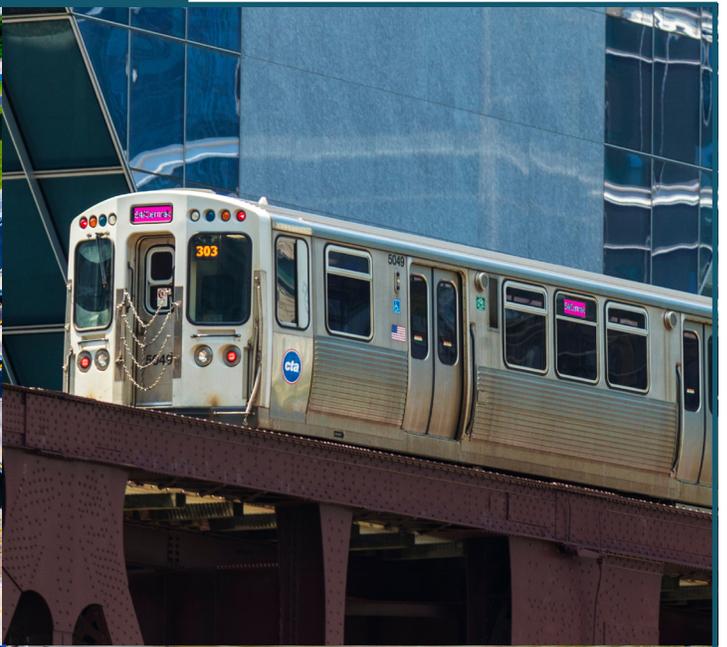


CBO

Federal Support for Financing State and Local Transportation and Water Infrastructure



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OCTOBER 2018

At a Glance

State and local governments are the main owners of highways, mass transit systems, airports, and water systems nationwide. In recent years, 60 percent of the investment in such infrastructure that state and local governments have made from their own funds (excluding federal grants) has been financed using mechanisms that impose costs on the federal government: tax-exempt bonds, state revolving funds and infrastructure banks (“state banks”), tax credit bonds, and direct federal credit programs.

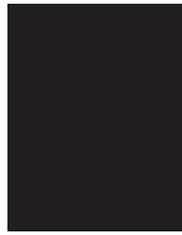
Use of Federally Supported Financing Mechanisms. On average between 2007 and 2016, states and localities invested \$64 billion per year (in 2017 dollars) in transportation and water infrastructure using those financing mechanisms:

- \$43 billion per year in tax-exempt bonds,
- \$9 billion per year in loans by state banks,
- \$8 billion per year in tax credit bonds (all from \$82 billion of Build America Bonds sold in 2009 and 2010), and
- \$4 billion per year from federal credit programs.

Federal Costs. The likely future costs of those mechanisms to the federal government are measured as discounted present values per dollar of financing provided. For tax-exempt bonds and state bank loans, CBO projected the federal cost of 20-year financing in 2023, a representative future year.

- Tax-exempt bonds cost an estimated 26 cents per dollar financed.
- The estimated cost of state bank loans depends on the source of funds: 23 cents for loans made directly from banks’ capital funds or from repayments of previous loans, and 43 cents for loans made from the proceeds of tax-exempt bonds issued by the banks (which accounted for about a quarter of state banks’ lending during the 2007–2016 period, CBO estimates).
- No tax credit bonds for transportation or water infrastructure have been issued since 2010. The cost of a future program would depend on its authorizing legislation. Tax credit bonds that provided the same amount of support as tax-exempt bonds would cost the federal government an estimated 19 cents per dollar for 20-year financing in 2023.
- The cost of direct federal credit programs depends on their loan portfolios. To date, loans made by the largest program have cost an average of 7 cents per dollar financed, as measured under the Federal Credit Reform Act of 1990. Under an alternative measure that accounts for the market value of financial risk, CBO estimates that cost to be 33 cents.

Other Characteristics. Financing mechanisms differ in the source of the federal support they provide—discretionary spending, mandatory spending, or provisions of tax law—and in their attractiveness to particular state or local borrowers. Tax-exempt bonds have the fewest restrictions on their use, but other mechanisms may offer different advantages, particularly for small borrowers.



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The years referred to in this report are calendar years, except where specified as fiscal years. In particular, references to the costs of federally supported financing mechanisms in 2023 are for the fiscal year. (Federal fiscal years run from October 1 to September 30 and are designated by the calendar year in which they end.)

Numbers in the text, tables, and figures may not add up to totals because of rounding.

Unless otherwise specified, spending amounts are reported in nominal (current-year) dollars, with the exception of data on the use of financing mechanisms in 2016 or on average use over the 2007–2016 period, which are in 2017 dollars. Amounts given in 2017 dollars have been adjusted to remove the effects of inflation using the gross domestic product price deflator of the Bureau of Economic Analysis.



Summary

Transportation and water infrastructure—such as highways, airports, and water treatment systems—plays an important role in promoting economic activity and contributing to public well-being. Much of that infrastructure is owned by state and local governments. However, the federal government provides extensive support for such infrastructure by making grants to states and localities or by helping them finance infrastructure projects through loans or bonds. In fiscal year 2017, capital investment in transportation and water infrastructure by all levels of government totaled \$174 billion. State and local governments accounted for \$102 billion of that investment (not counting funds they received from federal grants). In recent years, more than half of their spending has been financed through bonds that provide federal tax preferences or through federally supported loan programs.

This report by the Congressional Budget Office outlines the different mechanisms that the federal government offers state and local governments to assist them in financing projects for transportation or water infrastructure.

How Has the Federal Government Helped States and Localities Finance Infrastructure?

In recent years, the federal government has used several mechanisms to assist in financing state and local infrastructure projects (see Summary Table 1):

- *Tax-exempt bonds* allow states and localities to issue debt (bonds) whose holders do not have to pay federal taxes on the interest payments they receive.
- *State revolving funds and infrastructure banks* (which this report refers to, for simplicity, as *state banks*) are financial institutions that state governments create and run to lend money for infrastructure projects. Most of those institutions receive the majority of their capital through grants from the federal government. Some banks choose to increase their current lending
- *Tax credit bonds* (which were used most recently in 2009 and 2010 in the Build America Bonds program) allow state and local governments to issue debt that provides a federal tax credit or a federal payment to the issuer or bondholder.
- *Direct federal credit programs* offer loans or loan guarantees to state and local governments for infrastructure projects.

capacity by issuing tax-exempt bonds, thus receiving a second form of federal support.

Tax-exempt bonds are the most common form of financing for transportation and water infrastructure projects. Over the decade from calendar year 2007 to 2016, tax-exempt bonds provided an average of \$43 billion per year (in 2017 dollars) in new financing for such projects. (That figure does not represent total project costs, which reflect additional sources of funds.) State banks provided \$9 billion per year in new financing, on average, from 2007 to 2016, mostly for water infrastructure. Tax credit bonds provided an average of \$8 billion per year in new financing during that period (all of which came from \$82 billion in Build America Bonds sold in 2009 and 2010). Direct federal credit programs provided an average of \$4 billion per year in loans and loan guarantees for highway, mass transit, rail, and water infrastructure.

How Much Are the Financing Mechanisms Likely to Cost the Federal Government per Dollar Financed?

The cost to the federal government of providing such financing varies by mechanism as well as by the length of the financing term. To compare costs, CBO projected (where possible) how much the various mechanisms would cost the federal government in fiscal year 2023 per dollar of financing provided. (Those estimates use discounted present values to express a future stream of costs or dollars of financing as a single value today.) CBO chose 2023 as a representative future year because in its April 2018 economic projections, interest rates

Summary Table 1.

Overview of Federally Supported Mechanisms That States and Localities Can Use to Finance Transportation and Water Infrastructure

Mechanism	Average Amount of New Financing Provided Annually From 2007 to 2016 (Billions of 2017 dollars)	Projected Federal Cost of New Financing Provided in Fiscal Year 2023 (Cents per dollar financed) ^a	Type of Federal Support	Examples
Tax-Exempt Bonds	43 ^b	26	Forgone tax revenues	Traditional tax-exempt governmental bonds; grant anticipation bonds for highways and mass transit; qualified private activity bonds
State Revolving Funds and Infrastructure Banks	9	23 (Direct loans from capital funds); 43 (Loans from leveraged funds) ^c	For federal capitalization grants to banks, discretionary appropriations; for tax-exempt bonds issued by banks, forgone tax revenues	State revolving funds for clean water and drinking water; state infrastructure banks for highways and mass transit
Tax Credit Bonds	8 ^d	As specified in future authorizing legislation ^e	For traditional tax credit bonds, forgone tax revenues; for direct-pay bonds, such as Build America Bonds, mandatory spending	Build America Bonds
Direct Federal Credit Programs	4	7 (FCRA accounting); 33 (Fair-value accounting) ^f	Discretionary appropriations ^g	Transportation Infrastructure Finance and Innovation Act program; Water and Waste Disposal program; Railroad Rehabilitation and Improvement Financing program; Water Infrastructure Finance and Innovation Act program

Source: Congressional Budget Office.

FCRA = Federal Credit Reform Act of 1990.

- a. Estimates are for 20-year financing (except for direct federal credit programs, as noted) and are discounted present values, which express future cash flows as an equivalent lump sum at a given point in time.
- b. Excludes about \$2 billion per calendar year in tax-exempt bonds issued by state revolving funds for water projects. Those bonds are included in the \$9 billion average for state revolving funds and infrastructure banks.
- c. Banks sometimes leverage their program funds by selling tax-exempt bonds. The proceeds from those bonds allow them to increase the volume of loans they make in the short term; the tax exemption on interest income from the bonds adds to the federal cost of such loans.
- d. Reflects \$82 billion in Build America Bonds issued for transportation and water projects during the 2009–2010 period, when those bonds were authorized to be sold. (Issuance in other years was zero.)
- e. No current program allows such bonds to be issued for transportation or water infrastructure.
- f. These estimates are for the Transportation Infrastructure Finance and Innovation Act (TIFIA) program. The estimate under the methods specified in the Federal Credit Reform Act of 1990 is based on a ratio of \$14 in loans per \$1 of program funds reported by the Department of Transportation. The fair-value estimate reflects the market value of the financial risk associated with the program. CBO determined the ratio of the fair-value estimate to the FCRA estimate by analyzing program data for 2018. These estimates are not specific to 2023 or to 20-year financing, as the estimates for the other mechanisms are; in fact, the program commonly makes loans with terms of 30 to 35 years.
- g. The largest direct federal credit program for transportation or water infrastructure, the TIFIA program, is formally funded by contract authority, which is a form of mandatory budget authority. However, use of that contract authority is controlled by limitations on obligations contained in annual appropriation acts.

on bonds are projected to be relatively stable from that point forward.¹

Per dollar of financing provided, the average federal cost of the most widely used mechanism, tax-exempt bonds, is a bit higher than the cost of “direct loans” from state banks (loans made using banks’ capital funds and repayments of previous loans) but lower than the cost of “leveraged loans” from state banks (loans made using the proceeds of tax-exempt bonds issued by the banks), CBO estimates. The largest direct federal credit program costs much less than those other mechanisms when measured according to current budgetary rules. But the program’s cost is comparable to that of tax-exempt bonds when measured using an alternative approach that takes into account the market risk that the government faces from direct credit programs (see Summary Table 1).

Costs of Tax-Exempt Bonds and State Bank Loans

For tax-exempt bonds and for loans from state banks, CBO estimated the federal cost per dollar of financing in 2023 with a 20-year repayment period (a common length for loans from state revolving funds). That approach yielded the following estimates:

- For tax-exempt bonds, 26 cents in forgone federal tax revenues per dollar of financing provided;
- For direct state bank loans, 23 cents in federal spending on capitalization grants; and
- For leveraged state bank loans, 43 cents in capitalization grants and forgone tax revenues.

Federal costs increase with the length of the financing term. For example, CBO’s estimate of the cost of tax-exempt bonds that mature in 30 years is 36 cents per dollar of financing provided.

Those estimates depend not only on the length of the financing term but also on several other factors: CBO’s projections for interest rates on Treasury securities and tax-exempt bonds, average tax rates of investors who hold tax-exempt bonds, the required matching ratio of state funds to federal funds used to capitalize state banks, and the average interest rate that state banks charge on

their loans. In most cases, modest changes in those factors have modest effects on the estimates of federal costs. For example, an increase or decrease of 3 percentage points in the average marginal tax rate on all holders of tax-exempt bonds in 2023 (from 30.5 percent to either 33.5 percent or 27.5 percent) would not affect the estimated cost of direct state bank loans but would raise or lower the costs of tax-exempt bonds and leveraged state bank loans by about 2.5 cents.

Costs of Tax Credit Bonds

The federal government does not currently operate any programs in which states or localities can issue new tax credit bonds for transportation or water infrastructure. If lawmakers created such a program in the future, its cost would depend on the legislation authorizing the program. For instance, if bonds were issued in 2023 that gave issuers the same 35 percent subsidy specified in the 2009–2010 Build America Bonds program, the average present-value cost of 20-year bonds would be 30 cents per dollar of financing provided, CBO estimates.

Alternatively, if tax credit bonds were designed to give state or local issuers the same federal subsidy as tax-exempt bonds, they would cost the government 19 cents per dollar of financing provided. (Although tax-exempt bonds are estimated to cost 26 cents per dollar financed, only 19 cents represents a subsidy to the state or local government issuing the bonds. The other 7 cents represents a subsidy to certain bondholders.)

Costs of Direct Federal Credit Programs

CBO did not estimate federal costs for direct credit programs because it lacks detailed projections of the loans or loan guarantees that those programs will make in 2023. Instead, this analysis uses a general estimate of 7 cents per dollar financed, which is based on a report by the Department of Transportation about the Transportation Infrastructure Finance and Innovation Act (TIFIA) program.² In recent years, that program has accounted for three-fifths of the federal direct credit provided for transportation and water infrastructure.

The TIFIA program’s federal cost could be higher or lower than 7 cents in 2023 and other future years if the loans made in those years are more or less risky than

1. See the fourth panel of Figure 1-1 in Congressional Budget Office, *The Budget and Economic Outlook: 2018 to 2028* (April 2018), p. 8, www.cbo.gov/publication/53651.

2. See Department of Transportation, *Transportation Infrastructure Finance and Innovation Act: 2016 Report to Congress* (August 2016), p. 2, <https://go.usa.gov/xPX5c>.

the program's portfolio has been so far. Similarly, other direct credit programs could have higher or lower costs depending on their loan portfolios and the interest rates they charge.

The 7 cent estimate for the TIFIA program is much lower than CBO's estimates for 20-year financing through tax-exempt bonds and state bank loans, even though TIFIA loans tend to have repayment periods of 30 to 35 years. That estimate reflects budget rules established under the Federal Credit Reform Act of 1990, which define the cost of a federal credit program as the present value of its net cash flows (such as its up-front fees and loan disbursements and repayments). In contrast, CBO estimates that accounting for the market value of the financial risk to which direct federal credit programs expose taxpayers yields a cost of 33 cents per dollar financed for the TIFIA program. (With the other financing mechanisms, bondholders or state banks bear that risk; bondholders are compensated for doing so.)

Costs of Expanding the Use of Those Financing Mechanisms

The average federal costs of the financing mechanisms presented here implicitly reflect certain amounts of financing used by state and local governments. The incremental cost to increase the use of one or more of those mechanisms would probably be higher than the average cost. The reasons are that state and local financing

authorities that issue bonds might have to offer higher interest rates to compete for additional funds from investors, and financing authorities that make loans could end up pursuing some riskier projects. Quantifying how much higher those incremental costs would be is difficult, however, and CBO did not do so for this analysis.

How Else Do the Financing Mechanisms Differ?

Tax-exempt bonds, state banks, tax credit bonds, and direct federal credit programs can all be used to support private investment in publicly owned transportation and water infrastructure through public-private partnerships. However, those mechanisms differ in the sources of the federal support (discretionary spending, mandatory spending, or provisions of tax law) and in the roles that outside parties may play in helping governments determine which projects to finance.

The attractiveness to state and local governments of the different financing mechanisms depends on various factors besides the federal subsidies they provide. Tax-exempt bonds have the fewest restrictions on their use. However, other mechanisms may offer lower borrowing rates, longer borrowing periods, or other advantageous credit terms. For example, for smaller borrowers, state banks typically offer lower transaction or issuance costs than those borrowers would face if they issued their own bonds.

Federally Supported Financing of Transportation and Water Infrastructure

In the United States, the public sector typically funds and manages infrastructure related to transportation and water. Since the late 1980s, state and local governments have provided roughly two-thirds of public spending for capital investment in such infrastructure. (Capital investment consists of spending to buy new structures and equipment as well as spending to improve or rehabilitate existing structures and equipment.) Federal grants to state and local governments and federal spending on federally owned infrastructure have accounted for the remaining public spending for capital investment.

In fiscal year 2017, for example, the public sector as a whole spent \$174 billion on capital investment for transportation and water infrastructure, of which state and local governments spent 59 percent (\$102 billion).¹ Financing data for 2017 are incomplete, but in recent years, more than half of state and local investment has been financed using methods that involve federal tax preferences or federally supported loan programs.

Publicly owned transportation infrastructure falls into five main categories:

- Highways—national, state, and local roads (including bridges and tunnels);
- Mass transit—buses, subways, and commuter rail systems;
- Aviation—airport terminals, runways, and the air traffic control system;

- Water transportation—waterways, ports, and the equipment (such as Coast Guard vessels) used to support seaborne traffic; and
- Rail—the intercity passenger system run by Amtrak.

Water infrastructure consists of two main categories:

- Water utilities—supply systems (such as pipes and plants) to treat and distribute drinking water and to carry and treat wastewater and storm water; and
- Water resources—systems to contain water (such as dams, levees, and reservoirs), to manage sources of fresh water (such as canals and wells), and to restore aquatic ecosystems.

