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VALUING AND ACCOUNTING FOR LOAN GUARANTEES

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To achieve certain policy objectives, governments frequently provide private borrowers with loan guarantees that cover some or all of the risk that the borrower will be unable to repay the loan. Such guarantees are extremely valuable, and their value increases with the riskiness of the underlying asset or credit, the size of the investment, and the duration of the loan. The flip side of a guarantee's value to a lender is its cost to the government. Such a cost is not explicit but is real nevertheless. When providing guarantees, governments therefore must establish accounting, valuation, and risk-sharing mechanisms. This article describes methods of valuing guarantees; reports estimates of the value of guarantees in different settings; and summarizes new methods of accounting designed to anticipate losses, create reserves, and channel funds through transparent accounts to ensure that the costs of guarantees are evident to government decisionmakers.

Governments have long used loan guarantees that cover some or all of the risk of debt repayment to pursue a variety of policy objectives, including protecting bank depositors, promoting exports and foreign investment, supporting ailing industrial sectors, and even bailing out firms in financial distress. Today, especially in developing countries, governments are increasingly using guarantees to stimulate private lending for infrastructure projects. Partial guarantees—or guarantees targeted to specific policy or regulatory risks inherent in infrastructure sectors—mitigate those risks that the private sector cannot evaluate or will not bear. At the same time, partial guarantees can substantially diminish the government's financial obligation in cases where the only alternative is for the government to finance the project and bear all the risk.

Governments primarily guarantee debt. The instruments that governments guarantee include commercial bank loans and bonds issued on capital markets. Guarantees provide substantial comfort to the lender, especially as the underlying risk and the term of the loan increase, but they also entail a cost to the

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government, which is often overlooked. This cost—and consequent obligation—is not always explicit but is nevertheless real. When the government provides a guarantee, it incurs a *contingent* liability. That is, the guarantee is conditional on some future event. Although contingent liabilities do not demand immediate payment, they do require careful accounting and administration. When the magnitudes of such liabilities are large and not adequately accounted for, the payments resulting from default can have severe consequences for the government budget and can result in significant intergenerational inequity (Iden 1990).

One reason why governments do not account for contingent liabilities is because government budgets are typically maintained on a cash basis. Thus a *direct government loan* of $100 is recorded as an outflow of $100. But a *government guarantee* of a loan for the same amount from a private lender is not recorded at all, because nothing has been spent in that accounting period. Only when a default occurs and the obligation has to be honored is the cost of the guarantee accounted for. Fiscal prudence is maintained by setting a largely arbitrary upper limit on the total value of government guarantees. Guarantees are counted against this upper limit in various ways; in extreme cases, they are carried at the full face value of the underlying loans plus interest, even though the expected probability of default is slight.

History shows that defaults of guaranteed loans do occur, however, and when they do, guarantees, along with their significant implicit subsidy, have a serious impact on budgeting. (The subsidy reflects the fact that the interest rate is lower than the market rate and the difference is not made up by a guarantee fee.) A study of government-guaranteed loans for infrastructure projects in the nineteenth century supports the view that defaults arose in part from the poor design of the guarantees, which transferred all risk to the government (Eichengreen 1995). Allocating risk is a continuing concern because guarantees have been an important policy instrument in recent decades. In the 1970s, U.S. government guarantee programs, including loans to corporations, mortgage and deposit insurance, and trade and exchange-rate guarantees, grew at an extremely fast pace. These liabilities did not show up explicitly in the budget, however, and in the late 1980s, policymakers and the public felt the cost of such liabilities when the federal deposit insurance program had to make up the losses suffered by the savings and loan industry (Bosworth, Carron, and Rhyne 1987; Iden 1990; CBO 1989; Towe 1993). That crisis and similar defaults on loan guarantees in Canada prompted the search for more prudent methods of accounting and led to new budgetary practices to account for contingent liabilities.

A systematic accounting system that accurately reflects the government's liabilities and improves the allocation of resources can be achieved by recording in the budget the present value of expected outlays minus fees received for the guarantee. This methodology, which provides a more accurate picture of government liabilities (and takes into account the value of the implicit subsidy), gives the government a tool to decide between alternative projects.[1] Such procedures have been implemented to varying degrees in Canada and in the United

States. Several other countries are actively considering implementing similar accounting methodologies for guarantees.

