How CBO Produces Fair-Value Estimates of the Cost of Federal Credit Programs: A Primer

The federal government supports some private activities—such as home ownership, postsecondary education, and certain commercial ventures—through credit assistance offered to individuals and businesses. Some of that assistance is in the form of federal direct loans, and some is through federal guarantees of loans made by private financial institutions. Although the costs of most federal activities are recorded in the budget on a cash basis (showing the balance of inflows and outflows when those flows occur), the lifetime costs of federal credit programs are recorded up front on an accrual basis. That budgetary treatment applies both to direct loans (for which most of the cash outflows occur up front, when loans are disbursed) and to loan guarantees (for which cash flows both to and from the government occur gradually over the life of the commitments).

The cost of providing credit assistance is an important consideration for policymakers as they allocate spending among programs and choose between credit assistance and other forms of aid such as federal grants—but assessing cost is not a simple matter. Indeed, it is more difficult to measure the cost of credit assistance than to assess the costs of other forms of aid because, for credit assistance, the measurement of cost must account for future cash flows of uncertain amounts that can continue for many years.

In this primer and other reports, the Congressional Budget Office discusses two approaches that are used to estimate the cost to the federal government of credit programs:

- The accounting procedures currently used in the federal budget, as prescribed by the Federal Credit Reform Act of 1990 (FCRA),[1] and

- An alternative approach in which costs are estimated on the basis of the market value of the federal government's obligations—termed a fair-value approach.[2]

A common method for estimating the fair value of a direct loan or loan guarantee is to discount the projected cash flows to the present using market-based discount rates. The present value expresses the flows of current and future income or payments in terms of a single number. That number, in turn, depends on the discount rate, or rate of interest, that is used to translate future cash flows into current dollars. For FCRA estimates, the discount rates used are the projected yields on Treasury securities of varying maturities. The fair-value estimates employ discounting methods that are consistent with the way the loan or loan guarantee would be priced in a competitive market. The difference between the FCRA and fair-value discount rates can be interpreted as a risk premium—the additional compensation that investors would require to bear the risk associated with federal credit. In general, the cost of a direct loan or a loan guarantee reported in the federal budget under FCRA procedures would be lower than the fair-value cost that private institutions would assign to similar credit assistance on the basis of market prices.

FCRA estimates reflect the average budgetary effects of programs that provide credit assistance. Combining FCRA estimates with projections of average spending and revenues produces deficit projections that in the long run reflect the average cash flows to and from the government. However, average budgetary effects sometimes

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1. Sec. 504(d) of FCRA, 2 U.S.C. §661c(d) (2016).

2. For CBO's most recent comparison of estimates of the costs of federal credit programs under both the FCRA and fair-value approaches, see Congressional Budget Office, *Fair-Value Estimates of the Cost of Federal Credit Programs in 2019* (June 2018), www.cbo.gov/publication/54095.

are not the most useful measure of cost. By taking into account how the public assesses financial risks as expressed through market prices, fair-value estimates can help policymakers understand trade-offs between some types of policies.

Differences Between the FCRA and Fair-Value Approaches

In CBO's view, fair-value estimates provide a more comprehensive measure than FCRA estimates of the costs of federal credit programs. The total costs of all credit programs appear lower under FCRA procedures because they do not account for the cost of market risk, whereas the fair-value approach does. Market risk is the component of financial risk that remains even after investors have diversified their portfolios as much as possible; it arises from shifts in macroeconomic conditions, such as productivity and employment, and from changes in expectations about future macroeconomic conditions. The government is exposed to market risk because, when the economy is weak, borrowers default on their debt obligations more frequently, and recoveries from borrowers are lower. When the government extends credit, the associated market risk of those obligations is effectively passed along to taxpayers, who, as investors, would view that risk as having a cost.[3]

The lifetime cost of a loan or loan guarantee is generally described as a subsidy. It is measured by first projecting all of the expected future cash flows associated with a loan or loan guarantee as the average (statistical mean)

of the set of possible values and then by discounting those projected cash flows to a present value at the date the loan is disbursed.[4] Whether a program has a positive or negative subsidy depends on whether the discounted value of the government's cash outflows for the program exceeds the discounted value of its cash inflows.[5] For credit programs to have estimated budgetary savings, the discounted value of the government's cash inflows must exceed the discounted value of its cash outflows.