This report focuses on highways, mass transit, aviation, and water utilities—the types of publicly owned transportation and water infrastructure for which the federal government provides major financial support to state and local governments. Water transportation and water resources are excluded because the federal government provides relatively little financial support to states and localities for those types of infrastructure (less than \$100 million each in grants and loans in 2017). Amtrak is excluded because it is not owned by state or local governments.²

Funding Versus Financing

State and local governments that want to invest in infrastructure can do so either by funding it directly (spending their current resources) or by financing it (taking out loans or issuing bonds to obtain funds that they repay over time). Financing can allow infrastructure to be paid for over a period that more closely matches its useful life.

1. See Congressional Budget Office, *Public Spending on Transportation and Water Infrastructure, 1956 to 2017* (October 2018), www.cbo.gov/publication/54539. The public sector spent an additional \$266 billion in fiscal year 2017 to operate and maintain that infrastructure—ongoing activities that are typically paid for directly rather than financed through loans or bonds.

2. Although intercity rail is not included in this report, the Railroad Rehabilitation and Improvement Financing program is discussed because it supports commuter rail systems as well as Amtrak (and freight railroads, which are privately owned).

That option can be particularly attractive when a government does not have the current resources to fund the desired amount of investment.

Financing is not a source of revenues, however; it is only a mechanism for making future state or local revenues available to pay for projects sooner. In the short run, financing can augment grants and other funding available for infrastructure projects. But in the long run, revenues committed to paying back funds borrowed today will be unavailable to pay for projects in the future.

On average, about one-third of the public sector's total investment in highways, mass transit, aviation, and water utilities between 2007 and 2016 involved federally supported financing. (CBO looked at 10-year averages to smooth out the variations in financing activity that occur from year to year.) Specifically, of the \$173 billion average annual investment by all levels of government, \$64 billion, or 37 percent, was financed by states and localities using federally supported mechanisms (see Table 1-1). Such financing was even more important as a share of state and local governments' investment from nongrant funds, accounting for 60 percent.

The importance of federally supported financing varies considerably by type of infrastructure, in part based on the extent to which such infrastructure produces local revenues that can be used to repay the financing. Relatively little road use is subject to tolls, and highways had the lowest average share of federally supported financing during the 2007–2016 period: 37 percent of state and local spending from nongrant funds. In contrast, state and local governments used federally supported financing for 76 percent to 92 percent of their nongrant investment in water utilities, aviation, and mass transit—types of infrastructure for which all or most users are charged.

The use of federally supported financing also varies over time in response to economic conditions and legislative changes, as discussed at the end of this chapter.

Mechanisms for Federal Support of Financing

In recent years, the federal government has subsidized the financing of state and local transportation and water infrastructure using several different mechanisms: tax-preferred bonds, which consist of tax-exempt bonds

and tax credit bonds; state revolving funds and infrastructure banks; and direct federal credit programs.

Tax-Exempt Bonds

State and local governments frequently issue bonds, which they sell to investors, to raise money for a variety of purposes, including infrastructure projects. In general, the interest paid on such bonds is exempt from federal income tax; thus, issuers can offer a lower interest rate and still attract investors.

Tax-exempt bonds are the most commonly used form of federally supported financing for state and local infrastructure projects. On average over the 2007–2016 period, such bonds accounted for two-thirds of federally supported financing for highways, mass transit, aviation, and water utilities, with a total of \$43 billion of those bonds issued per year.

Tax-exempt bonds come in two forms: governmental bonds (which include traditional governmental bonds and grant anticipation bonds) and qualified private activity bonds (see Table 1-2).³ Issuers of bonds can back them—that is, pledge to repay them—with general revenues, specific revenues from designated taxes (such as a regional sales tax), or fees collected from users of the infrastructure financed with the bonds (such as tolls on roads and bridges or charges for water and sewer services). Grant anticipation bonds are unique in that they are explicitly backed, at least in part, with expected future federal grants, although those bonds do not constitute a commitment or guarantee by the federal government.⁴

Traditional Tax-Exempt Governmental Bonds. CBO estimates that \$34 billion in traditional tax-exempt bonds—which can be used to finance any public purpose of state and local governments—were issued for transportation and water infrastructure projects in 2016. That estimate covers only “new-money” bond issuances; it excludes “refunding” bond issuances, which are used to pay off bonds that have already been issued. As interest

3. For more discussion of various types of tax-preferred bonds, see Congressional Budget Office and the staff of the Joint Committee on Taxation, *Subsidizing Infrastructure Investment With Tax-Preferred Bonds* (October 2009), www.cbo.gov/publication/41359.

4. See Federal Highway Administration, *Project Finance Primer* (August 2010), p. 10, <https://go.usa.gov/xPXh2> (PDF, 763 KB).

Table 1-1.

Federally Supported Financing as a Share of Capital Spending, by Type of Infrastructure, 2007 to 2016

Billions of 2017 Dollars

Type of Infrastructure	Average Annual Capital Spending by All Levels of Government ^a	Average Annual Capital Spending by State and Local Governments	Average Annual Amount of Federally Supported New Financing ^b	Federally Supported Financing as a Share of Capital Spending by All Levels of Government (Percent)	Federally Supported Financing as a Share of Capital Spending by State and Local Governments (Percent)
Highways	97	52	19	20	37
Mass Transit	21	12	11	54	92
Aviation	14	7	6	47	88
Water Utilities	40	36	27	68	76
Total	173	108	64	37	60

Source: Congressional Budget Office.

Capital spending is spending for construction (including major structural alterations), land and existing structures, and equipment.

To facilitate comparisons of financing and spending, the numbers shown here include the total value of federally subsidized loans both as financing and as spending by state and local governments. In other contexts, CBO reports the subsidy component of such loans as federal spending rather than as state and local spending.

a. Includes federal spending on federally owned infrastructure (\$3 billion, almost all of which was for aviation), federal grants to state and local governments (\$62 billion), and spending by state and local governments from other sources (\$108 billion).

b. Financing by state and local governments using mechanisms that impose costs on the federal government: tax-exempt bonds, tax credit bonds, state revolving funds and infrastructure banks, and direct federal credit programs.

rates declined through 2016, state and local governments increased their issuances of refunding bonds until those roughly equaled their issuances of new-money bonds.⁵

Forgone federal revenues from the outstanding stock of traditional governmental bonds issued for transportation and water infrastructure (including both new-money and refunding issuances) totaled \$8.9 billion in 2016, CBO estimates. That estimate is based on a \$35.6 billion estimate from the Joint Committee on Taxation (JCT) for all tax-exempt governmental bonds and the fact that transportation and water infrastructure has accounted for roughly a quarter of such bond issuance since 1991.⁶

5. The extent to which refunding rates will be similar in the future will depend on interest rates. CBO estimates that interest rates will increase for the next several years, substantially reducing by 2023 opportunities for state and local governments to issue refunding bonds on favorable terms.

6. The number presented here for calendar year 2016 is based on estimates for fiscal years 2016 and 2017. See Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2016–2020*, JCX-3-17 (January 2017), <https://go.usa.gov/xQ3gn>, and *Estimates of Federal Tax Expenditures for Fiscal Years 2017–2021*, JCX-34-18 (May 2018), <https://go.usa.gov/xPKuT>. CBO calculated the one-quarter share using data from the Internal Revenue Service and Thomson Reuters.

Grant Anticipation Bonds. The Department of Transportation has two programs that allow state and local governmental entities to borrow by issuing tax-exempt bonds backed by future federal grants: the Grant Anticipation Revenue Vehicle (GARVEE) program for highway infrastructure, introduced in 1995, and the Grant Anticipation Notes (GAN) program for mass transit, begun in 1998.⁷ The GARVEE program is the larger of the two, with a total of \$21 billion (in nominal dollars) in bonds issued through the end of 2016 and

7. Unlike GARVEE bonds and GANs, which represent commitments by the state and local governments that issue them, some other proposed uses of future federal funds to repay nonfederal borrowing have been judged to represent a form of federal spending for capital assets. Examples include some proposed financing arrangements that counted on future federal lease payments to repay borrowings of a private lessor's financing instrument over a long term. For legislative proposals that involve such arrangements, CBO's cost estimates reflect the full cost of the asset up front. See, for example, the testimony of Robert A. Sunshine, Deputy Director, Congressional Budget Office, before the House Committee on Veterans' Affairs, *The Budgetary Treatment of Medical Facility Leases by the Department of Veterans Affairs* (June 27, 2013), www.cbo.gov/publication/44368.

Table 1-2.

Categories of Tax-Preferred Bonds

Category	Eligible Purposes	Bonds for Transportation and Water Infrastructure (Billions of 2017 dollars)	
		Amount of New Issuances in 2016 ^a	Estimated Forgone Federal Revenues on Outstanding Bonds in 2016 ^b
Tax-Exempt Bonds			
Governmental Bonds			
Traditional governmental bonds	Public-purpose projects (State and local governments have substantial latitude in choosing which projects to finance.)	34	8.9
Grant anticipation bonds (GARVEEs for highways, GANs for mass transit)	Highway and mass transit projects that are eligible for federal grants	1.1 (GARVEEs), 0.2 (GANs) ^c	0.2
Qualified Private Activity Bonds	Projects undertaken primarily by a private entity for certain qualified public-purpose activities	3	1.1
Tax Credit Bonds			
Traditional Tax Credit Bonds	None (No current program allows such bonds to be issued for transportation or water infrastructure.)	0	0
Direct-Pay Tax Credit Bonds (Build America Bonds)	None (No current program allows such bonds to be issued for transportation or water infrastructure.)	0	1.5 ^d

Source: Congressional Budget Office, using information from the Department of Transportation, the Internal Revenue Service, the staff of the Joint Committee on Taxation, and the Office of Management and Budget.

GAN = grant anticipation note; GARVEE = grant anticipation revenue vehicle.

- a. These numbers are only for “new-money” bond issuances; they exclude “refunding” bond issuances, which are used to pay off bonds that have already been issued.
- b. These numbers include forgone revenues on both new-money and refunding issuances.
- c. The number for GANs is the average for the years 1998 to 2012, the period for which data are available.
- d. Build America Bonds were authorized to be issued in 2009 and 2010 for all governmental purposes for which tax-exempt bonds could be issued; \$82 billion (in 2017 dollars) were issued for transportation and water infrastructure. This number represents federal payments to state and local governments that issued those bonds.

half of the states participating in the program. The latest available total for GANs is \$3 billion in bonds issued.⁸

GARVEE bonds commonly have terms of 10 to 15 years, as do some GANs. Such bonds are backed by future “formula funds”—federal grants allocated to states or localities according to fixed statutory formulas.

Shorter-term GANs have also been issued, backed by future mass transit grants from the federal New Starts program. Those grants come from discretionary funds that the Congress appropriates each year and thus are more uncertain than formula funds. Because of that greater uncertainty, GANs backed by New Starts grants tend to receive lower credit ratings than GANs backed by formula funds.

8. See Federal Highway Administration, “Federal Debt Financing Tools: Grant Anticipation Revenue Vehicles (GARVEEs)” (accessed August 27, 2018), <https://go.usa.gov/xPkrR>; and Federal Transit Administration, “Revenue Bonds” (accessed August 27, 2018), <https://go.usa.gov/xPkrQ>.

States and localities issued about \$1 billion in grant anticipation bonds in 2016. CBO estimates that forgone federal revenues from the outstanding stock of such bonds in 2016 totaled about \$200 million.

Qualified Private Activity Bonds. QPABs are a form of tax-exempt bond used to finance projects that are undertaken mainly by private entities. A state or local government can issue such bonds on behalf of a private entity for certain qualified activities, including private investment in transportation and water infrastructure. In some cases—such as airports, ports, and mass transit facilities—the tax exemption applies only to private investment in publicly owned facilities. In other cases—such as drinking water and sewer facilities and highways—the tax exemption applies whether the facility receiving private investment is publicly or privately owned.

About \$3 billion in QPABs were issued for new transportation and water infrastructure projects in 2016. JCT estimates that forgone federal revenues from the outstanding stock of such bonds (both new-money and refunding issuances) totaled approximately \$1 billion in 2016.⁹ Over the 2007–2016 period, roughly three-quarters of transportation and water QPABs were issued for aviation (the only type of transportation and water infrastructure for which such bonds are not subject to a cap on their volume). QPABs accounted for about half of all tax-exempt bonds issued for aviation projects during that period (see Table 1-3).

Tax Credit Bonds

The federal government first authorized state and local governments to issue tax credit bonds in 1998, with Qualified Zone Academy Bonds. Those bonds, and others authorized before 2009, provided bondholders with an annual credit against their federal income tax liability instead of, or sometimes in addition to, the interest that typically would be paid on the bonds.

The American Recovery and Reinvestment Act (ARRA) created a temporary program of Build America Bonds (BABs) to be sold in 2009 and 2010 and allowed them to be issued in a new form. Unlike earlier tax credit bonds, those “direct-pay” tax credit bonds required the federal government to make cash payments to the bonds’ issuer equal to a portion of the interest that the issuer paid to bondholders. Those federal payments allowed

the issuer to offer a higher rate of return on the bonds, thereby offsetting the fact that the interest bondholders receive is taxable. For direct-pay BABs, the credit rate was set at 35 percent (meaning that an issuer would get \$35 from the federal government for every \$100 it paid in interest to bondholders). That percentage equaled the top individual income tax rate at the time.

State and local governments sold \$181 billion (in nominal dollars) of Build America Bonds for all purposes during the 2009–2010 period; about \$73 billion of that amount was for transportation and water infrastructure (equivalent to \$82 billion in 2017 dollars). Federal payments to state and local governments on those bonds amounted to \$1.5 billion in 2016.¹⁰

State Revolving Funds and Infrastructure Banks

State governments create and operate state revolving funds (SRFs) and state infrastructure banks (SIBs) to provide credit assistance to projects of their choosing. Those institutions (which this report refers to collectively as “state banks”) are funded largely by capitalization grants from the federal government. They mainly provide loans for projects, although they may also offer loan guarantees and various other forms of assistance, such as lines of credit and bond insurance. During the 2007–2016 period, state banks provided an average of \$9 billion per year in financing for transportation and water infrastructure.¹¹

State banks can use their capital in two ways: to provide loans or other assistance directly, or to act as leverage (collateral) for the issuance of tax-exempt bonds, whose proceeds are then used to provide loans or other assistance. Direct lending allows loan repayments to be recycled into new loans and thus maximizes the length of time in which a bank can use its capitalization. With leveraged lending, loan repayments are used to help

9. The number presented here for calendar year 2016 is based on estimates for fiscal years 2016 and 2017. See Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2016–2020*, JCX-3-17 (January 2017), <https://go.usa.gov/xQ3gn>, and *Estimates of Federal Tax Expenditures for Fiscal Years 2017–2021*, JCX-34-18 (May 2018), <https://go.usa.gov/xPKuT>.

10. See Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2018: Appendix* (May 2017), p. 946, www.govinfo.gov/app/details/BUDGET-2018-APP, and *Budget of the United States Government, Fiscal Year 2019: Appendix* (May 2018), p. 951, www.govinfo.gov/app/details/BUDGET-2019-APP. Since 2013, direct-pay tax credit payments on Build America Bonds have been reduced each year because of across-the-board spending cuts, as explained in Chapter 3.

11. Because state banks can make loans from a combination of previous loan repayments and capitalization grants received in any year, there is no direct measure of the federal cost of their outstanding financing in 2016 as there is for tax-preferred bonds.

Table 1-3.

**Use of Qualified Private Activity Bonds,
by Type of Infrastructure, 2007 to 2016**

	Highways ^a	Mass Transit	Aviation	Water Utilities
Average Annual Issuance (Billions of 2017 dollars)	0.6	0.1	3.3	0.3
Average Issuance as a Share of Total Tax- Exempt Bonds (Percent)	4	1	54	2
Volume Cap	Cumulative ^b	Annual ^c	None	Annual ^c

Source: Congressional Budget Office, using data from the Internal Revenue Service, Thomson Reuters, the Department of Transportation, and the Congressional Research Service.

- Includes highways, surface freight transfer facilities, and transit projects eligible for funding under the Surface Transportation Block Grant program.
- Nationwide cap of \$15 billion.
- This cap limits each state's total issuance of bonds to pay for mass transit systems, wastewater and drinking water systems, residential rental projects, local heating and cooling facilities, hazardous waste facilities, student loans, and mortgages. In each state, the cap equals \$100 per person or a fixed dollar amount (\$302.88 million in 2016), whichever is greater.

repay the tax-exempt bonds; thus, leveraging increases the volume of loans a bank can issue in the short term from a given amount of capitalization but reduces the funds available for later rounds of loans.¹²

For direct loans, the federal government's only costs are its capitalization grants. Under existing programs for state banks, those grants provide 80 percent of the funds that capitalize the banks, with states supplying the other 20 percent. For leveraged loans, the federal government's costs are its share of the capitalization funds and the forgone revenues on tax-exempt bonds that banks use to raise more funds for lending.

12. Proposals in recent years have called for creating a federal infrastructure bank, which would operate differently from state banks. It would not be a revolving fund (repaid funds would not be made available as new rounds of financing), nor would it issue its own bonds. Rather, it would operate essentially like a direct federal credit program. For more information, see Congressional Budget Office, *Infrastructure Banks and Surface Transportation* (July 2012), www.cbo.gov/publication/43361.

State Revolving Funds. By far the largest use of state banks as a whole, accounting for more than 95 percent of such financing over the 2007–2016 period, is for water infrastructure. The federal Clean Water State Revolving Funds program, created in 1987, and Drinking Water State Revolving Funds program, established in 1996, authorize annual grants to state revolving funds. SRFs use the grants, plus required state matching funds, to provide financing to help communities comply with federal clean water or drinking water regulations or to promote public health. The types of assistance that those SRFs provide include loans, loan guarantees, and refinancing.

All 50 states participate in those two revolving fund programs. In addition, 28 states leverage their SRF capitalization with tax-exempt bonds, some more extensively than others. CBO estimates that roughly one-quarter of the assistance that SRFs provided during the 2007–2016 period came from leveraged loans. In all, state revolving funds made about \$10 billion in loans in 2016.