This article brings together two streams of research on procedures to establish the value of guarantees and methods to account for the government's contingent liabilities. Although there is a significant body of research on valuing other kinds of contingent claims, such as futures, options contracts, and exotic derivative securities, only recently have these pricing techniques begun to be applied to government liabilities arising from guarantees (Lewis and Pennachi 1994; Kau, Keenan, and Muller 1993; Ronn and Verma 1986; Merton 1977). Researchers have also looked at the issue of budgeting for such liabilities, but there is no single treatment on valuing and accounting. This article combines both subjects in an overview that should provide policymakers with benchmarks and guidelines for decisionmaking. Examples are drawn primarily from industrial countries—especially the United States—where substantial experience has accumulated. With the use of guarantees increasing in developing countries, the analytical methods and findings should be of value to policymakers there as well.

Financial Characteristics of Loan Guarantees

The main purpose of a guarantee is to convert a risky loan into a risk-free loan. Such a guarantee is valuable to a lender because, if the borrower fails to repay the debt, the guarantor pays the lender. This presumption holds when there is no risk that the guarantor will default on the commitment. In practice, no guarantee is completely free of the risk of default, and its value depends ultimately on the creditworthiness of the guarantor. To the extent that governments are more creditworthy than private lenders, governments are more likely to honor their obligations (although governments can renege on commitments). Mechanisms such as escrow accounts can be used to bolster the credibility of a guarantee, but they add to the cost of financing.

To illustrate, assume a "risk-free" guarantee—one that is certain to be honored. In this example, adapted from Merton and Bodie (1992), a borrower buys a loan guarantee for $1. After surrendering the guarantee to the lender, he then borrows $10 at the risk-free interest rate of 10 percent. Thus the borrower effectively receives $9 in return for a promise to pay back $11. The implicit rate (in this case 22.22 percent) reflects both the risk-free rate and the charge for the guarantee. From the lender's point of view, the return on the $10 risk-free loan is 12.22 percent, the implicit rate (22.22 percent) minus the risk-free rate of 10 percent, which reflects the perceived risk of default.

Maintaining Incentives

Once a guarantee is provided, however, lenders have little incentive to monitor the performance of the firm. Eichengreen (1995) reports that because government-guaranteed loans for infrastructure (usually railways) in the late nineteenth century were not monitored, speculators diverted government funds, and the public interest was frustrated. Several different approaches—including partial guarantees and specific debt structures—have been devised to maintain incentives, although each approach has its drawbacks.

PARTIAL GUARANTEES. In the example above, if the borrower obtains a guarantee that covers only part of the risk, the cost of borrowing should be between 10 percent (for a completely risk-free loan) and 22.22 percent (when all risk is borne by the lender). Because the guarantee covers only part of the transaction, the borrower has an incentive to be efficient and the lender has an incentive to monitor the borrower's activities. These incentives are similar to those at work in auto insurance deductibles, which give drivers an incentive to drive carefully. Similarly, the World Bank guarantees only a portion of the private lender's risk, leaving intact incentives for private parties to contain and manage commercial risks.

The expectation is that a partial guarantee will filter out bad borrowers and attract those better positioned to assess and manage risk. The process is one that can add value by providing the project with credibility and expertise in project and financial analysis. If the guarantor has the expertise to evaluate projects at a cost below that of other financial institutions, the costs attributable to adverse selection (that is, the inability of lenders to distinguish between good and bad risks) can be reduced further.

STRUCTURING DEBT. An alternative—or complement—to the use of partial guarantees is to structure the debt in a way that maintains the lender's incentive to monitor the project. For example, if the debt has senior and junior components, with senior debt holders having the first right on loan repayments, a guarantee on this senior loan dilutes the incentive for mitigating risk (Jones and Mason 1980) because senior debt holders lose their incentive to monitor the loan. The incentives of junior debt holders are more complex in this situation; they have a continued—perhaps even an increased—incentive to monitor, especially if the guarantor is perceived as unable to impose a discipline on the senior creditors. Because monitoring is costly, however, its thoroughness will depend upon the expected benefits. And when the value of the borrowing firm is low relative to its debt, junior debt holders have less of an incentive to monitor because they foresee limited gains from improved performance. By the time senior debtors have been repaid, the value of the firm's assets may be close to nil.

In contrast, guaranteeing junior debt gives senior debtors a strong incentive to remain diligent.[2] Jones and Mason (1980), however, note that the cost of guaranteeing junior debt is higher than the cost of guaranteeing an equal amount of senior debt because the existence of prior claims (senior debt) increases the likelihood of a default on junior debt. (They suggest that the cost of the guarantee should be lowered by restricting the amount the firms may pay out in dividends, thus leaving more cash available to repay debt.)