Differences in Methodology

Under FCRA's rules, the present value of expected future cash flows is calculated by discounting them using the rates on Treasury securities with similar terms to maturity. (For instance, the yield on a Treasury security maturing in one year would be used to discount cash flows one year from disbursement, a two-year rate would be used for cash flows two years from disbursement, and so on.) However, that procedure does not fully account for the cost of the risk the government takes on when issuing loans or loan guarantees; consequently, it makes the reported cost of federal direct loans and loan guarantees in the federal budget lower than the cost that private institutions would assign to similar credit assistance on the basis of market prices. In contrast, under a fair-value approach, projected future cash flows are discounted using the rates on Treasury securities plus a risk premium that represents the additional compensation a private investor would require from an asset or liability with similar risk.[6] Estimates of the risk premium are derived from market values—market prices when those prices

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3. Some analysts have criticized the idea of using a fair-value approach in federal budgeting. For example, see Government Accountability Office, *Credit Reform: Current Method to Estimate Credit Subsidy Costs Is More Appropriate for Budget Estimates Than a Fair Value Approach*, GAO-16-41 (January 2016), www.gao.gov/products/GAO-16-41; Paul N. Van de Water and Joan Huffer, *House "Budget Transparency" Bill Would Make Budget More Opaque* (Center on Budget and Policy Priorities, June 2013), www.cbpp.org/sites/default/files/atoms/files/6-18-13bud.pdf (186 KB); and David Kamin, "Risky Returns: Accounting for Risk in the Federal Budget," *Indiana Law Journal*, vol. 88, no. 2 (Spring 2013), pp. 723–772, www.repository.law.indiana.edu/ilj/vol88/iss2/9. In various documents, CBO has discussed criticisms of the fair-value approach. For example, see Congressional Budget Office, *Answers to Questions for the Record Following a Hearing on the Oversight of the Congressional Budget Office Conducted by the Senate Committee on the Budget* (November 18, 2016), pp. 14–17, www.cbo.gov/publication/52155; and testimony of Douglas W. Elmendorf, Director, Congressional Budget Office, before the House Committee on Financial Services, *Estimates of the Cost of the Credit Programs of the Export–Import Bank* (June 25, 2014), www.cbo.gov/publication/45468.

4. The statistical mean of a set of cash flows is the sum of each possible cash flow multiplied by the probability of its occurrence.

5. With a direct loan, the government's cash outflow is the disbursement of principal, and the inflows are the payments of interest and principal (net of amounts not paid when there is a default), recoveries, and any fees that the government receives from the borrower. With a loan guarantee, a financial institution lends to the borrower, and the government pays a claim to the lender if the borrower defaults. The government's cash outflows are the payments it makes to the lender when the borrower defaults, and its inflows are recoveries on those amounts and the fees it charges the borrower or lender for its guarantee.

6. A few programs are recorded in the budget using the fair-value approach. For example, the Emergency Economic Stabilization Act of 2008 (Division A of Public Law 110-343) required that purchases and sales of financial assets through the Troubled Asset Relief Program be recorded in the budget using procedures similar to those in FCRA but with an adjustment for market risk. Additionally, certain contributions to the International Monetary Fund are accounted for in the budget on an accrual basis with market-risk adjustment following direction provided in the authorizing legislation.

are available or approximations of market prices when directly comparable figures are unavailable—that offer a more comprehensive estimate of federal costs.[7]

The difference between FCRA and fair-value subsidy rates depends on the annual risk premium associated with the underlying loan; the average life of the loan; and, for a loan guarantee, the structure of the guarantee. The annual risk premium is a measure of the cost of market risk for a given year; it is added to the corresponding yield on Treasury securities to produce a fair-value estimate of a loan. The longer the average life of a loan, the larger the effect of the risk premium on the difference between FCRA and fair-value subsidies. For a loan guarantee, the subsidy also depends on the percentage of the loan that is guaranteed and, if the guarantee is less than 100 percent, whether the government shares losses evenly with the lender or takes losses ahead of or after the lender. The fewer losses the government is exposed to, the more market risk is shifted from the government to the lender.