The federal government contributed roughly \$2 billion (in 2016 dollars) to those SRFs in fiscal year 2016 (\$1.4 billion to the clean water SRFs and \$0.9 billion to the drinking water SRFs), as it has done in most years since appropriations for the drinking water funds began in 1997.¹³ An additional \$100 million went to Michigan through the federal Drinking Water SRF program to help the city of Flint repair its drinking water system. States may transfer up to a third of their federal grants each year between the two types of revolving funds to best meet state priorities.

State Infrastructure Banks. SIBs for highway and mass transit infrastructure projects have been established or expanded under several federal laws since 1995.¹⁴ Those

13. Exceptions occurred in 2009 and 2010, when the federal government appropriated \$7.5 billion and \$3.5 billion, respectively, to SRFs because of provisions in ARRA. See Jonathan L. Ramseur and Mary Tiemann, *Water Infrastructure Financing: History of EPA Appropriations*, Report for Congress 96-647 (Congressional Research Service, July 11, 2017), pp. 8–9.

14. Pilot programs that allowed SIBs to be funded with federal grants were created by the National Highway System Designation Act of 1995 (Public Law 104–59), the Department of Transportation and Related Agencies Appropriations Act, 1997 (P.L. 104–205), and the 1998 Transportation Equity Act for the 21st Century (P.L. 105–178). Permanent SIB programs were authorized by the 2005 Safe, Accountable, Flexible, Efficient Transportation

banks have been much less active than water SRFs, however, in part because they do not receive designated federal grants each year. Instead, states must decide to apply some of the federal formula grants they receive for highways and mass transit to capitalize SIBs.¹⁵ Most of the financial support those banks have provided has gone to highway projects.

SIBs established under different laws operate under somewhat different requirements. For example, federal regulations (such as that projects face review under the National Environmental Policy Act and meet Davis-Bacon Act wage requirements and Buy America Act purchasing requirements) may apply only to the first round of projects funded by a bank or to all projects.¹⁶

SIBs have been established in 33 states, although the Federal Highway Administration reports that only about a dozen are particularly active. In the past decade, no state has used federal funds to expand its SIB capitalization.

Direct Federal Credit Programs

Direct credit programs allow the federal government to lend money directly to state and local governments (or private entities) for infrastructure projects, to provide them with lines of credit, or to guarantee the repayment of funds they borrowed from other lenders, thus allowing

state and local borrowers to pay lower interest rates than they would have to otherwise. The federal government operates four direct credit programs for transportation and water infrastructure. Together, those programs provided an average of \$4 billion in financing per year between 2007 and 2016.

Transportation Infrastructure Finance and Innovation Act Program. Authorized in 1998, the Department of Transportation's TIFIA program provides credit assistance mainly for highway and mass transit infrastructure, although it can be used for a broad range of surface transportation projects. In fiscal year 2016, TIFIA provided roughly \$2.2 billion in loans, at an estimated subsidy rate of 4.98 percent, using about \$109 million (in 2016 dollars) of its budget authority.¹⁷

Water and Waste Disposal Program. Authorized in 1972, the Department of Agriculture's Water and Waste Disposal program provides loans, grants, and loan guarantees to households and businesses in rural areas for drinking water systems, sewage and solid waste disposal, and storm water drainage.¹⁸ Funds are allocated to states according to their shares of the nation's rural population, rural households in poverty, and rural unemployment.¹⁹ In fiscal year 2016, the program received budget authority of \$31 million (in 2016 dollars). With an estimated subsidy rate of 2.61 percent, that funding enabled the program to issue \$1.2 billion in loans in 2016.²⁰

Equity Act: A Legacy for Users (P.L. 109-59) and the 2015 Fixing America's Surface Transportation Act (P.L. 114-94). See Frederick Werner and Kevin McDonald, "State Infrastructure Banks (SIBs) 101" (Federal Highway Administration, Spring 2016), <https://go.usa.gov/xPkkB> (PDF, 309 KB); and Robert Puentes and Jennifer Thompson, *Banking on Infrastructure: Enhancing State Revolving Funds for Transportation* (Brookings-Rockefeller Project on State and Metropolitan Innovation, September 2012), <https://tinyurl.com/y8w4jxeu> (PDF, 770 KB).

15. States can also use federal rail grants to help capitalize their SIBs, in which case those banks can finance rail projects as well as highway and transit projects.

16. Under some conditions, states can convert their federally supported SIBs to state control; South Carolina and Utah have done so. Converted SIBs are exempt from federal oversight and regulations (although CBO still considers their operations "federally supported financing" for the purposes of this analysis). A state may also use its own funds to capitalize a state-controlled infrastructure bank or to set up a separate account within a bank established under federal law. States that have done the latter include Florida, Ohio, Pennsylvania, and Missouri. See Frederick Werner and Kevin McDonald, "State Infrastructure Banks (SIBs) 101" (Federal Highway Administration, Spring 2016), <https://go.usa.gov/xPkkB> (PDF, 309 KB).

17. The subsidy rate is an estimate of how much a type of credit assistance (loan, loan guarantee, or line of credit) from a given program costs the federal government per amount disbursed, calculated according to the method specified in the Federal Credit Reform Act of 1990. For budgetary purposes, the subsidy rate is calculated by the Office of Management and Budget and is applied to the amounts appropriated to a federal credit program to determine the volume of loans (or other credit assistance) the program can provide. See Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2018: Analytical Perspectives* (May 2017), Table 19-2, www.govinfo.gov/app/details/BUDGET-2018-PER; and Department of Transportation, "Projects Financed by TIFIA" (accessed September 21, 2018), www.transportation.gov/tifia/projects-financed.

18. Formally, the Department of Agriculture identifies two programs: one for loans and grants, and the other for loan guarantees.

19. Water and Waste Loans and Grants, 7 C.F.R. §1780.18 (2018).

20. See Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2018: Analytical Perspectives* (May 2017), Table 19-2, www.govinfo.gov/app/details/BUDGET-2018-PER.

Table 1-4.

Average Annual Amount of Federally Supported New Financing, by Mechanism, 2007 to 2016

Billions of 2017 Dollars

	Highways		Mass Transit		Aviation		Water Utilities		Total	
	Amount of Financing	Percent								
Tax-Exempt Bonds ^a	14.0	73	8.8	77	6.1	96	14.5 ^b	53	43.5	68
Tax Credit Bonds	3.5	18	1.8	16	0.3	4	2.6	10	8.2	13
State Revolving Funds and Infrastructure Banks ^c	0.2	1	*	**	n.a.	n.a.	8.8	32	9.0	14
Direct Federal Credit Programs	1.5	8	0.8	7	n.a.	n.a.	1.3	5	3.7	6
Total	19.2	100	11.5	100	6.4	100	27.3	100	64.4	100

Source: Congressional Budget Office, using data from the Internal Revenue Service, the Office of Management and Budget, the Department of the Treasury, various state infrastructure banks, Thomson Reuters, the Department of Agriculture, the Environmental Protection Agency, and the Department of Transportation.

The amounts of financing shown here are the average amounts of new financing (refunding bond issuances are excluded) provided by each mechanism per year over the 2007–2016 period. They are averaged over 10 years to smooth out variations in financing amounts in the individual years.

n.a. = not applicable (no such programs exist); * = between zero and \$50 million; ** = between zero and 0.5 percent.

- a. For grant anticipation bonds and qualified private activity bonds for highways and mass transit, amounts issued were estimated using data from the Department of Transportation. For other bonds, amounts issued from 2007 to 2015 were estimated using category totals from the Internal Revenue Service and, where necessary, subcategory shares from Thomson Reuters; amounts for 2016 were estimated by combining data from Thomson Reuters for that year with average ratios of Internal Revenue Service totals to Thomson Reuters totals for the 2007–2015 period.
- b. Excludes \$2.2 billion per year in tax-exempt bonds issued by state revolving funds for water projects. Those bonds are included in the \$8.8 billion average for state revolving funds and infrastructure banks.
- c. For a few state infrastructure banks, these numbers do not reflect all of calendar year 2016 because data for fiscal year 2017 are unavailable.

Railroad Rehabilitation and Improvement Financing Program. The Department of Transportation's RRIF program provides direct loans and loan guarantees to build, buy, or improve facilities and equipment for railroads or intermodal freight operations (in which shipping containers are transferred between ships, trains, or trucks). The program's funds can also be used to refinance outstanding debt incurred for those purposes. Besides state and local governments, private railroads and Amtrak (a government-sponsored corporation) can borrow money under the RRIF program. In 2015, the Fixing America's Surface Transportation Act expanded the program for four years to provide credit to sponsors of transit-oriented development projects. The RRIF program has authority for \$35 billion in outstanding loans and loan guarantees; as of January 2018, the amount outstanding totaled about \$4 billion.²¹

Although the program's main beneficiary has been Amtrak, which has received \$3.1 billion in loans since 2002, local commuter rail systems have also received support. The program has made four loans since 2012, two of them to transit authorities that operate commuter rail systems: \$967 million to the New York Metropolitan Transit Authority and \$220 million to the Massachusetts Bay Transit Authority. Both of those loans were intended to help the systems implement positive train control, a safety feature to automatically stop trains in dangerous situations. (The Massachusetts project also received a loan of \$162 million from the TIFIA program.)

Water Infrastructure Finance and Innovation Act Program. Established in 2014 as a five-year pilot program, the WIFIA program provides low-cost loans and loan guarantees to state and local governments (and to

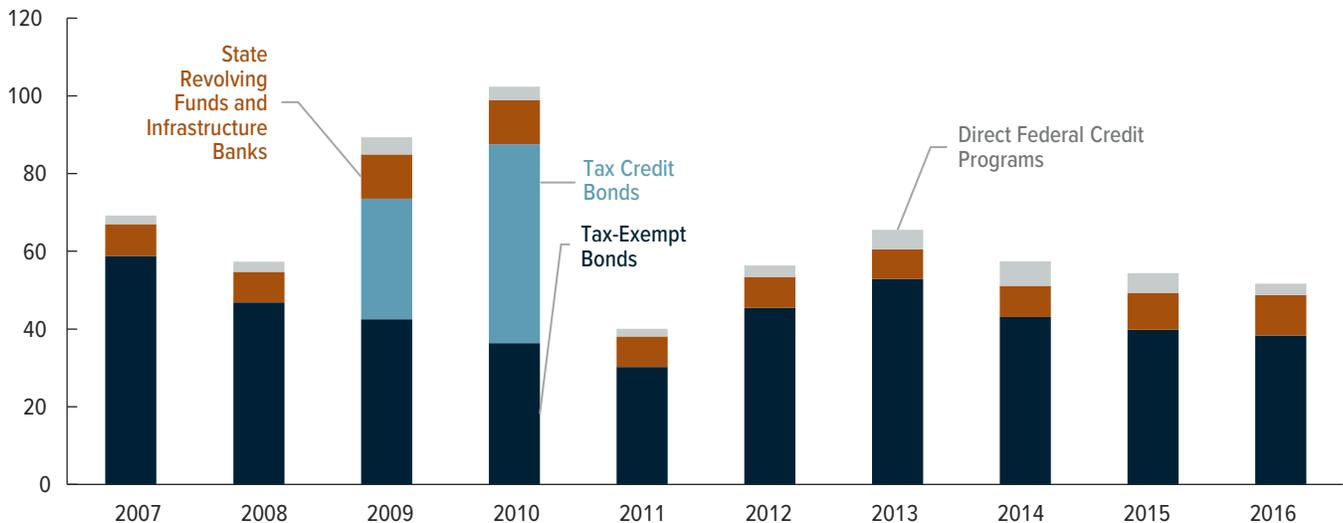
21. See David Randall Peterman, *The Railroad Rehabilitation and Improvement Financing (RRIF) Program*, Report for Congress

R44028 (Congressional Research Service, January 31, 2018), p. 4, <https://go.usa.gov/xPXDE>.

Figure 1-1.

Federally Supported Financing for Transportation and Water Infrastructure, 2007 to 2016

Billions of 2017 Dollars



Source: Congressional Budget Office, using data from the Internal Revenue Service, the Department of the Treasury, the Office of Management and Budget, various state infrastructure banks, Thomson Reuters, the Department of Agriculture, the Environmental Protection Agency, and the Department of Transportation.

private corporations for publicly sponsored projects) for certain kinds of investment in water infrastructure. Eligible types of projects include those involving drinking water, wastewater, desalination or other water supply facilities, and drought mitigation. The Environmental Protection Agency (EPA) administers the program for drinking water and wastewater projects, and the Army Corps of Engineers administers it for water resource projects.

The WIFIA program targets larger projects than those usually served by the state revolving fund programs: The minimum project size is \$20 million for large communities and \$5 million for small ones. And unlike the SRF programs, the WIFIA program can assist projects that are not tied to meeting federal clean water or drinking water standards.

In fiscal year 2017, the program received its first appropriations of \$25 million in funding to EPA to cover loan costs plus additional amounts for administrative expenses.²² The Office of Management and Budget (OMB)

22. See Jonathan L. Ramseur and Mary Tiemann, *Water Infrastructure Financing: The Water Infrastructure Finance and Innovation Act (WIFIA) Program*, Report for Congress R43315

estimated the program's subsidy rate to be 1.55 percent, so the \$25 million appropriation would allow the program to provide up to \$1.6 billion of assistance. However, that subsidy estimate was particularly uncertain (OMB referred to it as "notional") given that the program had not yet made any loans.²³ EPA invited sponsors of 12 projects, seeking a total of about \$2 billion, to submit their final applications for approval in August 2017. In April 2018, EPA awarded the program's first loan, for \$135 million.²⁴

Use of Federally Supported Financing Mechanisms in Recent Years

Of the various mechanisms available to state and local governments, tax-exempt bonds provided the majority of federally supported financing over the 2007–2016 period

(Congressional Research Service, September 26, 2018), p. 10, <https://go.usa.gov/xPXDs>.

23. See Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2018: Analytical Perspectives* (May 2017), Table 19-2, www.govinfo.gov/app/details/BUDGET-2018-PER.

24. See Environmental Protection Agency, "EPA Announces First Water Infrastructure Loan Under WIFIA" (press release, April 20, 2018), <https://go.usa.gov/xPXWx>.

for all of the categories of infrastructure examined in this analysis (see Table 1-4). Their dominance was particularly notable for state and local aviation infrastructure, for which fewer alternative methods of financing have been available. State revolving funds for water utilities were heavily used as well, accounting for 32 percent of financing for that category of infrastructure. However, state infrastructure banks for highways and mass transit received minimal use. Direct federal credit programs accounted for small portions of financing, between 5 percent and 8 percent, for the types of infrastructure for which they are available (highways, mass transit, and water utilities).

During the 2007–2016 period, the total amount of transportation and water infrastructure that state and local governments financed each year fluctuated from about \$40 billion to \$100 billion, averaging \$64 billion (see Figure 1-1). Most of the variation resulted from differences in the amount of tax-exempt bonds issued each year and from the availability of the Build America Bonds tax credit program in 2009 and 2010.

The advantageous terms that the program offered state and local borrowers appear to have pulled forward some bond issuance from subsequent years—particularly 2011, when the volume of tax-exempt bonds issued was at its lowest during the 10-year period.

Federally supported financing through state revolving funds and infrastructure banks was fairly consistent at about \$8 billion per year (in 2017 dollars) from 2007 through 2014—with the exception of 2009 and 2010, when ARRA increased capitalization grants for the water SRFs and the total grew to \$11 billion. In both 2015 and 2016, state bank financing totaled about \$10 billion.

Financing provided by direct federal credit programs varied from \$2 billion to \$6 billion per year over the 2007–2016 period. The largest amounts were financed from 2013 through 2015. That surge in use followed changes in the 2012 transportation authorization law that substantially increased funding for the TIFIA program.

Comparing Estimated Federal Costs of the Financing Mechanisms

Federally supported financing mechanisms impose costs on the federal government in different ways. Some types of costs, such as the tax revenues forgone on a tax-exempt bond, are incurred over the length of the financing term. Other costs, such as spending for capitalization grants to state revolving funds and infrastructure banks, are incurred immediately. The financing itself can also occur all at once or over many years, as happens when state banks make direct loans and then recycle repayments of those loans into new lending.

To facilitate comparisons among the mechanisms despite the differences in timing, CBO focused its analysis on a common financing term of 20 years and estimated the ratio of the present value of each mechanism's federal cost to the present value of the infrastructure it finances.¹ With the resulting measure of federal cost per dollar of financing provided, higher costs generally represent larger subsidies to state and local governments. There is an important exception, however: As discussed below, federal costs are higher for tax-exempt bonds than for tax credit bonds that provide the same federal subsidy, because part of the cost of tax-exempt bonds represents gains to certain bondholders rather than a subsidy of investment by state and local governments.

For this analysis, CBO estimated the average federal cost of financing through tax-exempt bonds and through direct or leveraged loans from state revolving funds and infrastructure banks. (About one-quarter of SRF

assistance during the 2007–2016 period came from leveraged funds, CBO estimates.) Those costs are sensitive to interest rates and other factors that can change from year to year, so CBO focused not on current costs but on costs for financing in 2023, a representative future year. Interest rates, especially for Treasury securities, have been particularly low in the aftermath of the 2007–2009 recession. But in CBO's April 2018 economic projections, those rates roughly stabilize at higher values beginning in 2023.²

CBO did not independently estimate the costs of direct federal credit programs because it had no basis for projecting the details of the loans that those programs will make or guarantee in the future. Instead, CBO adopted an estimate by the Department of Transportation for the Transportation Infrastructure Finance and Innovation Act program, which accounted for three-fifths of the federal direct credit for transportation and water infrastructure provided between 2007 and 2016. That estimate is based on the program's experience to date and is not specific to 2023 or to 20-year financing (most TIFIA loans are for 30 to 35 years).³ Other direct federal credit programs will have different costs to the extent that the loans they make or guarantee are more or less risky than the TIFIA program's have been or that they charge higher or lower interest rates for the credit they provide. The costs of the TIFIA program could also change if its portfolio becomes more or less risky, on average.

No federal programs authorizing new tax credit bonds for transportation or water infrastructure currently exist. CBO did not estimate the average cost of a future program, which would be determined by the authorizing

1. In contrast, the budgetary estimates that CBO or the staff of the Joint Committee on Taxation would provide for legislation affecting federal support for infrastructure financing would be dollar amounts based on the expected volume of financing rather than ratios of federal costs per dollar of financing provided. Also, the estimates for bond programs and state bank programs would reflect costs incurred during the first 10 years for bonds issued and capitalization grants made during that period rather than discounted present values of the entire future stream of costs associated with one year's bonds and grants.

