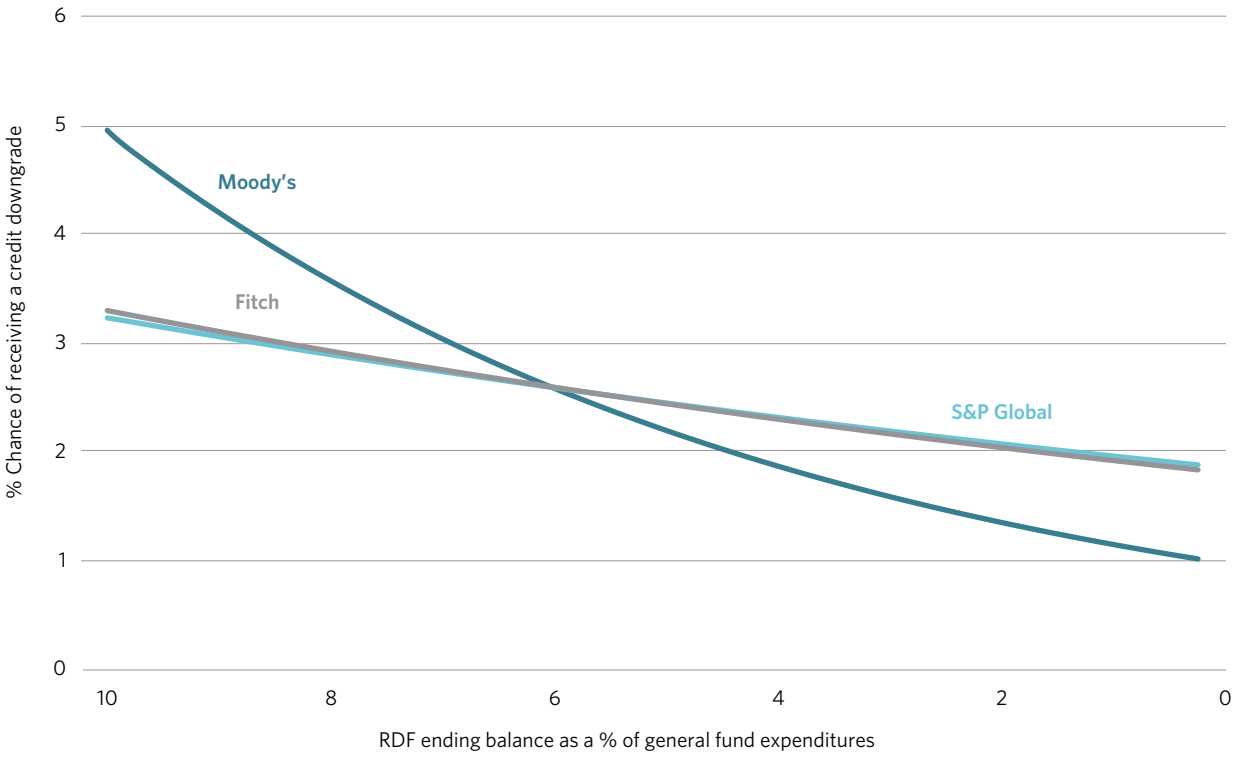
Source: Pew analysis of state rainy day fund use and general obligation credit ratings.

Unlike the previous scenario, the initial probability of a credit downgrade is higher across all three rating agencies. However, whereas the probability of a downgrade increases as the state withdraws from its rainy day fund in the previous scenario, here the probability of a downgrade decreases by more than 1 percentage point for S&P and Fitch and almost 4 percentage points for Moody's.

These results also corroborate the statements of the credit rating agencies. The initial probability of a downgrade is higher because the state's revenue is below its long-term trend, indicating the presence of fiscal stress resulting from a revenue downturn. But the credit negative associated with a decreased RDF balance is offset by the credit positive resulting from countercyclical rainy day fund use.

Figure 5

Withdrawals During a Revenue Downturn Scenario



Source: Pew analysis of state rainy day fund use and general obligation credit ratings.

Other notes

Pew recommends caution in the interpretation of these models for several reasons. First, many states' rainy day funds are not purely intended for countercyclical budgetary stabilization. In cases where states have designated other purposes for their reserves, use only in the manner described here is unreasonable to expect. Further, the rating agencies are aware of these alternative purposes and are likely to factor them into their considerations of a state's fiscal flexibility.

Second, rating agencies have made clear that states should not rely only on their rainy day funds during times of revenue decline or economic hardship. These models show that using a rainy day fund during revenue declines is a credit positive, even to the extent of reducing its balance to zero if necessary. But these funds are best seen as one of many tools available to states to help supplement revenue during downturns and should be used accordingly.

Third, the changes in the probability of a credit downgrade illustrated in the figures in the preceding pages and in the report reflect simulated effects for a hypothetical state under assumed conditions. Readers are cautioned from assuming that any effects will be uniform across states or contexts. States' experiences will vary depending on the conditions surrounding their rainy day fund activity and their broader fiscal conditions.

Lastly, Pew cautions against using these models to assess the causality of the relationships between rainy day funds and credit downgrades. Similar to other comparable studies in the academic literature, these models face endogeneity concerns as fiscal decisions regarding how rainy day funds are used often affect both the fund use and the credit rating, rather than comprising a serial set of decisions and events.

Summary

Based on the results reported in Table 3, Pew finds no evidence of a significant relationship between credit upgrades and reserve fund use or ending balances. In contrast, Table 4 and Figures 3 and 4 offer clarification regarding how rainy day funds relate to credit downgrades. While downgrades are rare events, RDF use and reserve balances both significantly affect the probability that a state will experience a credit downgrade.

These results offer support for Pew's hypotheses. Withdrawals made from reserves during times of revenue growth result in a significant increase in the likelihood of receiving a credit downgrade. And when reserves are tapped during downturns, there does not appear to be a net credit negative, as the positive effect of a countercyclical transfer offsets any penalty associated with a shrinking reserve balance.

Endnotes

1 Christine R. Martell, Sharon N. Kioko, and Tima Moldogaziev, "Impact of Unfunded Pension Obligations on Credit Quality of State Governments," Public Budgeting & Finance 33, no. 3 (2013): 24–54, doi:10.1111/j.1540-5850.2013.12013.x.

2 William Greene, "The Bias of the Fixed Effects Estimator in Nonlinear Models," unpublished manuscript, Stern School of Business, New York University (2002), http://people.stern.nyu.edu/wgreene/nonlinearfixedeffects.pdf; Gregori Baetschmann, Kevin E. Staub, and Rainer Winkelmann, "Consistent Estimation of the Fixed Effects Ordered Logit Model," Journal of the Royal Statistical Society: Series A (Statistics in Society) 178, no. 3 (2015): 685–703, doi:10.1111/rssa.12090.

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pewtrusts.org/fiscal-health

Contact: Catherine An, communications officer
Email: can@pewtrusts.org
Project website: pewtrusts.org/fiscal-health