The estimates of cash flows, including the net amount lost through defaults, are the same using both approaches, but the difference in discount rates means that those cash flows are valued differently. For example, fair-value estimates assign greater weight to outcomes with losses than do FCRA estimates, even though expected losses are the same on average. (See Box 1 for a numerical example of subsidy cost calculations under FCRA and fair-value accounting.)

Differences in Results

The cost of a direct loan reported in the federal budget under FCRA procedures would be lower than the cost that private institutions would assign to similar credit assistance on the basis of market prices. Specifically, private institutions would generally calculate the present value of projected future cash flows by discounting them using the expected rates of return on private loans (or securities) with similar risks and maturities. Because the expected rates of return on private loans exceed the rates on Treasury securities, the discounted value of borrowers' projected payments would be smaller under the fair-value approach, which implies a larger cost for issuing a loan.

Similar reasoning implies that the cost of a loan guarantee calculated using the fair-value approach would be higher than its cost as estimated under FCRA. When the government provides a loan guarantee, it bears the losses resulting from a default on the loan and any market risk associated with those losses. Thus, a lender places more value on a loan with a guarantee than on the same loan without a guarantee. The difference in value between them is the fair value of the guarantee, which reflects the higher losses that an investor would expect on a loan without a guarantee and the higher discount rate that an investor would require to compensate for the market risk associated with such a loan. Under FCRA, the projected losses but not the value of the market risk would be included in the cost. Because a loan without a guarantee has more market risk than the same loan with a guarantee, assigning a cost to market risk through the use of the fair-value approach would result in a higher estimated cost for the guarantee.

CBO's Estimation of Cash Flows, Discount Rates, and Risk Premiums

CBO reports the costs of federal direct loans and loan guarantees as subsidy rates—the cost divided by the amount disbursed. Cash flows, discount rates, and risk premiums are the building blocks of the agency's estimates of those rates. FCRA estimates of subsidy costs change with interest rates, projections of losses from defaults, and other factors that affect projections of cash flows. Fair-value estimates include additional volatility from changes in estimates of market risk.

In its annual updates of fair-value estimates, CBO uses its own projections of the volume of loans, cash flows, and discount rates for some programs and projections by the Office of Management and Budget (OMB) and other federal agencies for others (see Table 1 on page 6). In particular, CBO uses its own estimates for the Department of Education's student loan programs and the Federal Housing Administration's (FHA's) single-family mortgage guarantee program because those estimates are a routine part of its baseline budget projections. However, because CBO does not ordinarily project the detailed cash flows required to estimate the costs of most of the other, smaller federal credit programs, CBO relies on other federal agencies' projections of those cash flows for the purpose of comparing the two methods of accounting. CBO's FCRA subsidy estimates for those programs are the same as the ones published by OMB in the *Federal Credit Supplement*, with some minor

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7. For further discussion, see *Congressional Budget Office, Fair-Value Accounting for Federal Credit Programs* (March 2012), www.cbo.gov/publication/43027.

Box 1.

Comparison of Methods: FCRA and Fair-Value Accounting

Consider a $100 million portfolio of federal direct loans with terms of three years and an annual interest rate of 3 percent. Net federal cash flows each year include disbursements, the scheduled payments of principal and interest, and losses from defaults (see the table). Note that the net interest and principal payments that the government will receive are the scheduled payments of principal and interest minus the amounts that are expected not to be paid by or recovered from borrowers because of default.

According to the rules for budgetary accounting prescribed by the Federal Credit Reform Act of 1990 (FCRA, incorporated as

title V of the Congressional Budget Act of 1974), the net cash flow in each future year is discounted at a compounded annual rate equal to the yield on Treasury securities with the same term to maturity—up to three years in the current example.[1] The FCRA subsidy of −$1.6 million (which represents a net reduction in the budget deficit) is the sum across all years of the net cash outflow from the government in each year discounted on a FCRA basis—that is, the annual net cash outflow multiplied by the corresponding present-value factor. (Present value is a single number that expresses a flow of revenues or

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1. Sec. 502(5)(E) of FCRA, 2 U.S.C. §661a (5)(E) (2016).