2. See the fourth panel of Figure 1-1 in Congressional Budget Office, *The Budget and Economic Outlook: 2018 to 2028* (April 2018), p. 8, www.cbo.gov/publication/53651.

3. See Department of Transportation, *Transportation Infrastructure Finance and Innovation Act: 2016 Report to Congress* (August 2016), p. 2, <https://go.usa.gov/xPX5c>.

legislation.⁴ However, as useful points of comparison, CBO estimated the federal costs of future tax credit bonds that would provide either the same degree of support to bond issuers as traditional tax-exempt governmental bonds or, more generously, the same credit as Build America Bonds, the most recent program of tax credit bonds that could be used for transportation or water infrastructure.

Estimated Average Federal Costs of the Financing Mechanisms

The federal cost per dollar financed depends on the mechanism used and the length of the financing term (see Figure 2-1). For 20-year financing in 2023, tax-exempt bonds are projected to cost the federal government 26 cents per dollar of financing provided; direct loans from state banks, 23 cents; and leveraged loans from state banks, 43 cents.⁵ (Because CBO did not estimate the average cost of a future program of tax credit bonds, those bonds are excluded from Figure 2-1.) Loans from the TIFIA program typically have a term of 30 years or more; the Department of Transportation estimates the cost of the program's loans at 7 cents per dollar of financing provided, as measured under the Federal Credit Reform Act of 1990 (FCRA).

CBO's estimate for direct loans from state banks reflects 40 years of loan repayments recycled into new loans. Extending the analysis to cover more years of recycling would increase the total amount of financing provided from the initial federal grant and thus would reduce the estimated cost per dollar financed, although the effect of additional years is diminished by discounting. Preliminary analysis indicates that an estimate of federal

costs based on 50 years of recycling instead of 40 years would be 20 cents per dollar financed rather than 23 cents.

Longer financing periods for tax-exempt bonds, including those issued by state banks, carry higher federal costs, reflecting the fact that longer periods mean more years of forgone tax revenues on those bonds. In the case of leveraged loans from state banks, an additional factor is at work: Paying more years of interest on the bonds that provide the funding for those loans reduces the volume of loans a bank can make from a given amount of capitalization, thus increasing the cost per dollar financed. For both tax-exempt bonds and leveraged loans, the difference in federal costs between 30-year and 20-year terms is smaller than the difference between 20-year and 10-year terms, reflecting the fact that present-value calculations discount later years more heavily than earlier years.

The same pattern applies to direct state bank loans: Loans with shorter financing periods cost the federal government less per dollar financed, and loans with longer periods cost the government more. In this case, the reason is that the longer the financing term, the more slowly repayments of existing loans provide funds that can be recycled into new loans. State revolving funds for wastewater and drinking water commonly make loans for 20-year periods.⁶ CBO limited the scope of this analysis by not estimating costs for direct loans with 10-year or 30-year terms.

For the TIFIA direct credit program, the Department of Transportation reports a ratio of \$14 in loan volume per dollar of program funds, which corresponds to a federal cost of about 7 cents per dollar financed.⁷ That estimate is far below the federal costs of the other mechanisms for 30-year financing (and even for 20-year financing)—but, as discussed below in the section on direct federal credit programs, it does not reflect all of the costs to taxpayers of the direct credit mechanism.

4. Lawmakers could set the tax credit equal to any desired share of the interest paid on the bonds or to any desired number of basis points relative to the bonds' face value. In practice, however, a successful program cannot set the credit rate too low if state and local governments can still issue tax-exempt bonds, because those governments would ignore the tax credit bonds and continue to issue only tax-exempt bonds. Conversely, a high credit rate could lead governments to switch entirely to the new bonds.
5. CBO's estimates for tax-exempt bonds do not distinguish between traditional governmental bonds, qualified private activity bonds, and grant anticipation bonds. Doing so would require having information that is not readily available about differences in the average marginal tax rates faced by all holders of such bonds and by "market-clearing" bond buyers (people whose purchases of tax-exempt bonds would change with small changes in the bonds' returns relative to the returns from other investments).

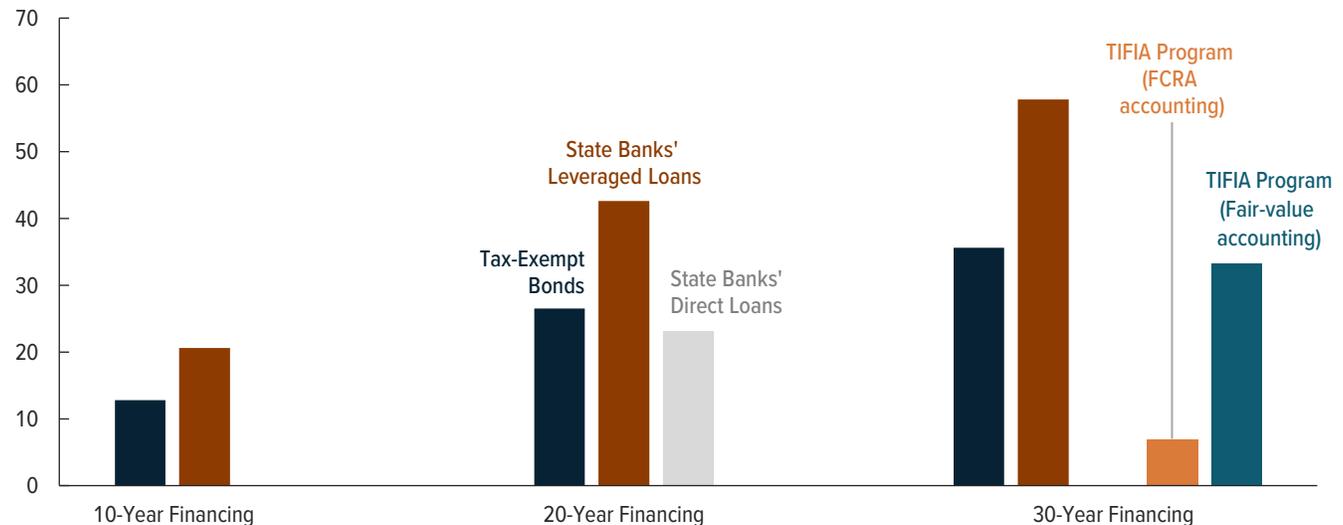
6. Rick Farrell, Executive Director, Council of Infrastructure Financing Authorities, personal communication (February 2, 2017).

7. See Department of Transportation, *Transportation Infrastructure Finance and Innovation Act: 2016 Report to Congress* (August 2016), p. 2, <https://go.usa.gov/xPX5c>.

Figure 2-1.

Projected Average Federal Costs, by Mechanism and Financing Term, Fiscal Year 2023

Cents per Dollar Financed



Source: Congressional Budget Office.

Estimates for state banks' direct loans and for the TIFIA program are shown for the terms (20 years and 30 years, respectively) that are most representative of the financing provided through those mechanisms.

FCRA = Federal Credit Reform Act of 1990; TIFIA = Transportation Infrastructure Finance and Innovation Act.

Tax-Exempt Bonds and State Bank Loans

To estimate the federal cost of financing provided through tax-exempt bonds or state bank loans in 2023, CBO had to project values for several variables, such as the interest rates on tax-exempt bonds and Treasury bonds, the average marginal tax rate of “market-clearing” buyers of tax-exempt bonds (investors whose purchases of new tax-exempt bonds would change with small changes in the returns on those bonds relative to the returns on alternative investments), and the rate at which the average dollar of interest received on a tax-exempt bond would have been taxed if not for the exemption.⁸

8. A marginal tax rate is the percentage of an additional dollar of income that is paid in taxes. The type of interest rate that is most relevant to this analysis is the rate paid by the issuer of a bond (such as a state government), which equals one year's interest payments per dollar of the bond's proceeds, given any premium or discount in the original sale price. That rate may differ from the coupon rate, which equals annual interest payments per dollar of the bond's face value, and the yield, which equals annual interest payments per dollar of the bond's current value (based on the market price at which bonds are currently bought and sold). The interest rate equals the coupon rate if the bond was issued at

CBO's base-case estimates for a 20-year financing term reflect the following premises, which are derived in part from CBO's economic projections:

- A 4.8 percent interest rate on 20-year tax-exempt governmental bonds rated Aa,⁹
- A 4.1 percent interest rate on 20-year Treasury bonds,
- A 30.5 percent marginal federal tax rate on the average dollar of interest received on tax-exempt bonds,

par (that is, if the initial buyer paid \$1 per dollar of face value); the interest rate equals the yield if the original sale price equals the current market price.

9. CBO used Moody's Aa rating as a representative rating for all tax-exempt governmental bonds because it was the most common rating on such bonds in recent years. Specifically, between 2012 and 2016, bonds rated Aa accounted for 56 percent to 60 percent of the annual dollar volume of all long-term municipal bonds rated by Moody's; see Thomson Reuters, *The Bond Buyer Yearbook* (SourceMedia, various years).

- A 22 percent average marginal tax rate for market-clearing buyers of tax-exempt bonds,¹⁰ and
- A 6.1 percent interest rate on 20-year bonds if they were not exempt from federal taxes.¹¹ (For more discussion of the role of that premise in CBO's analysis, see the appendix.)

Calculating those average tax rates involved making judgments about who would be holding tax-exempt bonds in 2023 and what tax brackets they would be in. CBO modeled tax-exempt bonds as being held entirely by households in 2023 and as being distributed among households the same way they were in 2012, according to data from the Internal Revenue Service (IRS).

CBO judged that the IRS data about households' bond holdings in 2012 are useful for projecting holdings in 2023 despite the reductions in marginal tax rates that were enacted in major tax legislation in 2017 (Public Law 115-97). Those reductions made the tax exemption on governmental bonds less valuable to investors (and thus can be expected to lead to higher interest rates on tax-exempt bonds as issuers strive to keep their offerings competitive with other investments). But the changes did not greatly affect the bonds' *relative* value to different households because the reductions in marginal tax rates were similar at all levels of household income. The decrease in the value of the tax exemption was much greater for corporations, most of which experienced a reduction in their marginal tax rate from 35 percent to 21 percent.

CBO's estimates of the federal cost of financing provided through state banks reflect some additional premises:

- The federal government provides 80 percent of the funding used to capitalize state banks, and states provide the other 20 percent;
- The banks lend money to project sponsors at an interest rate that is 200 basis points (2.0 percentage

points) below the rate on tax-exempt governmental bonds; and

- Cash available from banks' bond issues is invested in Treasury bonds.

The federal government's share of funding to capitalize state banks reflects current law, and the other premises are based on the current behavior of SRFs. As discussed later in this chapter, CBO analyzed how sensitive its estimates of federal costs are to various changes to the premises used in this analysis.

Tax Credit Bonds

CBO did not predict the amount of subsidy that lawmakers would authorize in any future program of tax credit bonds for infrastructure, but for illustrative purposes, it compared the costs of similar tax-exempt and tax credit bonds. That analysis, which is described below, illustrates the fact that tax credit bonds are more cost efficient than tax-exempt bonds at providing federal support to state and local governments. Specifically, tax credit bonds could provide the same amount of support to their issuers as tax-exempt bonds at a federal cost that is 28 percent lower. Stated another way, tax credit bonds could provide issuers with 39 percent more support than tax-exempt bonds for the same federal cost.¹²

The reason for the difference in federal costs between tax credit and tax-exempt bonds is that all of the federal cost of a tax credit bond represents benefits to issuers, whereas part of the cost of a tax-exempt bond represents benefits to certain bondholders.¹³ All holders of the same tax-exempt bond receive the same rate of interest on it, but they do not benefit equally from the tax exemption for that interest: Bondholders with higher marginal tax rates save more than those with lower marginal tax rates. To sell the desired quantity of bonds, issuers must offer interest rates that are high enough to appeal to some investors whose tax rates are lower than other investors' or who find the bonds less attractive for other reasons. Interest rates that were any lower would not "clear the

10. That percentage is an average for all market-clearing buyers under the new tax rates enacted in 2017. Individual buyers of tax-exempt bonds could be in higher or lower tax brackets and still be sensitive to small changes in relative investment returns if they place different values on various characteristics of those bonds and alternative investments, such as liquidity or the trade-off between risk and return.

11. The 6.1 percent was calculated as follows: $0.048 \div (1 - 0.22)$.

12. $1 \div (1 - 0.28) = 1.39$. The estimates in this section ignore any differences in the costs of issuing the bonds, which could somewhat reduce the efficiency advantage of tax credit bonds.

13. For further discussion of the relative cost of tax credit bonds, see Congressional Budget Office and the staff of the Joint Committee on Taxation, *Subsidizing Infrastructure Investment With Tax-Preferred Bonds* (October 2009), www.cbo.gov/publication/41359.

market” because those investors would buy taxable bonds or other investments instead of the tax-exempt bonds. Bondholders who are not market-clearing buyers save more in taxes than is necessary to compensate them for the lower interest rate of tax-exempt bonds; those additional savings represent costs to the federal government that do not benefit bond issuers.

Given the average tax rates that CBO used for its base-case estimates of federal costs, tax-exempt bonds save their issuers 22 percent in interest costs (the average marginal tax rate for market-clearing buyers) but cost the federal government 30.5 percent of the revenues it would have received if the bonds’ interest had been taxable (the average marginal tax rate for all holders of tax-exempt bonds). The result is that 72 percent ($0.22 \div 0.305 = 0.72$) of the federal cost of tax-exempt bonds benefits issuers, and the remaining 28 percent represents gains to bondholders not in the market-clearing group.

Consequently, tax credit bonds that produced the same savings for their issuers as tax-exempt bonds—because they carried a credit rate of 22 percent—would cost the federal government 28 percent less than the tax-exempt bonds. For CBO’s base case of 20-year bonds issued in 2023, those tax credit bonds would cost the federal government 19 cents per dollar financed, whereas the tax-exempt bonds cost 26 cents.

Alternatively, future tax credit bonds that carried a 35 percent credit rate—the rate of the cash payments offered under the Build America Bonds program—would cost the federal government a bit more than tax-exempt bonds but would provide a much larger subsidy to state and local issuers. Specifically, the federal cost would be 15 percent greater ($0.35 \div 0.305 = 1.15$)—about 30 cents per dollar financed—whereas the savings to issuers would be almost 60 percent greater ($0.35 \div 0.22 = 1.59$).

Direct Federal Credit Programs

The costs of federal credit programs can be measured in various ways. Current budgetary practice is governed by FCRA, which defines the cost of a credit program as the present value of its net cash flows. For a federal loan, that present value reflects the following factors:

- The amount loaned;
- Any up-front fees or charges collected from the borrower;

- The expected stream of repayments, given the interest rate charged on the loan and the estimated probabilities of default and of recovering assets after a default; and
- The discount rates used to convert future cash flows into a present value.¹⁴

Although budgetary costs measured under FCRA take the risk of default into account, they do not reflect the extent to which that risk is greater when the economy as a whole is weak. Such correlation between the risks of a particular investment and the macroeconomy leads to market risk—the component of financial risk that remains even after investors have diversified their portfolios as much as possible.

Federal credit programs expose the government to market risk because defaults are more likely to occur when the overall economy is performing poorly, making losses particularly undesirable. That market risk is effectively passed on to taxpayers, who, as investors, would regard that risk as having a cost and would require compensation for accepting it. (Other federally supported financing mechanisms assign the market risk of a project to nonfederal parties. With tax-preferred bonds, bondholders assume the risk and are compensated for doing so through the interest rate they are willing to accept. State revolving funds and infrastructure banks assume the risk of the projects they finance.)

An alternative measure of the cost of federal credit programs, known as fair-value accounting, takes market risk into account. Under that measure, the discount rates used to calculate present-value costs are typically higher than the Treasury bond rates used for FCRA purposes; the reason is that they include an estimate of the risk premium that private investors would require to accept similar amounts of market risk. For a loan, higher discount rates reduce the present value of the stream of repayments and thus increase the net cost of the loan.

CBO estimates risk premiums for various federal programs that make loans. First, it estimates credit ratings for a program’s portfolios of loans on the basis of the loans’ maturities and reported default rates. Then, CBO

14. CBO discounted future amounts using its projections of interest rates on Treasury securities with comparable maturities (for instance, using the projected interest rate on 10-year Treasury notes to discount cash flows occurring 10 years ahead).

derives risk premiums corresponding to those credit ratings using past data on interest rates on corporate bonds. That approach produces an estimated risk premium for the TIFIA program of 150 basis points in 2018.¹⁵

For this analysis, CBO applied the estimated risk premium of 150 basis points to the Department of Transportation's analysis of the TIFIA program's projected loan portfolio in 2018. With that risk premium, the estimated federal cost per dollar financed is 31.4 cents, compared with the Office of Management and Budget's FCRA estimate of 6.6 cents for the program in 2018. CBO applied that 31.4-to-6.6 ratio of fair-value to FCRA estimates for 2018 to the 7 cent FCRA estimate reported for the TIFIA program based on its average experience to date, producing a fair-value estimate of 33 cents per dollar financed (see Figure 2-1 on page 17).

The fair-value costs of other direct federal credit programs would depend on the degree of market risk accompanying their assistance. Loans from the Water Infrastructure Finance and Innovation Act program, for example, are likely to involve less market risk because water use tends to be less affected by economic downturns than road use.¹⁶ In a recent analysis of various federal credit programs, CBO estimated that the market risk of TIFIA direct loans is comparable to that of commercial loans rated BB-, whereas the market risk of direct loans from the WIFIA program is comparable to that of commercial loans with a higher rating of BBB-.¹⁷

15. The market risk premium associated with a corporate bond is not simply the spread (difference in interest rates) between that bond and a Treasury bond of the same length. CBO's method for estimating the risk premium from the spread considers such factors as default risk and liquidity risk. For a description of that method, see Congressional Budget Office, *How CBO Produces Fair-Value Estimates of the Cost of Federal Credit Programs: A Primer* (July 2018), www.cbo.gov/publication/53886; and John Hull, Mirela Predescu, and Alan White, "Bond Prices, Default Probabilities and Risk Premiums," *Journal of Credit Risk*, vol. 1, no. 2 (Spring 2005), pp. 53–60, <http://doi.org/10.21314/JCR.2005.007>.

16. For example, people who need to decrease their spending in a recession may take fewer trips and go out less often, thus reducing auto travel, but cut back relatively little on their water and sewer use.

17. See Supplemental Table 3 in the supplemental tables for 2019 posted with Congressional Budget Office, *Fair-Value Estimates of the Cost of Federal Credit Programs in 2019* (June 2018), www.cbo.gov/publication/54095. In contrast,

Effects of Increased Use of the Financing Mechanisms

If state and local governments significantly expanded their use of any of the financing mechanisms, whether because of federal policy changes or for other reasons, the incremental costs to the federal government of the additional use would probably be higher than the average costs presented here. Those averages are likely to understate the costs of financing an additional \$1 billion of infrastructure—and to understate even more the costs of an additional \$10 billion or \$100 billion—for several reasons, some of which are specific to the individual financing mechanisms:

- For tax-exempt bonds, CBO's estimate of average costs is based on the agency's projection of interest rates on bonds in 2023. Combined with CBO's projections of other macroeconomic variables, those rates imply some total quantity of tax-exempt bonds issued in the base-case scenario. Significantly different quantities of those bonds could lead to different costs. For example, if states issued a much larger volume of tax-exempt bonds, they would have to pay a higher average interest rate on the bonds to attract additional investors. That higher rate would be associated with larger forgone federal tax revenues for each dollar financed (unless there was an offsetting shift in the distribution of bond holdings to taxpayers in lower tax brackets).
- For a future program of tax credit bonds, average and incremental costs could be the same if the federal tax credit for the bonds' issuers was defined as a fixed number of basis points. However, if the credit was defined as a percentage of the interest that the issuers pay to bondholders (as was the case in the Build America Bonds program), the incremental costs would be higher than the average costs, as they are for tax-exempt bonds.
- For state banks, a large expansion of their operations—such as one spurred by larger federal capitalization grants—could cause the banks to incur higher costs for marketing and outreach or for greater loan-rate subsidies or other inducements for

only 2 percent of the volume of long-term state and local bonds issued in 2016 and rated by Standard & Poor's, Fitch, or Moody's carried ratings equivalent to BBB- or below; CBO calculation using data from Thomson Reuters, *The Bond Buyer 2017 Yearbook* (SourceMedia), p. 35.

borrowers. CBO has no data with which to quantify a relationship between nationwide bank capitalization or loan volumes and federal costs.

- For direct federal credit programs (such as TIFIA) that provide a subsidy to borrowers, potential projects present a spectrum of risk. A large expansion could theoretically move the program along the spectrum to riskier projects, thereby increasing the average federal cost per dollar financed. However, data on annual subsidy rates for the TIFIA program do not show evidence of rising costs over time, which suggests that the program has not taken on higher-risk projects as the amount of credit it supplies has increased.

The federal costs of financing additional infrastructure could also be higher than the average costs shown here because of the effects that expanding one mechanism could have on the use of other mechanisms. To the extent that increasing the amount of financing provided through one mechanism led to a partially or totally offsetting reduction in the use of a lower-cost mechanism or in the use of pay-as-you-go funding from state or local sources, federal costs would rise with no net increase in the stock of infrastructure.

Even if federal policymakers made financing more broadly available and offered more attractive terms than are now being provided, they could not directly increase the use of federally supported financing mechanisms. The volume of tax-exempt bonds, for example, is determined in the market, based on the desire of state and local governments to issue them and the willingness of investors to hold them. With some mechanisms—such as qualified private activity bonds, tax credit bonds, and direct credit programs—the federal government can raise ceilings on the amount of financing available by providing more funding or increasing explicit caps. But such changes may have no effect if a ceiling is not binding (as is currently true for the TIFIA program, which has had an unobligated balance of more than \$1 billion since 2013).

Sensitivity of CBO’s Projections of Federal Costs for Tax-Exempt Bonds and State Bank Loans

The calculations that produced CBO’s estimates of the federal cost of supporting infrastructure through tax-exempt bonds and state banks rely on specific values for a number of key variables, as described earlier in this

chapter. To test the sensitivity of its estimates of federal costs for 20-year financing, CBO examined how the estimates would change with different values for the following variables:

- Average marginal tax rates in 2023 for all investors who hold tax-exempt bonds and for the buyers of those bonds who are market-clearing investors;¹⁸
- Interest rates in 2023 on Treasury bonds, tax-exempt bonds, and loans from state banks; and
- The required matching ratio of state funds to federal funds used to capitalize state banks.

Those factors are subject to uncertainty for various reasons. All of them are uncertain because they could be affected by changes in policy, whether federal law or the operating policies of state banks. Projections of tax rates and the interest rates on bonds are also uncertain because models cannot perfectly predict changes to the economy over time. Further, projected marginal tax rates for bondholders are uncertain because even their past values can only be estimated, not directly observed. For example, CBO’s estimate of the tax rate for market-clearing investors is based on two published studies that inferred that rate by comparing interest rates on samples of tax credit bonds and tax-exempt bonds in 2009 and 2010 (see the appendix).

In most cases, uncertainty about those factors has the same effect on CBO’s estimate of a mechanism’s federal cost regardless of whether the uncertainty stems solely from the possibility of policy changes or also from the limitations of future projections or of information about the past. However, as discussed below, that is not true for the tax rate for market-clearing investors.

Sensitivity to Tax Rates

In CBO’s analysis, the federal costs of tax-exempt governmental bonds—and of state bank loans made using proceeds from such bonds—depend directly on the average marginal tax rate faced by investors who hold those bonds. Estimated costs also depend indirectly on the average marginal tax rate faced by investors who clear the

18. CBO projects tax rates for the tax year, which corresponds to the calendar year for most taxpayers. The results of the cost analysis would not change significantly if CBO used a weighted average of bondholders’ rates for tax years 2022 and 2023 to estimate tax rates that correspond to fiscal year 2023.

market for those bonds; their average rate is combined with the interest rates on those bonds to calculate the rates that such bonds would carry if they were taxable.

Average Marginal Tax Rate for All Holders of Tax-Exempt Bonds. Of those two average tax rates, the one for all bondholders is subject to less uncertainty because past values can be estimated from IRS data. Increasing or decreasing the base-case tax rate of 30.5 percent by 3 percentage points changes the federal cost of 20-year financing by 2.6 cents per dollar financed for both tax-exempt bonds and state banks' leveraged loans (see the top panel of Figure 2-2). Those two mechanisms are affected equally because both involve issuing a dollar of bonds for every dollar of infrastructure financed. By contrast, changing the average marginal tax rate for all bondholders has no effect on the cost of state banks' direct loans because those loans do not require the issuance of any bonds.

Average Marginal Tax Rate for Market-Clearing Investors. Available data do not identify which bondholders are in the market-clearing group, so CBO's estimate of their average marginal tax rate in 2023 is subject to two types of uncertainty:

- The estimate of the market-clearing marginal tax rate in 2010 is subject to uncertainty because of possible imprecision in the studies that inferred that tax rate (which was based on the observed interest rates for tax-exempt bonds and tax credit bonds) or CBO's application of the studies' results.
- Even if the estimate of the market-clearing rate in 2010 is accurate, uncertainty exists about changes in that rate between 2010 and 2023 (for example, because of real bracket creep, changes over time in the markets for alternative investments or in overall economic conditions, changes in expectations about future tax rates, or legislated changes in marginal tax rates, such as those included in the Affordable Care Act or the major 2017 tax law).¹⁹

Those two sources of uncertainty have different implications for the interest rates on hypothetical taxable

19. "Real bracket creep" occurs because the income thresholds that define tax brackets are indexed to increase at the rate of inflation. Thus, when income grows faster than inflation (as usually happens when the economy is growing), more income is pushed into higher tax brackets.

versions of governmental bonds in 2023—which underpin CBO's estimates for the costs of tax-exempt bonds and leveraged state bank loans. Any imprecision in the estimated market-clearing tax rate in 2010 directly affects CBO's estimates for 2023. In contrast, changes in the market-clearing tax rate over time may be accompanied by changes in the interest rates on tax-exempt bonds that offset some or all of the effect on the implied rates on hypothetical taxable bonds. For instance, reductions in marginal tax rates, such as those included in the major 2017 tax law, increase the after-tax return on taxable corporate bonds. When that happens, issuers of governmental bonds probably have to raise the interest rates they offer to maintain the competitiveness of their bonds. Those higher interest rates reduce, if not eliminate, the effect of the reductions in marginal tax rates on the interest rates on hypothetical taxable bonds—and thus on the federal costs per dollar of financing provided by the tax-exempt bonds.²⁰

Because the average marginal tax rate for market-clearing investors can only be indirectly inferred, CBO's estimate of it is more uncertain than the agency's estimate of the average tax rate for all bondholders. However, the estimates of federal costs are less sensitive to any given error in the market-clearing tax rate than to the same error in the average tax rate for all bondholders. Increasing or decreasing the base-case tax rate of 22 percent for market-clearing investors by 3 percentage points, while holding constant interest rates on tax-exempt bonds, changes the federal cost of 20-year financing through tax-exempt bonds or leveraged loans by 1.1 cents per dollar financed instead of by 2.6 cents (see the bottom panel of Figure 2-2).²¹ The effects on estimated costs

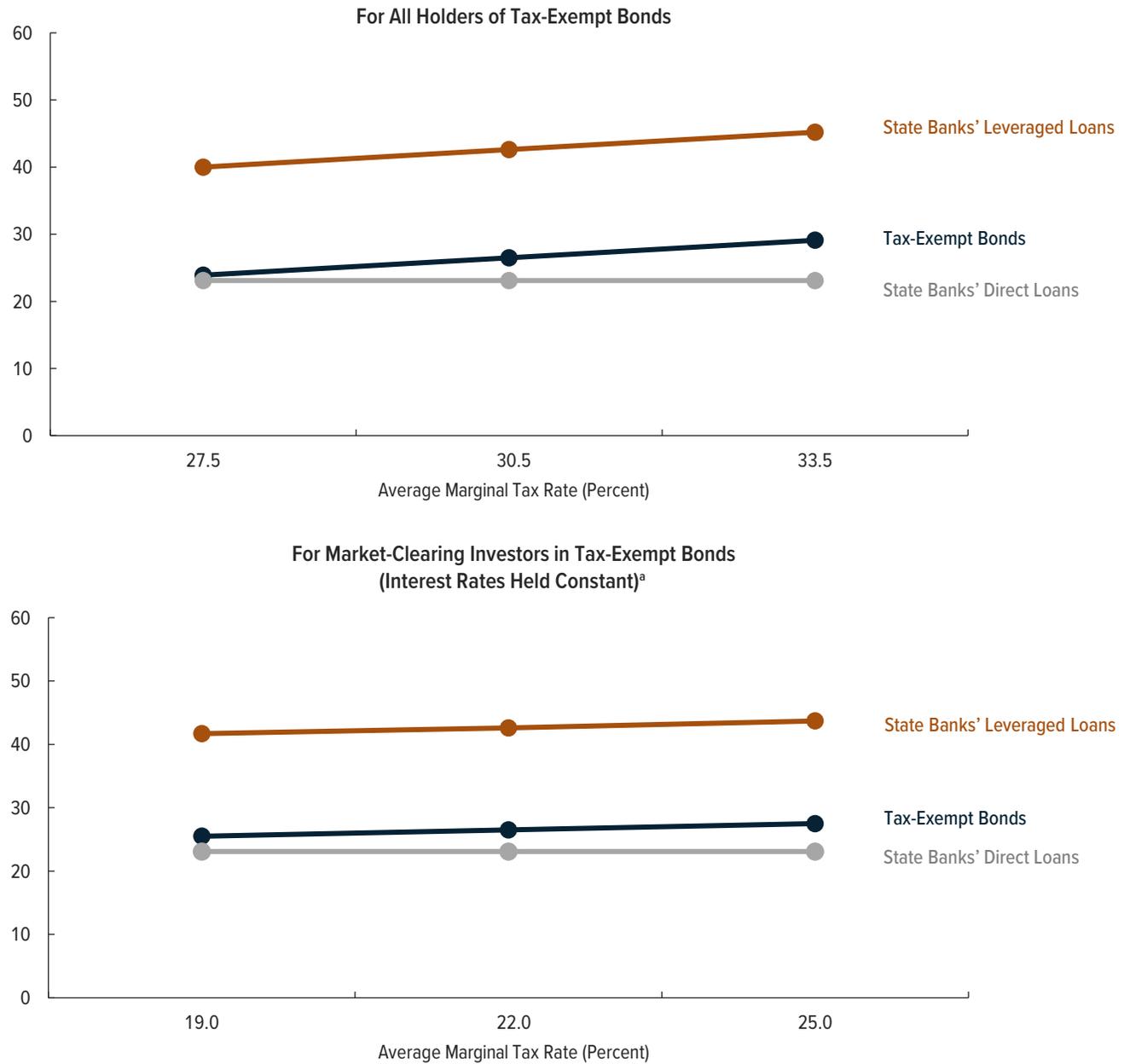
20. In the extreme case, a reduction in marginal tax rates that had no effect on the implied interest rate on hypothetical taxable bonds (because of offsetting changes in the interest rate on tax-exempt bonds) could nonetheless affect the federal cost of the tax exemption by reducing the average marginal tax rate for all holders of tax-exempt bonds. (The effects of changes in that average rate are shown in the top panel of Figure 2-2.)

21. The estimates' lower sensitivity to the average market-clearing tax rate reflects the fact that the implied interest rate on hypothetical taxable government bonds is inversely proportional to 1 minus the average rate. Given that relationship, an increase of 3 percentage points from the 22 percent rate used in the base case leads to a relative increase of 4 percent in the implied taxable rate: $[1 \div (1 - 0.25)] \div [1 \div (1 - 0.22)] = 1.04$. The same increase of 3 percentage points results in a relative increase of 9.8 percent in the base-case value of 30.5 percent for the average tax rate of all tax-exempt bondholders: $0.335 \div 0.305 = 1.098$.

Figure 2-2.

How Different Average Marginal Tax Rates for Holders of Tax-Exempt Bonds Affect CBO’s Estimates of Federal Costs

Cents per Dollar Financed



Source: Congressional Budget Office.

The costs shown here are for 20-year financing.

The average marginal tax rates in the centers of the ranges shown (30.5 percent and 22 percent) are those used for CBO’s base-case estimates.

a. Market-clearing investors are buyers whose purchases of new tax-exempt bonds would change with small changes in the returns on those bonds relative to the returns on alternative investments. Changes in the average marginal tax rate for market-clearing investors may lead to offsetting changes in the interest rates at which tax-exempt bonds are sold. In such cases, the effects of changes in the average marginal tax rate on CBO’s estimates are smaller than the effects shown here.

are smaller if a change in the market-clearing tax rate is offset by compensating changes in interest rates on tax-exempt bonds.

Sensitivity to Interest Rates

Interest rates on both Treasury bonds and tax-exempt governmental bonds fluctuate on a daily basis and have been much higher in the past than they are now. Their movements over time tend to be correlated, but rates on the two types of bonds can also move independently, as shown by the fact that rates on Treasury bonds were higher than those on tax-exempt bonds before the financial crisis of 2007 but are now lower. State banks adjust the interest rates on the loans they make as needed to balance the competing goals of providing low-cost assistance and conserving their capital.

Large uncorrelated changes in those interest rates from CBO's base-case values can cause the costs of federal financing mechanisms to differ significantly from the estimates presented above. Such changes may also alter the ranking of the costs of the different mechanisms. More common than large uncorrelated changes, however, are correlated changes and small uncorrelated changes, which have much smaller effects on federal costs.

Interest Rates on Treasury Bonds. If everything else stays the same, higher interest rates on Treasury bonds reduce the federal costs of using tax-exempt bonds and leveraged loans to finance infrastructure, but they increase the costs of using direct loans (see the first panel of Figure 2-3). The reason for those different effects lies in the mechanisms' different time patterns of benefits and costs. With present-value estimating, higher interest rates—derived in this analysis from the interest rates on Treasury securities of different maturities—decrease the present value of future effects. For tax-exempt bonds (including those issued by state banks), the future effects are costs: the federal tax revenues that are forgone over the life of the bonds. Conversely, for direct loans supported by capitalization grants, the future effects are benefits: the new lending that occurs over time as loan repayments are recycled.

Interest rates on Treasury bonds play an additional role in CBO's estimates of the costs of leveraged loans: They determine the interest that state banks can earn on the cash available from grants and the proceeds of tax-exempt bonds. As a result, if interest rates on tax-exempt bonds are held constant, higher Treasury rates make

it easier for a bank to service its bond debt and therefore allow it to issue a larger volume of bonds—and to finance a larger volume of infrastructure investment—for a given amount of capitalization. Thus, the costs of leveraged loans are more sensitive to Treasury bond rates than are the costs of tax-exempt bonds.

Given the diverse effects of Treasury interest rates, different values for those rates can affect the cost rankings of the different financing mechanisms. For example, if the rate on 20-year Treasury bonds (4.1 percent in the base case) equaled or exceeded the tax-exempt rate of 4.8 percent (and the rates on Treasury bonds of other maturities were similarly higher), the federal costs of 20-year financing would be lower for tax-exempt bonds than for direct loans—unlike in the base case. Moreover, Treasury rates that were about 200 basis points higher than those in the base case could cause the costs of direct state bank loans to roughly equal those of leveraged loans. However, it is unlikely that economic conditions that produced Treasury rates that were 200 basis points higher than CBO's base-case projections would leave interest rates on state banks' tax-exempt bonds at their base-case levels.