FCRA and Fair-Value Treatments of a Three-Year Direct Loan for $100 Million at 3 Percent Interest
Millions of Dollars

	Year				
	0	1	2	3	Subsidy[a]
	Cash Flows				
Disbursement	100	0	0	0	n.a.
Scheduled Interest Payments	0	-3	-2	-1	n.a.
Scheduled Principal Payments	0	-33	-33	-34	n.a.
Losses From Default	0	1	1	1	n.a.
Net Cash Outflow From the Federal Government	100	-35	-34	-34	n.a.
	FCRA Treatment				
Treasury Discount Rate (Percent per year)	0	0.25	0.50	1.00	n.a.
FCRA Present-Value Factor[b]	1	0.998	0.990	0.971	n.a.
FCRA Discounted Net Cash Outflow From the Federal Government[c]	100	-34.9	-33.7	-33.0	-1.6
	Fair-Value Treatment				
Fair-Value Discount Rate (Percent per year)	0	1.75	2.00	2.50	n.a.
Fair-Value Present-Value Factor[b]	1	0.983	0.961	0.929	n.a.
Fair-Value Discounted Net Cash Outflow From the Federal Government[c]	100	-34.4	-32.7	-31.6	1.3

Source: Congressional Budget Office.

With direct loans, the government collects scheduled interest and repayments of principal (net of amounts not paid when there is a default), and in some cases the government also charges borrowers fees. Most of the net costs occur up front, when loans are disbursed.

Present value is a single number that expresses a flow of revenues or outlays over time in terms of an equivalent lump sum received or paid at a specific point in time.

FCRA = Federal Credit Reform Act of 1990; n.a. = not applicable.

a. Sum of the discounted net cash outflows.

b. One divided by one plus the interest rate raised to the power of the number of years until the payment is made or received. For example,
   $1 / (1 + 0.5 / 100)^2 = 0.990$.

c. The net cash outflow multiplied by the present-value factor.

Box 1.	Continued

Comparison of Methods: FCRA and Fair-Value Accounting

outlays over time in terms of an equivalent lump sum received or paid at a specific point in time.)

Suppose that, on the basis of observed pricing for a privately held portfolio that is comparable to the federal loan portfolio, the implied fair-value discount rate for the cash flows in each period is 1.5 percentage points higher than the corresponding

Treasury rate. The fair-value subsidy is computed in the same way as the FCRA subsidy, using the same net cash outflows, but the present-value factor is computed from the Treasury rate plus the market risk premium of 1.5 percentage points. Accounting for market risk in this example changes the estimated subsidy to a positive subsidy of $1.3 million, which implies a cost to the government.

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discrepancies (resulting, for instance, from differences in rounding at various stages of the calculations).[8] CBO applies its own estimates of the appropriate risk premiums in calculating fair-value subsidy estimates.[9]

CBO computes all of the fair-value estimates in its annual updates using a discounted cash-flow approach.[10] For other purposes, CBO has also used more sophisticated techniques, such as options-pricing models, to more precisely estimate the fair value of some credit instruments.[11] The options-pricing approach typically applies a risk adjustment to the cash flows themselves rather than to the discount rate. That risk adjustment creates a certainty-equivalent cash flow, which is the certain amount that an investor would willingly exchange for an uncertain cash flow. Such certainty-equivalent

cash flows can then be discounted using risk-free rates. In some cases, CBO uses the insights from those more sophisticated analyses to guide the assumptions about discount rates used in the annual updates. The use of a single approach for those updates makes the fair-value estimates more readily comparable across programs and with FCRA estimates.

Estimates of Cash Flows

For the Department of Education's student loan programs and FHA's single-family mortgage program, CBO's estimates of cash flows—including scheduled and unscheduled principal payments, defaults, and recoveries—are based on models calibrated to data on the historical performance of loans in those programs. The cash flows generated by those models account for the characteristics of the loans and borrowers in each program and CBO's projections of macroeconomic variables such as interest rates and house prices. CBO and OMB account for student loans somewhat differently. In particular, CBO considers consolidation loans—which replace one or more federal student loans with a single loan that typically carries a longer term—to be extensions of the original loans, whereas OMB considers consolidation loans to be new loans.[12]

8.　See Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 2019: Federal Credit Supplement*, www.whitehouse.gov/omb/supplemental-materials/.

9.　FCRA accounting separates the administrative expenses of federal credit programs from the programs' subsidy costs, and it accounts for administrative expenses on a cash basis. Although comprehensive fair-value estimates of subsidies for credit programs would incorporate certain administrative expenses—such as servicing and collection costs—that are essential to preserving the value of the government's claims (rather than accounting separately for those costs on a cash basis), CBO excludes those expenses in its fair-value estimates.