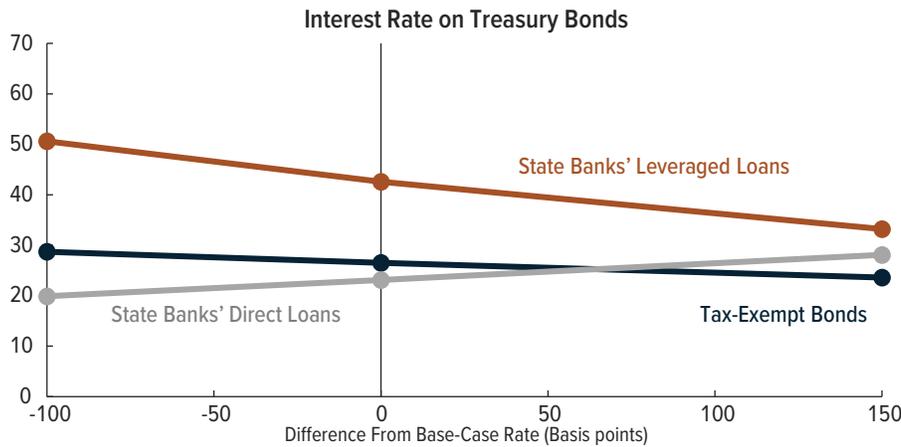
Interest Rates on Tax-Exempt Bonds and State Bank Loans. For tax-exempt bonds and leveraged loans from state banks, movements in interest rates on tax-exempt bonds and movements in rates on Treasury bonds have opposite effects on federal costs (see the second panel of Figure 2-3). Higher rates on tax-exempt bonds are associated with higher federal costs for such bonds because they imply greater forgone tax revenues on the hypothetical taxable versions of the bonds. Costs for leveraged loans are higher for the same reason and also because the higher rates on tax-exempt bonds increase banks' debt-service costs and thus reduce the volume of lending that a bank can provide from a given amount of capital.

For state banks' direct loans, by contrast, increases in rates on tax-exempt bonds have no direct effect on federal costs. Such increases may have an indirect effect, however, if banks raise the interest rates they charge on their loans to maintain a desired degree of subsidy in those loans relative to the interest costs that borrowers would face if they issued their own bonds. By itself, raising the loan rate reduces the federal cost of both direct loans and leveraged loans by increasing the repayments available for recycling into further loans or for servicing bond debt. Nonetheless, when interest rates on tax-exempt bonds and state bank loans increase by the same

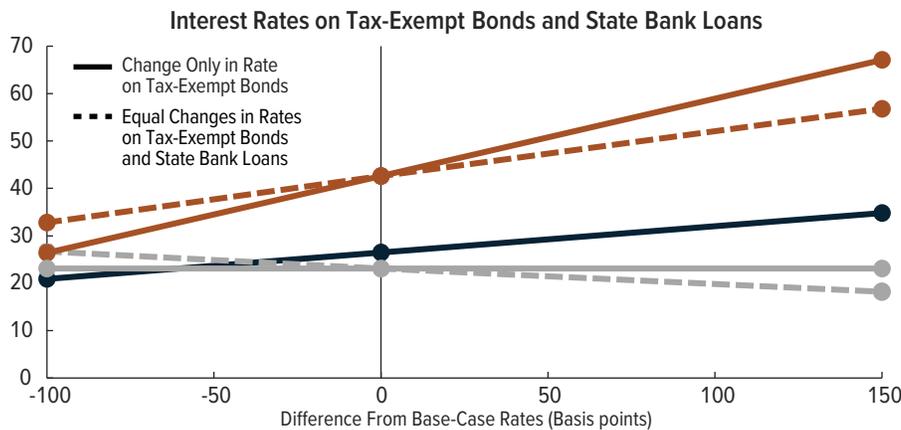
Figure 2-3.

How Different Interest Rates on Treasury Securities and Tax-Exempt Bonds Affect CBO's Estimates of Federal Costs

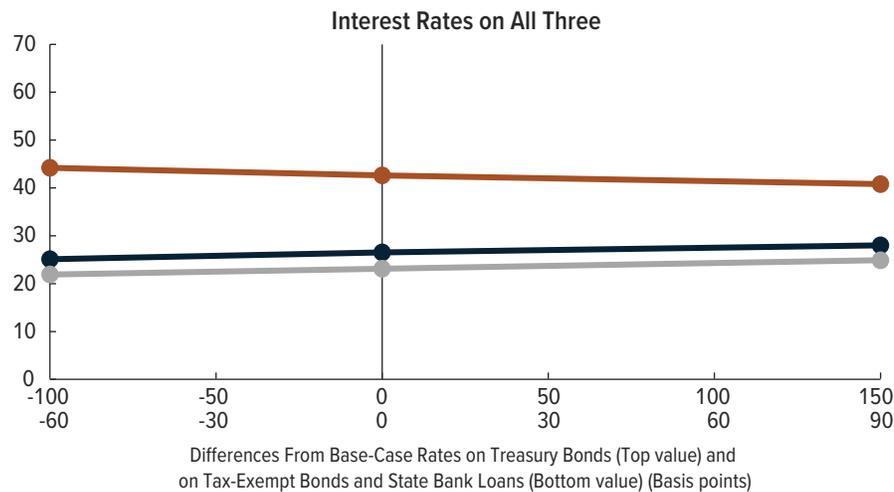
Cents per Dollar Financed



Higher interest rates on Treasury bonds reduce the current, discounted value of future effects. For direct loans from state banks, higher rates increase federal costs per dollar of financing by reducing the value of future loans made from repayments of past loans. For tax-exempt bonds and for state bank loans made from the proceeds of such bonds (leveraged loans), higher rates reduce federal costs by reducing the current value of future forgone tax revenues.



Higher interest rates on tax-exempt bonds increase the federal revenues forgone on such bonds. They also reduce the volume of leveraged loans that can be supported with a given amount of state bank capitalization, thus increasing the cost of those loans, but they have no effect on the cost of state banks' direct loans. If state banks raised the interest rates on their loans to match an increase in rates on tax-exempt bonds, the cost increase for leveraged loans would be smaller and the cost of direct loans would decline.



For each of the three financing mechanisms shown here, increases in interest rates on Treasury bonds, tax-exempt bonds, and state bank loans have a mix of positive and negative (or, in some cases, neutral) effects on federal costs. Because of those offsetting effects, representative movements in all three rates leave federal costs relatively unchanged.

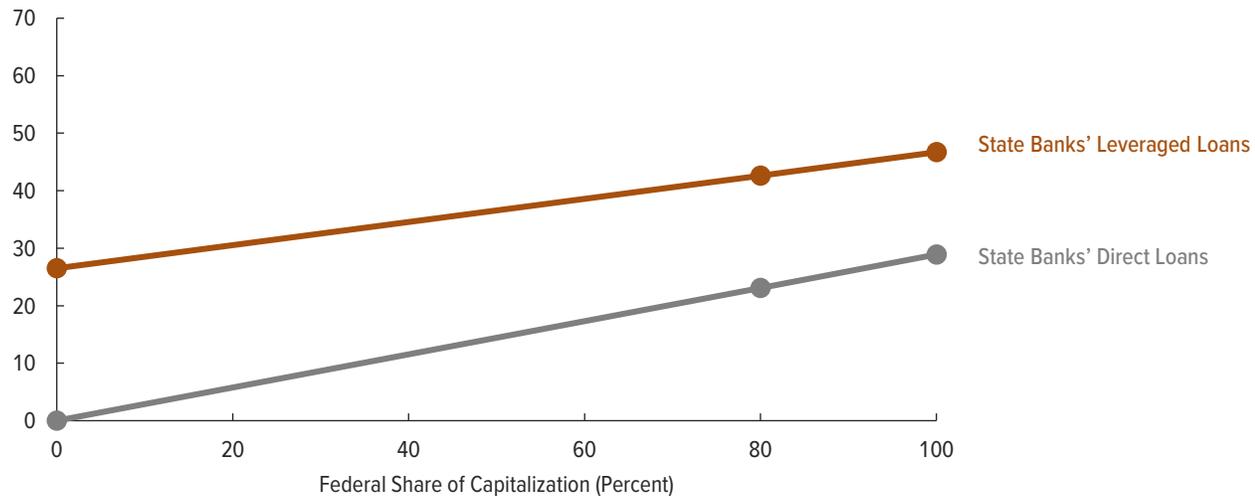
Source: Congressional Budget Office.

The costs shown here are for 20-year financing. A basis point equals 0.01 percentage point. The interest rates used for CBO's base-case estimates are 4.1 percent on Treasury bonds, 4.8 percent on tax-exempt bonds, and 2.8 percent on state bank loans.

Figure 2-4.

How Different Percentages for the Federal Share of State Banks' Capitalization Affect CBO's Estimates of Federal Costs

Cents per Dollar Financed



Source: Congressional Budget Office.

The costs shown here are for 20-year financing.

CBO's base-case estimates use a federal share of 80 percent and a state share of 20 percent, the percentages specified in current law.

amount (illustrated by the dashed lines in Figure 2-3), the net effect on the cost of leveraged loans is an increase.

Correlated Changes in All Three Interest Rates. When interest rates on Treasury bonds, tax-exempt bonds, and state bank loans move in the same direction over time, the federal costs of the financing mechanisms that CBO analyzed experience a mix of upward, downward, and neutral effects. Such correlated movements in interest rates are common: Rates on Treasury bonds and tax-exempt bonds may move together under the influence of the same macroeconomic factors, and managers of state banks may want to keep the spreads between the rates on their loans and the rates on tax-exempt bonds within desired ranges.

On the basis of historical data, CBO estimates that interest rates on tax-exempt bonds tend to increase (or decrease) by an average of 60 basis points for every increase (or decrease) of 100 basis points in rates on Treasury bonds. When those two rates for 20-year financing move together in that 60:100 ratio and state

banks keep the spread between tax-exempt bond rates and their loan rates constant, the effects on estimated federal costs per dollar financed are relatively modest: a change of roughly 1 cent to 2 cents for every 100 basis points of change in Treasury rates (see the third panel of Figure 2-3).

Sensitivity to Capitalization Shares for State Banks

Federal costs for state bank loans depend in a straightforward way on the federal government's share of the funds used to capitalize those banks. For direct loans, a bank's capitalization is the sole source of costs to the funding governments, and the total cost per dollar financed (which reflects the bank's ability to recycle loan repayments into new loans) is the same regardless of the shares of capital provided by the federal and state governments. Consequently, for direct loans, the federal cost per dollar financed is simply the total cost per dollar financed multiplied by the federal share of capitalization. That federal cost grows linearly from zero to 29 cents (all of the total cost) as the federal share of capitalization increases from zero to 100 percent (see Figure 2-4).

The story for leveraged loans is similar, except that the cost of such loans to the federal and state governments comes not only from a bank's capitalization but also from the federal tax revenues forgone on tax-exempt bonds. Those forgone revenues are the same regardless of the source of a bank's capitalization, so federal costs

per dollar financed are positive even if the federal share of capitalization is zero. As the federal share of capitalization rises toward 100 percent, the federal share of the total government costs associated with that capitalization increases proportionately.

Comparing Other Characteristics of the Financing Mechanisms

Besides having different federal costs, the approaches that the federal government uses to help states and localities finance transportation and water infrastructure differ in various qualitative ways. Some of those differences are inherent in the general characteristics of tax-exempt bonds, tax credit bonds, state revolving funds and infrastructure banks, and direct federal credit. Other differences are specific to the federal programs that implement those mechanisms and affect the programs' attractiveness to state and local governments.

General Characteristics of the Mechanisms

Financing mechanisms differ in their sources of federal funds, in their applicability to private-sector investments (mostly in publicly owned infrastructure), and in the extent to which judgments by outside parties may influence the decisions of a project's sponsors (see Table 3-1).

Sources of Federal Support

The federal government uses various processes to provide the funds that support infrastructure financing through the different mechanisms:

- *Discretionary spending* (spending subject to appropriation) is used to fund the programs that provide capitalization grants for state banks and to fund the net subsidy costs of direct federal credit programs.¹
- *Direct spending* (authorization of mandatory spending) was used for the Build America Bonds program and would probably be used for future programs of tax credit bonds.

- *Provisions of tax law* authorize exemptions from federal taxation for the interest paid on traditional tax-exempt governmental bonds, grant anticipation bonds, and qualified private activity bonds.

Those funding processes differ in the degree to which control of annual federal costs rests with the Congress or with state and local governments. Most authority for discretionary spending is provided for one year, giving the Congress an annual opportunity to review the effectiveness and desirability of the spending and to revise both the amount of appropriations and limits on how they can be used.

Direct spending and provisions of tax law can be enacted for relatively short periods before they expire, as was the case with the two-year Build America Bonds program, or for longer or indefinite periods, as is the case for tax-exempt governmental bonds and QPABs. Longer horizons provide more stability to state and local governments, although they do not preclude the Congress from revising a program before its scheduled expiration. Both direct spending and tax provisions may include dollar caps to limit federal costs. For example, the cumulative issuance of QPABs for highways and surface freight transfer facilities is capped at a total volume of \$15 billion nationwide. Within such limits, or when none exist, federal costs are driven by the decisions of state and local governments to issue bonds.

Applicability to Private Investment

State and local governments own almost all of the nation's transportation and water infrastructure (although some drinking water systems and ports are privately owned). Thus, most of the private-sector investment relevant to this analysis occurs through public-private partnerships for publicly owned infrastructure.²

1. The Transportation Infrastructure Finance and Innovation Act program is formally funded by contract authority, which is a form of mandatory budget authority. However, use of that contract authority is controlled by limitations on obligations contained in annual appropriation acts.

2. Private ownership is common for other things that could be considered infrastructure but that are not included in this analysis, such as electric utilities and communications networks.

Table 3-1.

Selected Characteristics of Federally Supported Financing Mechanisms

Mechanism	Type of Federal Support	Applicability to Private Investment	Parties Who May Influence Sponsors' Decisions About Projects
Tax-Exempt Bonds	Forgone tax revenues	Through qualified private activity bonds	For bonds backed by project revenues, credit-rating agencies and bond market advisers
Tax Credit Bonds	For traditional tax credit bonds, forgone tax revenues; for direct-pay bonds, such as Build America Bonds, mandatory spending	As specified in authorizing legislation	Same as for tax-exempt bonds
State Revolving Funds and Infrastructure Banks	For federal capitalization grants to banks, discretionary appropriations; for tax-exempt bonds issued by banks, forgone tax revenues	Unless precluded by state law or program requirements	Typically none ^a
Direct Federal Credit Programs	Discretionary appropriations ^b	Unless precluded by program requirements	In some cases, federal lenders, credit-rating agencies, or both

Source: Congressional Budget Office.

- a. State revolving funds and infrastructure banks are typically concerned with a borrowing authority's overall fiscal health, but they may reject a particular project they deem deficient.
- b. The Transportation Infrastructure Finance and Innovation Act program is formally funded by contract authority, which is a form of mandatory budget authority. However, use of that contract authority is controlled by limitations on obligations contained in annual appropriation acts. The Railroad Rehabilitation and Improvement Financing program has involved minimal federal support because borrowers have been required to cover the estimated cost of the program's loans.

All of the funding mechanisms analyzed here can be used to support private investment in infrastructure (though particular programs may limit or prohibit such support). For example:

- Tax-exempt financing is available for qualified private activity bonds. Some types of infrastructure, including airports and mass transit facilities, must be publicly owned to be eligible for QPAB financing.
- Unless precluded by state law, state revolving funds may lend money to privately owned drinking water systems and to private entities for efforts to manage stormwater and non-point-source pollution, though not for sewage treatment plants.
- Direct federal credit programs typically target loans toward projects that will generate revenue streams that can be used to pay off the loans—and that therefore may be of particular interest to private investors. In the case of the Transportation

Infrastructure Finance and Innovation Act program, the participation of private investors “is a key objective.”³

Parties Who May Influence Sponsors' Decisions About Projects

Agencies responsible for transportation and water infrastructure decide whether to pursue a particular investment by using tools such as engineering studies, projections of the resulting increases in revenues from user charges, and cost-benefit analyses. In some cases, the process of seeking financing gives those sponsors additional perspectives from outside parties about the value of the project. Such outside parties may weigh costs and benefits differently than sponsoring agencies do—for instance, they may place more importance on financial risk and less importance on nonmonetary or public benefits, such as increased safety. Nevertheless,

3. See Department of Transportation, *Transportation Infrastructure Finance and Innovation Act: 2016 Report to Congress* (August 2016), p. 10, <https://go.usa.gov/xPX5c>.

their judgments can be useful as quality-control checks or second opinions.

Concerns raised by outside parties may lead sponsors to modify the terms of the proposed financing or to seek alternative sources of financing or funding. Unfavorable judgments may lead a sponsor to make changes to the project—or, in extreme cases, to abandon the project.

The significance of the views of outside parties for project decisions depends on whether the funds that would be used to repay the financing would come from revenues generated by the project itself or from the borrower's general funds. In the case of proposed tax-exempt bonds or tax credit bonds backed by project-specific revenue streams, the perspectives that outside parties (such as credit-rating agencies and bond market advisers) provide about the quality of the bonds and about the interest rates they expect investors to require to buy the bonds are essentially judgments of the underlying projects.

In the case of proposed financing backed by more general sources of funds, outside parties tend to judge a borrower's overall fiscal health rather than the quality of the particular project. Examples of such financing include general-obligation bonds, loans that state infrastructure banks for transportation make to local governments (which are repaid from the borrowing authority's general funds), and loans that state revolving funds make to water and sewer authorities (which are typically repaid from general revenues from users).⁴ Although they tend to focus on a borrower's fiscal health, state infrastructure banks or revolving funds may decide not to approve a loan if they consider a project deficient.

Direct federal credit programs use outside opinions in various ways. The TIFIA program requires loan applicants to show that their project has received investment-grade ratings on its senior debt (bonds or non-TIFIA loans). The Department of Transportation also has a policy that the project's subordinated debt (the prospective TIFIA loan) must be rated as investment-grade. The Railroad Rehabilitation and Improvement Financing program determines the estimated cost of the default risk

of its loans using private credit ratings submitted by loan applicants or analysis by the program's staff. Loan recipients have been required to pay a deposit to cover the estimated cost of expected defaults.⁵ The Water and Waste Disposal program for rural areas uses private valuations in a different way: Applicants for assistance must certify that they are unable to finance their project "through commercial credit at reasonable rates and terms."⁶

Factors Affecting State and Local Use of Federal Financing Programs

Traditional tax-exempt governmental bonds are the most broadly applicable, and most extensively used, type of federally supported financing for transportation and water infrastructure. State and local borrowers use alternatives to those bonds mainly when they offer certain advantages, such as better credit terms, lower transaction or issuance costs, longer borrowing terms or periods when repayment is deferred, or the ability to avoid statutory or constitutional limits on the amount borrowed. However, alternatives to tax-exempt bonds may take more time to deliver the financing or may entail additional federal conditions, such as restrictions on the type or size of eligible projects, regulations about the wages a project must pay its workers, and more rigorous environmental permitting processes.

Tax-Exempt Bonds

Tax-exempt bonds are an attractive source of financing for states and localities because the federal tax exemption for interest received by bondholders allows the issuers to offer a lower interest rate, thus reducing their cost of borrowing. Those bonds are also attractive because state and local governments have substantial latitude in choosing which projects to finance from the bonds' proceeds,

4. State infrastructure banks and revolving funds do not have the same profit motive as bond investors or private banks, but they may want to minimize default risk in order to maximize the availability of funds for recycling (in the case of direct loans) or the volume of bonds that can be issued and paid off with a given amount of capital (in the case of leveraged loans).

5. Such deposits may not result in zero federal costs: If sponsors have better information about a project's risks than federal evaluators do, sponsors may be more likely to borrow under the program when the required deposit underestimates the true expected cost of default and may be less likely to borrow under the program when the required deposit overestimates that cost. See Congressional Budget Office, cost estimate for H.R. 7, the American Energy and Infrastructure Jobs Act of 2012 (February 9, 2012), www.cbo.gov/publication/43002. As discussed below, the Congress could change the requirement that sponsors provide deposits equal to projects' estimated default costs by appropriating funds to subsidize those costs, as it does for other federal credit programs.

6. Water and Waste Loans and Grants, 7 C.F.R. §1780.7 (2018).

particularly in the case of traditional governmental bonds.⁷ Some characteristics of the different types of tax-exempt bonds bear on their advantages and limitations for state and local issuers (see Table 3-2).

Traditional Tax-Exempt Governmental Bonds. Notwithstanding their popularity for transportation and water infrastructure projects, the issuance of traditional tax-exempt bonds may be limited by constitutional or statutory provisions at the state and local level. For example, 37 states limit tax-exempt general-obligation bonds—those backed by general revenues rather than by specific revenue streams—through constitutional or statutory caps on issuances or debt-service costs. (In 10 of those states, the limits can be overridden with a public vote or a legislative supermajority.) And 25 states require a public vote or a legislative supermajority for any such bonds to be issued.⁸

Grant Anticipation Bonds. These bonds are distinguished from traditional tax-exempt governmental bonds in that state and local governments can pledge future federal grants to pay debt-service costs on the bonds—interest payments and issuance costs financed from bond proceeds—not just direct project costs. (Of course, federal grants used to repay interest and issuance costs are not available for other projects.) In addition, grant anticipation bonds may be exempt from state or local constraints that limit the issuance of traditional tax-exempt governmental bonds. In particular, some states' supreme courts have ruled that GARVEE bonds do not require a public vote because they are repaid with federal funds.⁹

One disadvantage of grant anticipation bonds is that potential bond issuers must get confirmation from the federal agency overseeing the relevant grants (the Federal Highway Administration or the Federal Transit

Administration) that the project to be financed is eligible for federal grant funding, which may delay the bond offering. A further disadvantage is that issuers may have to pay higher interest rates on them than on traditional tax-exempt bonds—depending on investors' perceptions of the risk associated with the future availability of federal grant funds and on the extent to which the bonds are “backstopped” by pledges of other specific or general revenues.

Qualified Private Activity Bonds. Among their other purposes, QPABs allow tax-exempt financing to be used to support private investment in infrastructure. As a result, they have proved popular as part of financing packages for public-private partnerships.

Two factors may discourage the use of QPABs, however. First, issuers have to pay higher interest rates on those bonds than on traditional governmental bonds; on average, the difference is more than 25 basis points.¹⁰ The reason for the difference is that the market for QPABs is smaller because those bonds are not fully tax-exempt: Investors who pay the alternative minimum tax must include interest from QPABs in their taxable income (unless the bonds were issued for certain nonprofit organizations, such as hospitals and schools). QPABs were temporarily exempted from the alternative minimum tax in 2009 and 2010 by the American Recovery and Reinvestment Act, which led to a spike in their issuance.

Second, QPABs are subject to some restrictions that do not apply to traditional governmental bonds. For example, the length of the bond issue may not exceed 120 percent of the expected economic life of the infrastructure facilities being financed. In addition, the quantity of QPABs that may be issued for some purposes is limited by the federal government. For instance, the cumulative issuance of QPABs for highways and certain surface transportation projects is capped at \$15 billion nationwide, although that limit has not yet been reached.¹¹ In addition, QPABs issued for mass transit

7. In addition to tax-exempt bonds, states and localities issue very small quantities of taxable bonds. Such bonds are used when their purpose does not meet the conditions for a federal tax exemption; examples include bonds issued for housing projects led by private investors and bonds used to raise capital for underfunded pension plans.

8. See Pew Charitable Trusts, *Strategies for Managing State Debt* (June 2017), <https://tinyurl.com/y9exa5od>.

9. See Robert Puentes and David Warren, *Today's Roads With Tomorrow's Dollars: Using GARVEE Bonds to Finance Transportation Projects* (Brookings Institution, March 2005), p. 9, <https://tinyurl.com/yccafvc>.

10. See Robert Puentes, “Promoting Infrastructure Investment Through Private Activity Bonds,” *The Avenue* (blog entry, Brookings Institution, October 25, 2012), <https://tinyurl.com/yckhxy>.

11. The Department of Transportation has defined the highway category (formally “highways and surface freight transfer facilities”) as encompassing QPABs issued for transit projects that would be eligible for federal aid under the Surface Transportation Block Grant program.

Table 3-2.

Comparison of Various Tax-Preferred Bonds for Transportation and Water Infrastructure

Category	Source of Main Financial Benefit to Issuers	Other Significant Advantages for Issuers	Significant Disadvantages for Issuers
Tax-Exempt Bonds			
Governmental Bonds			
Traditional governmental bonds	The interest income that bondholders receive is generally exempt from federal taxes, so issuers can offer lower interest rates and still attract investors.	State and local governments have substantial latitude in choosing which public-purpose projects to finance.	Bonds backed by general revenues may be subject to state or local caps or may require approval by voters.
Grant anticipation bonds (GARVEEs for highways, GANs for mass transit)	The interest income that bondholders receive is generally exempt from federal taxes, so issuers can offer lower interest rates and still attract investors.	Issuance and interest costs can be paid from future federal grants. In some states, GARVEEs are exempt from requirements that new bond issuances be approved by voters.	The Federal Highway Administration or the Federal Transit Administration must confirm that the project to be financed is eligible for federal grant funding before the bonds are issued.
Qualified Private Activity Bonds (QPABs)	The interest income that bondholders receive is generally exempt from federal taxes, so issuers can offer lower interest rates and still attract investors.	QPABs allow tax-exempt financing to be used to support private investment in infrastructure.	Interest rates tend to be higher because interest income is not exempt from the alternative minimum tax, narrowing the universe of investors. The quantity of QPABs that can be issued for certain purposes is subject to nationwide or state caps.
Tax Credit Bonds			
Traditional Tax Credit Bonds ^a	Bondholders receive a credit against their federal tax liability, so they are willing to accept lower interest payments from issuers.	None	Before 2010, tax credits could not be separated from the associated bonds and resold, which limited their appeal.
Direct-Pay Tax Credit Bonds (Build America Bonds) ^a	Issuers receive cash payments directly from the federal government equal to a percentage of the taxable interest they pay to bondholders.	Depending on the percentage credit rate paid by the government, issuers' net interest costs may be lower than with tax-exempt bonds. Unlike traditional tax credit and tax-exempt bonds, direct-pay tax credit bonds appeal to investors with little or no federal tax liability, such as pension funds, endowment funds, international insurance funds, and people in low tax brackets.	Federal payments to issuers of Build America Bonds are subject to sequestration and have been reduced in recent years.

Source: Congressional Budget Office.

GAN = grant anticipation note; GARVEE = grant anticipation revenue vehicle.

a. No current program allows such bonds to be issued for transportation or water infrastructure.

systems and water utilities are subject to annual caps on a state-by-state basis (see Table 1-3 on page 10). Bonds for airports, ports, and government-owned high-speed intercity rail projects are not subject to federal caps.

Tax Credit Bonds

Earlier federal programs of tax credit bonds, the first of which was established in 1998, gave bondholders credits against their tax liability but were not particularly well received by the market. Use of such bonds was hampered by the limited size and temporary nature of the programs and by the absence of rules for separating the tax credits from the associated bonds and reselling them. (Such rules were established in 2010.)

The direct-pay Build America Bonds authorized by ARRA to be sold in 2009 and 2010, which entitled issuers to federal payments equal to 35 percent of the taxable interest paid to bondholders, were more successful for several reasons:

- The 35 percent credit rate was equal to the highest marginal income tax rate at the time. Thus, the net financing cost for issuers was lower than the prevailing interest rates on tax-exempt bonds.
- With credits going to the issuing governments rather than to the bondholders, the pool of potential buyers expanded to include investors who could not take full advantage of the traditional tax credit because they had little or no tax liability, such as international insurance funds, pension funds, and other tax-exempt organizations.
- Providing the credits to the issuing governments, which are not taxable entities, also avoided the problem that credits provided to investors would count as taxable income, reducing their net value.

Although not anticipated when BABs were authorized, the federal payments to issuers are subject to sequestration (across-the-board cuts) under the Budget Control Act of 2011, which established automatic procedures to reduce both discretionary and mandatory spending. (Those procedures were triggered when lawmakers did not enact deficit reduction legislation to achieve the savings targets established by that law.) As a result, BAB payments were reduced by 8.7 percent in fiscal year 2013 and have been reduced each year since then, by amounts

ranging from 6.2 percent to 7.2 percent.¹² Concern about sequestration could affect the reception of direct-pay bonds established in the future if they were not clearly exempted from sequestration in their authorizing legislation.

State Revolving Funds and Infrastructure Banks

State funds and banks can be attractive sources of financing in part because their loans may involve much lower transaction costs—particularly for local entities that want to finance relatively small amounts of capital—than financing from alternative sources, such as the bond market. (State banks that issue bonds can generally do so on a larger scale and with lower costs for underwriting, legal fees, and marketing.) In addition, officials of state banks may be more familiar with their state’s budgetary, legal, and regulatory environments and have more experience lending to small local entities in their state.

State Revolving Funds. In addition to those general advantages, the state revolving fund programs for clean water and drinking water are appealing to project sponsors because they offer significant subsidies; interest rates are sometimes zero or even negative.¹³ In 2016, the national average interest rate on loans from clean water SRFs was 1.6 percent, about 2 percentage points lower than the national average rate on comparable tax-exempt bonds.¹⁴ Another advantage of SRFs to borrowers is that loan repayment periods may last up to 30 years.

State Infrastructure Banks. Like SRFs, state infrastructure banks for transportation offer favorable loan terms. Interest rates are set at or below market rates (as determined by each state), and loan periods can be as long as 30 years, with repayment deferred until 5 years after the project is completed. Also, SIBs have proved advantageous when financing has needed to be executed quickly. After some natural disasters, loans provided by SIBs for highways and mass transit have provided temporary funding, allowing recovery efforts to start before

12. See Internal Revenue Service, “Effect of Sequestration on State & Local Government Filers of Form 8038-CP” (June 21, 2018), <https://go.usa.gov/xPkqU>.

13. A negative interest rate allows a borrower to repay less than 100 percent of the amount loaned. In effect, it adds a grant component to a loan.

14. See Environmental Protection Agency, *2016 Annual Report: Clean Water State Revolving Fund Programs* (March 2017), <https://go.usa.gov/xPXpq> (PDF, 3 MB).

federal grant money for disaster relief was received.¹⁵ Weighing against those advantages is the fact that SIBs for transportation, unlike SRFs for water, do not receive dedicated federal funding, so states must choose between allocating grant money to capitalize them or to fund projects directly.

Direct Federal Credit Programs

The attractiveness to potential borrowers of direct federal credit programs depends on the terms of the financing that each program provides, including subsidies, maximum loan lengths, and eligibility restrictions (see Table 3-3).

Transportation Infrastructure Finance and Innovation Act Program. Demand for loans from the TIFIA program has been buoyed over the past decade by low interest rates. The program lends at Treasury bond rates, which since 2008 have generally been lower than rates on tax-exempt governmental bonds with the same maturity (see Figure 3-1).¹⁶

Besides low interest rates, TIFIA loans offer borrowers such advantages as a long loan period (up to 35 years), deferred repayment terms (repayment does not begin until 5 years after a project is substantially complete), and a subordinated loan status, meaning that a project's other lenders and equity investors retain rights to be repaid before TIFIA (unless the borrower defaults and enters bankruptcy, in which case the TIFIA loan takes on a priority equal to that of the project's senior debt).

15. See Robert Puentes and Jennifer Thompson, *Banking on Infrastructure: Enhancing State Revolving Funds for Transportation* (Brookings-Rockefeller Project on State and Metropolitan Innovation, September 2012), <https://tinyurl.com/y8w4jxeu> (PDF, 770 KB).

16. That difference resulted primarily from two factors. One was a "flight to quality" by private investors, shifting their portfolios away from investments they saw as riskier, including tax-exempt governmental bonds, to investments they perceived as safer. The other factor was growth in demand for Treasury bonds by the Federal Reserve System, which implemented a policy of quantitative easing (an increase, begun in 2008, in holdings of Treasury notes and bonds of all maturities and of mortgage-backed securities) and a maturity extension program (a temporary shift, from September 2011 through December 2012, in holdings of Treasury securities away from notes and shorter-term bonds to bonds with maturities of five or more years). See Brett Fawley and Luciana Juvenal, "Quantitative Easing: Lessons We've Learned," *Regional Economist* (Federal Reserve Bank of St. Louis, July 2012), <https://tinyurl.com/ydzdx7z6>.

The deferred repayment terms are particularly valuable to borrowers when there is uncertainty about how quickly a project's revenues will grow.¹⁷ Borrowers can apply to receive a loan equal to as much as 49 percent of a project's eligible costs, but in practice, loan amounts have typically been limited to 33 percent (the rate of assistance provided for in the program's initial authorizing legislation).¹⁸

One factor that may limit the use of TIFIA financing is a minimum size requirement for projects. Projects must cost at least \$10 million if they are in rural areas, are sponsored by a local government, or involve transit-oriented development; \$15 million if they are classified as intelligent transportation system projects; and at least \$50 million otherwise. In addition, the Department of Transportation must certify that TIFIA assistance to a project would "foster partnerships that attract public and private investment."¹⁹

Water and Waste Disposal Program. Unlike the TIFIA program, the Water and Waste Disposal program does not charge Treasury interest rates for its loans. Instead, it charges a predetermined fraction—either 60, 80, or 100 percent—of a national average of municipal bond rates, depending on the median household income of the area served by the project. Other terms attractive to borrowers include payback periods of up to 40 years.

Railroad Rehabilitation and Improvement Financing Program. Some terms of the RRIF program are advantageous to borrowers: Direct loans can cover up to 100 percent of a project's costs, with payback periods of up to 35 years after the project is substantially complete; interest rates are equal to the rates on Treasury bonds of comparable maturity; and repayments can be deferred for up to 6 years.

17. See the testimony of Joseph Kile, Assistant Director for Microeconomic Studies, Congressional Budget Office, before the Senate Committee on Finance, *The Highway Trust Fund and Paying for Highways* (May 17, 2011), p. 20, www.cbo.gov/publication/41455.

18. Combined with federal grants and other credit assistance, TIFIA loans can be part of a package of federal assistance that funds up to 80 percent of the cost of a transportation project.

19. See Department of Transportation, Build America Bureau, "Chapter 3: Eligibility Requirements," *Credit Programs Guide* (April 3, 2017), <https://go.usa.gov/xPXhn>.

Table 3-3.

Summary of Direct Federal Credit Programs for Transportation and Water Infrastructure

Program	Eligible Purposes	Loans Issued in 2016 (Billions of dollars)	Federal Cost for Loans Issued in 2016 (Millions of dollars) ^a	Federal Subsidy Rate in 2016 (Percent) ^b	Loan Interest Rate	Maximum Loan Length (Years)	Restrictions
Transportation Infrastructure Finance and Innovation Act (TIFIA) Program	Highway and mass transit infrastructure	2.2	109	4.98	Rate on Treasury bonds of comparable maturity	35	Minimum project size is generally \$50 million, or \$10 million in rural areas and for certain projects. Loans are limited to 49 percent of project costs but typically do not exceed 33 percent.
Water and Waste Disposal Program	Rural drinking water systems, sewage disposal, solid waste disposal, storm water drainage	1.2	31	2.61	60, 80, or 100 percent of national average of rates on municipal bonds ^c	40	Available for projects that cannot be commercially financed “at reasonable rates and terms”
Railroad Rehabilitation and Improvement Financing (RRIF) Program	Railroad tracks, bridges, yards, buildings, and shops; transit-oriented development	0 ^d	n.a.	n.a. ^e	Rate on Treasury bonds of comparable maturity	35	None
Water Infrastructure Finance and Innovation Act (WIFIA) Program	Drinking water and wastewater systems, water supply, drought mitigation	0 ^f	n.a.	n.a. ^g	Rate on Treasury bonds of comparable maturity	35	Minimum project size is \$20 million in large communities and \$5 million in small ones. Loans are limited to 49 percent of project costs.

Source: Congressional Budget Office, using data from the Army Corps of Engineers, the Department of Agriculture, the Department of Transportation, the Environmental Protection Agency, and the Office of Management and Budget.