10.　For example, see Congressional Budget Office, *Fair-Value Estimates of the Cost of Federal Credit Programs in 2019* (June 2018), www.cbo.gov/publication/54095.

11.　For example, to price FHA's mortgage insurance, CBO has used an options-pricing model that took into account the probability of prepayment and defaults. See Francesca Castelli and others, *Modeling the Budgetary Costs of FHA's Single Family Mortgage Insurance*, Working Paper 2014-05 (Congressional Budget Office, September 2014), www.cbo.gov/publication/45711.

12.　FCRA requires that the cost of a loan be recorded at the time the loan is disbursed and that it include the effects of changes in loan terms if the borrower exercises an option included in the loan contract. CBO estimates the incremental costs of loan consolidation—an option that is included in the master promissory note—at the time the loan is disbursed, a practice that is consistent with the principle of recognizing the value of a contractual right (in this case, the right to consolidate) at the time it is granted.

Table 1.

Sources of Information About Cash Flows, Discount Rates, and Risk Premiums

	Source	
	CBO	**OMB**[a]
Direct Loan		
Department of Education's student loan programs		
Direct loan cash flows[b]	X	
U.S. Treasury rates	X	
Risk premiums	X	
Other programs		
Direct loan cash flows[b]		X
U.S. Treasury rates		X
Risk premiums	X	
Loan Guarantees		
FHA's single-family mortgage programs		
Guarantee cash flows[c]	X	
Guaranteed loan cash flows[d]	X	
U.S. Treasury rates	X	
Risk premiums	X	
Other programs		
Guarantee cash flows[c]		X
Guaranteed loan cash flows[d]	X	
U.S. Treasury rates		X
Risk premiums	X	

Source: Congressional Budget Office.

With direct loans, the government collects scheduled interest and repayments of principal (net of amounts not paid when there is a default), and in some cases the government also charges borrowers fees. With guaranteed loans, the government may collect fees at origination and annually from the financial institution or the borrowers; in return, the government agrees to cover all or a portion of losses if the borrower defaults. For direct loans, most of the net costs occur up front, when loans are disbursed. This contrasts with loan guarantees, for which net costs occur gradually over the life of the commitment.

OMB = Office of Management and Budget.

a. Data are taken directly from OMB's Credit Subsidy Calculator.

b. Direct loan cash flows include principal, interest, default, recovery, fees, prepayments, nondefault losses, and other outflows or inflows.

c. Guarantee cash flows include default, recovery, fees, premiums, and other outflows or inflows.

d. Guaranteed loan cash flows include principal, interest, and prepayments.

For the other programs analyzed, CBO uses projections of cash flows obtained from OMB that include defaults, recoveries, prepayments, fees, and other miscellaneous amounts. For direct loans, those cash flows also include interest payments and principal repayments. CBO makes no adjustments to the projections of cash flows and follows OMB's method for discounting to the date of disbursement. CBO also uses the same yields on Treasury securities (which affect projected cash flows as well as the fair-value discount rates that it uses for the fair-value estimates).

The computation of fair-value subsidies for loan guarantee programs is complicated by the fact that the data files that OMB provides to CBO for those programs include only the projected fee and claim payments but not the payments of interest and principal because those cash flows are not required to compute FCRA estimates. They are necessary, however, to compute fair-value estimates (see the section below describing loan guarantees), so CBO approximates them using data on loan characteristics published by OMB in the *Federal Credit Supplement*.

Estimates of Discount Rates

As described, the discount rates used in FCRA calculations are equal to the rates on Treasury securities with similar terms to maturity. To maintain consistency with the assumptions used to develop the cash flows, CBO uses either its own estimates of rates on Treasury securities (for programs whose cash flows are estimated by CBO) or OMB's estimates (for programs whose cash flows are estimated by individual agencies) as the discount rates in the FCRA calculations.

The discount rates that CBO uses in fair-value calculations exceed the Treasury rates used in FCRA calculations to the extent that the loans have market risk. That risk premium reflects the fact that investors demand additional compensation to accept the risk that losses may exceed those already reflected in the estimates of cash flows and that those losses may occur when resources are scarce and particularly valuable.