Numbers in the table are for fiscal year 2016.

n.a. = not applicable (no loans).

a. Budgetary costs as measured under the Federal Credit Reform Act of 1990.

b. The subsidy rate is an estimate of the budgetary cost to the federal government. It equals the present value of cash outflows minus inflows, per dollar of loan (or other credit) provided.

c. The interest rate for a loan depends on the median household income of the project’s service area.

d. The RRIF program has made four loans since 2012, including loans to local transit authorities in 2015 and 2018.

e. The subsidy rate has been zero because RRIF loan applicants have provided deposits to offset the expected default risks. That rate is subject to change if the Congress provides funds to cover those risks.

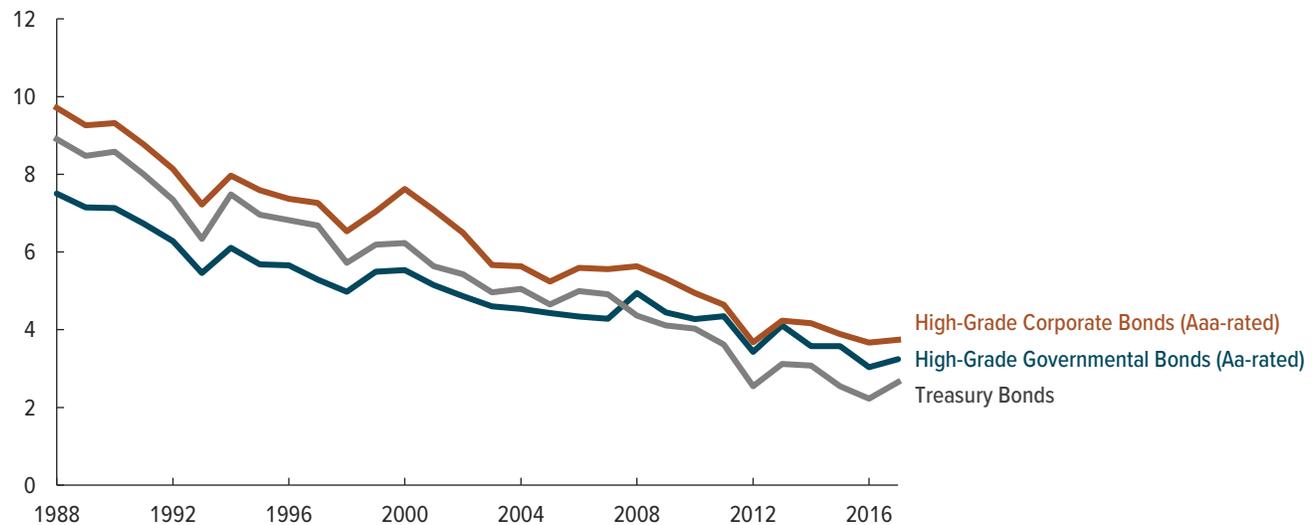
f. The WIFIA program is a five-year pilot program that made its first loan in 2018.

g. The Office of Management and Budget issued a “notional” estimate of 1.55 percent before the program had made any loans.

Figure 3-1.

Yields for Tax-Exempt Governmental Bonds, Treasury Bonds, and Corporate Bonds, 1988 to 2017

Percent



Source: Congressional Budget Office, using data from Bloomberg and the Federal Reserve System.

The yields shown here are for 20-year bonds. Yields reflect the prices at which all bonds are bought and sold in the market; they may differ from the interest rates at which new bonds are issued if the characteristics of new bonds differ in relevant ways from those of older bonds.

Other features of RRIF loans have been disadvantageous to borrowers. The RRIF program has traditionally operated under a requirement that it have no cost to the federal government. To meet that requirement, the program mandates that a loan recipient offset the risk of default by providing a deposit equal to the estimated subsidy cost of the loan. Typically, the deposit does not exceed 5 percent of the loan amount, but in some cases it can be substantially higher.²⁰ That requirement could change if the Congress provided funds to cover subsidy costs.²¹

20. The deposit required on a \$155 million RRIF loan for the Denver Union Station project in 2014 was nearly 20 percent; David Seltzer, Mercatus Advisors, personal communication (March 13, 2018).

21. The Consolidated Appropriations Act, 2018 (P.L. 115-141), gave the RRIF program \$25 million for “the cost of direct loans and loan guarantees,” but that provision was interpreted to mean that the money should be used to return deposits to previous borrowers who have repaid their loans. See Mick Mulvaney, Director, Office of Management and Budget, letter to the Honorable Richard Shelby, Chairman, Senate Committee on Appropriations (June 18, 2018), <https://go.usa.gov/xPXpK> (PDF, 186 KB). Originally, deposits were to be returned to borrowers after all of the loans in a given cohort had been repaid; the 2015 Fixing America’s Surface Transportation Act (P.L. 114-94) eliminated that requirement, but no deposits on loans made

Another disadvantage of RRIF loans for potential borrowers is that they are required to pay up to 0.5 percent of the requested loan amount up front as an application fee, whereas the underwriting costs of a tax-exempt governmental bond are usually taken from the bond proceeds. Long review times for applications may also be discouraging use of the RRIF program.²²

Water Infrastructure Finance and Innovation Act Program. The WIFIA program—which made its first loan earlier this year—offers borrowers many of the same advantages as the TIFIA program, on which it is modeled. It lends money at Treasury interest rates, for terms of up to 35 years, and repayment can be deferred until 5 years after a project is substantially complete.

before that law’s enactment have been returned yet. See David Randall Peterman, *The Railroad Rehabilitation and Improvement Financing (RRIF) Program*, Report for Congress R44028 (Congressional Research Service, January 31, 2018), p. 12, <https://go.usa.gov/xPXDE>.

22. See Department of Transportation, *Office of the Inspector General Audit Report: Process Inefficiencies and Costs Discourage Participation in FRA’s RRIF Program* (June 10, 2014), <https://go.usa.gov/xPXp8> (PDF, 290 KB).

Borrowers can apply for funds equal to as much as 49 percent of a project's costs.

The WIFIA program also has minimum size requirements: \$20 million for projects in large communities and \$5 million for projects in small communities. Borrowers face an application fee of \$100,000 for large-community

projects and \$25,000 for small-community projects, once program staff have judged that the project has a reasonable chance of being approved to receive assistance.²³

23. See Environmental Protection Agency, *WIFIA Program Handbook* (April 2018), <https://go.usa.gov/xPXP2> (PDF, 916 KB).



Appendix:

Modeling the Federal Tax Revenues Forgone on Tax-Exempt Bonds

Conceptually, the projected federal cost of the tax exemption on governmental bonds issued in 2023 is the difference between the tax revenues that the government would collect if such bonds were taxable and the revenues it will collect under the tax exemption. For the hypothetical no-exemption case, inferring tax revenues required the Congressional Budget Office to make modeling choices that answered three questions:

- What volume of taxable bonds would be issued in the absence of the exemption?
- What categories of federal revenues would be affected?
- What would determine the interest rates on those taxable bonds?

In addition, CBO had to select a value for a key parameter: the average marginal tax rate faced by investors who clear the market for tax-exempt bonds (investors whose bond purchases would change with small changes in the returns on those bonds relative to the returns on other investments). This appendix describes CBO's decisions and provides an example of how federal costs were calculated.

Bond Volumes

In answering the first question, CBO chose to project that *state and local governments would issue the same volume of bonds with or without the tax exemption*. That choice is an oversimplification—having to pay higher, taxable interest rates might lead some governments to postpone, forgo, or seek alternative financing for some of the infrastructure projects for which they would issue tax-exempt bonds. However, CBO judged that choice to be a reasonable approximation.

Types of Revenues Affected

For the second question, CBO chose to project that *the only difference in federal revenues if governmental bonds were taxable would be to the revenues from the bonds themselves*—that is, there would be no additional or offsetting effects on taxes collected on income from corporate bonds, stocks, or other sources. That choice is consistent with the approach that the staff of the Joint Committee on Taxation (JCT) takes when evaluating the budgetary effects of legislative proposals to eliminate the tax exemption for governmental bonds.¹

Under that approach, investors who face U.S. tax rates at or near zero (such as pension funds and foreign investors) would seek to maintain the same balance of debt and equity in their portfolios after the tax exemption on governmental bonds was eliminated. Thus, if they bought such bonds from investors who did not want to hold the bonds without a tax exemption, they would offset their purchases by selling other taxable (corporate or Treasury) bonds. As a result, taxable investors as a whole would absorb in their portfolios all of the increase in the stock of taxable bonds.

An alternative approach would be to project that investors with tax rates of zero would absorb some of the increase in taxable bonds with an offsetting reduction in their collective stock holdings.² That alternative would result in a smaller estimate of the revenues forgone because of the tax exemption on governmental bonds:

1. See Joint Committee on Taxation, *The Federal Revenue Effects of Tax-Exempt and Direct-Pay Tax Credit Bond Provisions*, JCX-60-12 (July 16, 2012), pp. 12–16, <https://go.usa.gov/xPXPX>.
2. See James M. Poterba and Arturo Ramirez Verdugo, “Portfolio Substitution and the Revenue Cost of the Federal Income Tax Exemption for State and Local Government Bonds,” *National Tax Journal*, vol. 64, no. 2 (June 2011), pp. 591–613, <http://doi.org/10.17310/ntj.2011.2S.07>.

Investors who pay taxes would hold more corporate stocks and fewer bonds than they do under JCT's approach, and income from stocks is taxed at lower rates than income from bonds.

Interest Rates on Taxable Bonds

The third modeling choice that CBO made was to estimate that *the interest rates on taxable governmental bonds would be the rates that would provide the same average after-tax income to market-clearing buyers of tax-exempt bonds as the tax-exempt bonds do*. "Average" reflects the fact that those bond buyers, whose sensitivity to small changes helps determine the market-clearing interest rate, do not necessarily all have the same marginal tax rate. One possible alternative to that choice would be to estimate that taxable governmental bonds would have the same interest rates as corporate bonds of the same maturity and comparable riskiness, despite their lower liquidity (in part because of their low appeal to institutional investors not subject to taxation) and despite the fact that they commonly include call options (opportunities for issuers to buy back the bonds before maturity). Under that alternative, taxable 20-year governmental bonds issued in 2023 would carry an interest rate of 5.0 percent rather than 6.1 percent.

CBO did not choose that alternative for two reasons. First, the idea that investors who require a rate of 4.8 percent on tax-exempt governmental bonds would accept a rate of 5.0 percent on the same bonds in taxable form is highly questionable. Such a narrow spread is possible only if the average marginal tax rate of market-clearing investors is extremely low—4 percent—or if that average tax rate is fairly low and disadvantages of the exemption itself (such as the low demand from institutional investors) offset a significant share of the exemption's dollar value. (For example, the market-clearing tax rate could be 10 percent if the disadvantages offset 55 percent of the tax savings, or 15 percent if the disadvantages offset roughly 70 percent of the tax savings.)

Second, modeling the interest rates on taxable governmental bonds as equal to those on comparable corporate bonds would imply that the savings to issuers from reduced interest costs represented only about 13 percent of the federal cost of the tax exemption.³ The other 87 percent would represent gains to bondholders not in the market-clearing group. CBO knows of no reports or

analyses suggesting that the benefits of the tax exemption skew so heavily toward those bondholders.

Average Tax Rate of Market-Clearing Investors

To implement its modeling choice about the interest rate on taxable bonds, CBO selected *22 percent as the average marginal tax rate faced by market-clearing bond buyers*. That choice was informed by two studies that analyzed data on tax-exempt bonds and Build America Bonds (BABs) issued in California and Ohio to estimate what implied tax rates would be consistent with the observed differences in interest rates between the two types of bonds. Those studies suggested a market-clearing tax rate of 25 percent; CBO adjusted that figure to reflect the reductions in marginal tax rates resulting from the major tax legislation enacted in 2017 (Public Law 115-97).

One study analyzed data for 404 tax-exempt bonds and 74 BABs issued by government entities in California between April 1, 2009, and March 31, 2010.⁴ Some of those entities issued both types of bonds on the same day, so the study also analyzed data for the subsample of 64 tax-exempt bonds and 53 BABs that could be matched by issuer and date. For the larger sample, two models that controlled for bond maturity in different ways yielded estimates of 25 percent and 23 percent for the implied market-clearing tax rate.⁵ The subsample also yielded an estimated tax rate of 25 percent.

The other study analyzed bond pricing information—expected interest rates, by maturity date, for otherwise identical tax-exempt bonds and BABs—provided to the government of Ohio by its underwriters before it issued two sets of general-obligation BABs for highway capital

3. $(0.050 - 0.048) \div (0.305 \times 0.050) = 0.13$.

4. See Gao Liu and Dwight V. Denison, "Indirect and Direct Subsidies for the Cost of Government Capital: Comparing Tax-Exempt Bonds and Build America Bonds," *National Tax Journal*, vol. 67, no. 3 (September 2014), pp. 569–594, <http://doi.org/10.17310/ntj.2014.3.03>.

5. The study's second model allowed the effect of years to maturity to differ for tax-exempt bonds and BABs and yielded different results at different maturities: The implied marginal tax rates were 29 percent for bonds of roughly 20 years (that is, between 17.5 and 22.5 years), 23 or 24 percent for bonds of roughly 25 or 30 years, and 16 percent for bonds of more than 32.5 years. However, only one of the three regression coefficients on the dummy variables for BAB maturity was statistically significant even at the 10 percent level, at least partly because of the small sample sizes.

improvements in 2010.⁶ In both sets, the bonds to be issued all matured in 15 or fewer years. For the first issuance, the expected interest rates for the tax-exempt bonds and BABs of 10 years or more implied a tax rate of 22 percent or 23 percent for the market-clearing bond buyers.⁷ For the second issuance, in which the longest bonds matured in 14 years, the implied tax rate was 23 percent or 24 percent for bonds of 10 years or more.

On the basis of those two studies' results, CBO would have used 25 percent as the average marginal tax rate of market-clearing bond buyers under the pre-2018 tax code. But in light of the reductions in marginal tax rates made by P.L. 115-97, CBO lowered that average to 22 percent. That adjustment reflects CBO's estimate that 85 percent of households who have tax returns showing income from tax-exempt bonds and who would have had a marginal rate of 25 percent in 2023 in the absence of P.L. 115-97 will instead have a marginal rate of 22 percent. CBO does not assume that all market-clearing buyers face the same marginal tax rate, but for plausible groupings of investors whose marginal rates would have averaged 25 percent under the old tax rates, the average will be close to 22 percent under the rates scheduled to be in effect in 2023.

That 22 percent estimate is subject to significant uncertainty. The experience with BABs provides the most relevant data available, but it has limitations. For example, investors may have required higher interest rates for BABs, given the novelty of those bonds, than they would require for future taxable governmental bonds. If so, the actual market-clearing tax rate may be lower than estimates based on the experience with BABs. Alternatively, federal involvement in the Build America Bonds program may have given BABs better credit ratings, and thus allowed for lower interest rates, than would be the case for taxable bonds. Another factor contributing to the uncertainty is that the adjustment from 25 percent to 22 percent is based on CBO's use of data from 2012 tax returns to model the distribution of bond holdings

(or, more precisely, of interest income from tax-exempt bonds) in 2023.

An Illustrative Calculation of Federal Costs

CBO's base-case estimates of the discounted present value of federal costs per dollar of tax-exempt bond financing are based on the modeling choices discussed above, the 22 percent estimate for the average marginal tax rate of market-clearing buyers of tax-exempt bonds, and three additional factors:

- An estimate of 30.5 percent for the average marginal tax rate of all holders of tax-exempt bonds,
- The projected interest rates on those bonds, and
- The discount rates (derived from CBO's projections of interest rates on Treasury bonds) used to convert future cash flows to present values.

The estimation process can be illustrated by summarizing the calculations underlying CBO's estimate that the federal cost for 20-year tax-exempt bonds issued in 2023 is projected to be 26 cents per dollar of financing provided. CBO projects that those bonds will have an average interest rate of 4.78 percent. Given the modeling choice about the interest rates that governmental bonds would carry if they were taxable and the 22 percent estimate for the average tax rate of market-clearing investors, the interest rate on taxable bonds would be $0.0478 \div (1 - 0.22) = 0.0613$, or 6.13 percent. Thus, given the modeling choices about bond volumes and portfolio allocations, and given the 30.5 percent estimate for the average marginal tax rate of all bondholders, the federal tax revenues forgone on one year's interest on \$100 of tax-exempt bonds is $\$100 \times 0.0613 \times 0.305 = \1.87 . And given the base-case discount rates, the present value of \$1.87 per year for 20 years is \$26.45.

6. See Martin J. Luby, "Federal Intervention in the Municipal Bond Market: The Effectiveness of the Build America Bond Program and Its Implications on Federal and Subnational Budgeting," *Public Budgeting and Finance*, vol. 32, no. 4 (Winter 2012), pp. 46–70, <http://doi.org/10.1111/j.1540-5850.2012.01023.x>.

7. CBO calculated those rates by comparing the tax-exempt bond yields and Build America Bond yields in Table 3 of that study.



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About This Document

This Congressional Budget Office report was prepared at the request of the Ranking Member of the Senate Committee on Finance. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Perry Beider and Chad Shirley prepared the report with assistance from David Wylie; contributions from Edward Gamber, Ed Harris, Jason Levine (formerly of CBO), John McClelland, Jeffrey Perry, and Kurt Siebert; and guidance from Joseph Kile. Useful comments were provided by Michael Falkenheim, Sebastien Gay, Wendy Kiska, Nathan Musick, Sarah Puro, and Jon Sperl of CBO.

Helpful comments were also provided by Tracy Gordon and Kim Reuben of the Urban Institute; Martin Luby of the University of Texas, Austin; David Seltzer of Mercator Advisors; and Dennis Zimmerman (formerly of CBO). The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.

Wendy Edelberg and Jeffrey Kling reviewed the report, Christian Howlett edited it, and Jorge Salazar prepared it for publication. The report is available on CBO's website (www.cbo.gov/publication/54549).

A handwritten signature in black ink, appearing to read "Keith Hall".

Keith Hall
Director
October 2018