To make those ideas concrete, consider the issuance by the federal government of a group of one-year loans totaling $1 million that have an interest rate of 7 percent. Suppose that the government expects losses—interest payments or repayments of principal that will not be made—totaling $50,000. Thus, in one year's time, the government expects to receive $1,020,000—the amount

due plus interest of $70,000 minus losses of $50,000. If the Treasury rate is 1 percent, then the value of the future cash flows under FCRA would be about $1,010,000 (that is, $1,020,000 divided by 1.01), resulting in a budgetary gain (or negative subsidy) of about $10,000 (the difference between the $1,000,000 disbursed and the present value of about $1,010,000 for interest payments and principal repayments). If, however, it was estimated that investors would require a risk premium of 2 percent (for a total discount rate of 3 percent) to hold such loans, the estimated market value of the future cash flows would be about $990,000 (that is, $1,020,000 divided by 1.03), corresponding to a fair-value subsidy cost of about $10,000.

Estimates of Risk Premiums

In CBO's calculations, the annual risk premium is a measure of the cost of market risk for a given year; it is added to the corresponding yield on Treasury securities to produce a fair-value estimate of a loan. The longer the average life of a loan, the larger the effect of the risk premium on the difference between FCRA and fair-value subsidies. For a loan guarantee, the subsidy also depends on the percentage of the loan that is guaranteed and, if the guarantee is less than 100 percent, whether the government shares losses evenly with the lender or takes losses ahead of or after the lender. The fewer losses the government is exposed to, the more market risk is shifted from the government to the lender.

The discount rates used in CBO's fair-value calculations incorporate estimates of risk premiums that reflect two factors:[13]

- The type of loans—categorized as housing and real estate, student, commercial, and consumer; and

- The degree of market risk—based on projected default rates and the terms of the loans, such as their maturity and the opportunity for borrowers to repay the loans early.

Housing and Real Estate Loans. CBO categorizes each real estate credit program as either residential or commercial. The agency further classifies residential programs as low-, moderate-, or high-risk on the basis of the characteristics of their loan portfolios—examining, for

example, loan-to-value ratios (capturing the relationship between the amounts lent and the value of properties) and the creditworthiness of the borrowers. To determine the risk premiums for residential real estate programs, CBO relies on four sources of private market pricing: the interest rates charged on mortgages that are not guaranteed by Fannie Mae, Freddie Mac, FHA, or another federally backed entity; prices for private mortgage insurance; the risk-based capital requirements for mortgage risk adopted in the Basel II and Basel III agreements; and the prices for risk-sharing instruments issued by Fannie Mae and Freddie Mac since 2010.[14] CBO adjusts those prices to factor out differences between private and federally backed mortgages that do not relate directly to market risk, including differences in liquidity and other characteristics of the transaction. For riskier types of mortgages, such as those with low down payments, CBO applies a higher risk premium than it uses for other mortgages. For commercial real estate programs, CBO assigns risk premiums on the basis of research on the returns on real estate investment trusts (private entities that invest in real estate).

Student Loans. CBO analyzes data on the pricing of private student loans and other consumer lending (discussed below) to inform its estimates of the risk premiums for federal student loans. The market for private student loans is small and focused primarily on low-risk borrowers; however, inferences can be drawn about other types of borrowers by relating risk premiums to the losses from defaults using data from other types of consumer lending. The risk premium reported for each student loan program represents a weighted average that is based on the distribution of outcomes—for example, the risk premium for a single program is derived from a distribution of loss estimates (based on default and repayment rates) spanning low-, moderate-, and high-risk borrowers. In some cases, student loan programs may have a greater degree of market risk because of features allowing principal to be forgiven, such as those offered to borrowers enrolled in some income-driven repayment plans.

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13. Estimates of the risk premiums are reported with the fair-value subsidy estimates for individual credit programs.

14. The Basel II and Basel III agreements are frameworks for capital requirements developed by the Basel Committee for Banking Supervision, which sets standards for internationally active banks among its member nations, including the United States. The "advanced" approach of the framework sets capital requirements for each loan on the basis of its probability of default and expected recovery. Risk premiums are estimated as a required return on capital multiplied by that requirement.

Commercial Loans. CBO assigns a credit rating to each commercial lending program—loans or loan guarantees to businesses, such as those offered by the Small Business Administration's 7(a) general business loan guarantee program—on the basis of the loans' maturity and reported default rates. Using that credit rating, CBO then assigns a risk premium depending on whether the loans are long term (with a maturity of seven years or longer) or short term. CBO's estimates for the risk premiums are based on an analysis of the average risk premiums for various credit ratings using data on yields for corporate bonds.[15] Because those risk premiums are available only for broad categories, CBO interpolates between those amounts to infer risk premiums for intermediate categories. For example, CBO uses a linear relationship between the estimated risk premiums for the A-rated and BBB-rated securities to infer risk premiums for the A-minus and BBB-plus categories. Additionally, CBO reduces the risk premiums slightly for short-term loans.

Consumer Loans. CBO categorizes the risk attached to each consumer lending program—loans or loan guarantees to individual borrowers, such as those offered by the Farm Service Agency's farm ownership and farm operating programs—as very low, low, moderate, or high on the basis of the characteristics of the program and its borrowers. Low-risk programs include, for instance, conditions that reduce the government's exposure to default risk (such as the federal loan's having seniority over a borrower's other loans in the event of default or a requirement that the borrower pledge specific assets as collateral); high-risk programs may involve, for instance, unsecured lending to borrowers whose ability to pay is significantly correlated with the state of the economy. CBO analyzes data on the pricing of various forms of consumer lending (such as automobile loans, credit cards, and personal loans) to inform its estimates of the risk premiums for consumer loans.

CBO's Method for Computing Fair-Value Estimates

CBO's method for estimating the fair-value subsidies of direct loans requires only the cash flows associated with the loan and an estimate of the risk premium. However,

to estimate the fair value of loan guarantees, CBO needs to supplement the cash flows of the guarantee with the cash flows associated with the underlying loan.

Direct Loans

CBO estimates the fair-value subsidy for direct loan programs by computing the present value of cash flows, discounting them in each period by using a discount rate equal to a Treasury rate of appropriate maturity plus a risk premium. Because the cash flows are identical to those used for the FCRA subsidy estimates, the difference between the fair-value and FCRA subsidy estimates for direct loans results solely from differences in the discount rate.

In some cases, issuing direct loans exposes the government to sources of market risk other than the risk of default. For example, the Treasury's purchases in 2009 of mortgage-backed securities that were issued and guaranteed by Fannie Mae and Freddie Mac exposed the government to prepayment risk (the risk that the securities will be repaid sooner, or later, than projected). Investors facing that risk generally expect to earn a higher rate of return than they would on a Treasury security. Therefore, the discount rate that CBO uses to estimate the fair value of certain types of direct loans includes a component for risks other than those related to the risk of default.[16]

Loan Guarantees

The fair value of loan guarantees approximates what a private guarantor would charge for obligations with similar risk and expected returns. In the absence of directly observable prices for such loan obligations, which are not available for most of the programs that CBO analyzes, a standard approach to calculating the fair value of a loan guarantee relies on an estimate of the difference between the fair value of the loan with and without the guarantee.[17]

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15. CBO estimates risk premiums for commercial loans using the analytic method described in John Hull, Mirela Predescu, and Alan White, "Bond Prices, Default Probabilities and Risk Premiums," *Journal of Credit Risk*, vol. 1, no. 2 (Spring 2005), https://doi.org/10.21314/JCR.2005.007.

16. The ability to prepay a loan confers a valuable benefit to the borrower, allowing him or her to exercise the option of accelerating the repayment of principal when doing so is most valuable (in particular, when interest rates fall), imposing a cost on the lender. To account for the value of that option, CBO adjusts the discount rate applied to the projected cash flows for direct loans using estimates from its options-pricing models and the observed difference between market values of securities that do and do not have prepayment options.

17. An alternative method for valuing loan guarantees is to use an options-pricing approach. See Congressional Budget Office, *Estimating the Value of Subsidies for Federal Loans and Loan Guarantees* (August 2004), www.cbo.gov/publication/15923.

When the government guarantees a loan that is provided by a private lender, its projected cash flows are quite different from those that would occur if it issued a loan directly that had the same terms. With its guarantee, the government is essentially transforming a loan with a risk of losses from default into a loan that has that risk removed (either completely, in the case of a full guarantee, or partially, when the government guarantees something less than 100 percent of losses). The value of the guarantee is the difference between the value of the underlying loan and the value to the lender of the guaranteed loan, whose cash flows are the sum of those for the underlying loan and the net guarantee payments (default claim payments minus the guarantee fees that the borrower or lender must pay).[18]

The procedure for estimating the value of the underlying loan is the same as that for a direct loan—the net cash flows are equal to the promised cash flows of the underlying loan minus the projected losses on the loan because of default. The projected losses represent the gross guarantee payment for a full guarantee. Similarly, the value of the guaranteed loan is estimated using the net guarantee payments (provided by OMB for most programs). For each program, CBO computes the present value of the cash flows stemming from the loans with and without guarantees, using discount rates that incorporate appropriate premiums for their market risk.

However, the discount rate applied to the less risky cash flows from the guaranteed loan should be lower than the discount rate for the underlying loan. For a loan guarantee that ensures the lender receives all principal and interest and does not bear any other risks, such as prepayment risk, the discount rate for the guaranteed loan should be the Treasury discount rate. For a loan guarantee for which the lender has some exposure to losses from default or bears prepayment risk, the discount rate on the guaranteed loan should be between the Treasury rate and the discount rate for the underlying loan. That discount rate can be estimated from the prices of securities that lenders issue to fund their guaranteed loans.

The subsidy cost of a guarantee under FCRA or fair value is the difference between the value of the unguaranteed loan and the value of the guaranteed loan. In the case of FCRA, the discount rates for both the guaranteed and unguaranteed loan are equal to the Treasury rates. Because they use the same discount rates, the difference between the value of the guaranteed loan and the value of the unguaranteed loan derives entirely from the net guarantee payments. In contrast, the fair-value approach uses higher discount rates for the loan without the guarantee than for the loan with the guarantee. That higher discount rate reduces the value of the unguaranteed loan relative to the guaranteed loan. Thus, the difference between the value of the underlying loan and that of the guaranteed loan is larger under the fair-value approach than under FCRA, which means that, because of the adjustment for market risk, the estimated subsidy cost is greater when the fair-value approach is used.

Fluctuations in Subsidy Estimates Over Time

All accrual estimates are subject to significant revisions over time because of changes in projected cash flows and discount rates. In addition, the initial estimates for each new group of borrowers can change from year to year. Changes in projected cash flows derive from several sources, such as swings in projected losses resulting from defaults; changes in fees and other terms of the loans resulting from administrative changes to programs; and changes in the mix of borrowers who participate. FCRA estimates are subject to those changes in projected cash flows as well as to unexpected changes in the Treasury interest rates that are used for discounting.

Fair-value estimates are subject to revision because of those same factors but also because of changes in the risk premiums that are added to the Treasury rates used for discounting. For example, because in most cases CBO relies on the projections of cash flows that underlie OMB's FCRA estimates—using the loss projections embedded in those cash flows to infer appropriate risk premiums—a reappraisal of those cash flows or additional analysis of the characteristics of the programs or borrowers might suggest that different risk premiums should be used to calculate the fair-value subsidies. More generally, fair-value estimates are subject to additional volatility because of changes in the cost of market risk, which fluctuates with market conditions. However, that additional volatility tends to be small in proportion to the considerable volatility of FCRA estimates.

Although market prices of credit can change significantly from year to year—because, for example, anticipated cash flows are derived from expectations, which may

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18. For an illustration, see Congressional Budget Office, *Federal Loan Guarantees for the Construction of Nuclear Power Plants* (August 2011), pp. 29–33, www.cbo.gov/publication/41510.

vary over time, about defaults, recoveries, and borrowers' decisions to prepay on their mortgage—estimates of risk premiums tend to move more slowly, especially when economic conditions are stable. Because CBO's estimates for risk premiums are based on a well-functioning market and do not include fluctuations based on short-term dislocations—periods during which financial markets are operating under stressful conditions and might misprice assets—a major change in market conditions must occur for risk premium estimates to change significantly. For

example, in the wake of the 2008–2009 financial crisis, investors demanded significantly higher rates of return on credit obligations, especially household-related debt, than they did before the crisis. At that time, CBO increased its estimates of risk premiums—although not to the highest levels reflected in market prices. As the economy and credit markets have recovered, those premiums have slowly decreased, though generally not to the levels that existed before the crisis.