The Guarantee as a Put Option

A guarantee may also be viewed as a put option, a mechanism used in securities markets that gives the owner the right, but not the obligation, to sell an asset for a prespecified price (called the exercise price) on or before a certain maturity date. A risk-free loan, which is equivalent to a risky loan and a guarantee, is also equivalent to a portfolio of a risky loan and a put option. A guarantee is a put option on the assets of the firm with an exercise price equal to the face value of the debt.

Consider the following: let *V* be the value of a firm's assets and *F* be the face value of its debt. For simplicity, assume there are no coupon payments and all the debt matures on a specified date. Also consider a put option purchased by the lender on the assets of the firm, with an exercise price *F*.[3]

Two scenarios are possible: either the value of the firm is greater than the debt, in which case full repayment can be expected and the put option is not exercised (so its value is zero); or the value of the firm is less than the debt, and the put option is exercised. The lender receives the exercise price, *F*, for assets that are worth *V*. Also, when the value of the firm (*V*) is greater than *F*, the value of the risky debt is *F*. But when *V* is less than *F*, the value of the debt is *V* since debt holders have first claim on the assets of the firm. If the debt is risk-free, its value is *F*, by definition. The difference between the value of the risky debt and that of the risk-free debt is also the value of the put option (see table 1).

From this analysis, it follows that the value of a risky loan equals the value of a risk-free loan minus the value of the put option. But we also know that the value of a risky loan equals the value of a risk-free loan minus the value of the loan guarantee. Thus the value of the guarantee can be estimated by computing the value of the put option.

Identifying a guarantee as a put option serves both a substantive and a practical purpose. Although the value of a guarantee could apparently be measured as the present value of future guarantee payments, in practice this is not possible except in the simplest cases because the value of the guarantee depends on parameters that change over time. The guarantee, or option, value is thus sensitive to such factors as the time to maturity, the volatility of the underlying asset, the value of the underlying asset, and the claims of other debt and equity holders. To capture the time-varying effects of these and other parameters, a fully speci-

Table 1. *The Guarantee as a Put Option*

Value of	$V > F$	$V < F$
Risky debt	*F*	*V*
Put option	0	$F-V$
Risk-free debt	*F*	*F*

Note: V = value of firm's assets; F = face value of debt.

fied dynamic model is needed, as in contingent-claims, or option-pricing, analysis.[4] The use of present-value methods is also complicated because it is unclear what discount rate to use for contingent claims such as loan guarantees. (A discount rate arises from the fact that money to be received in the future is considered to be worth less than the same amount today.) The appropriate discount rate should reflect only that risk that is inherent in the market and cannot be eliminated by diversifying a portfolio, but for contingent claims—such as put options—no methodology is available for estimating their nondiversifiable risk.

Academics and practitioners have therefore relied on methods that price contingent claims as functions of more fundamental claims such as stocks and bonds. These methods have been used extensively to value loan guarantees, including government-guaranteed deposit insurance such as that provided by the Federal Deposit Insurance Corp. in the United States (Ronn and Verma 1986; Pennachi 1987a, b). One of the best-known methods for pricing contingent claims was devised by Fisher Black and Myron Scholes in 1973 (see appendix for methodology).

Value of Guarantees to Lenders and Indirect Beneficiaries

When a full or partial guarantee is provided, the risk of default is reduced and the borrower is able to obtain lower interest rates. Studies show that the pecuniary value of guarantees—the full extent of the possible saving in interest costs—is often very large. As may be expected, the value of a guarantee increases with the volatility (or risk) of the underlying asset or credit, the size of the investment, and the time to maturity. Guarantee values of 15 percent of the underlying debt are not uncommon and can often be much larger in risky and long-maturity situations.

The value of a guarantee is shared by the guaranteed debt holder, the borrower, and others who have claims on the assets of the borrower. The guarantee may be of little benefit to the actual recipient (that is, the lender), unless the provision of the guarantee was unexpected. Equity holders benefit indirectly because the borrower's firm is able to borrow at a lower rate. Nonguaranteed debt holders, however, may be worse off because they will have a secondary claim on assets in the event of a bankruptcy.

A clarification is in order. Guarantee values referred to here are the gross values, or the effect that guarantees have on reducing the spread (that is, the difference between the interest rate without a guarantee and the interest rate with a guarantee) charged by bondholders and other lenders. Because the lender pays a premium or a fee for the guarantee, a net value calculation must be made to determine if the gain from lower financing costs is greater than the fee paid. The implicit assumption is that a net positive gain accrues to the borrower and that this net gain results from the guarantor's assessment that the market value of the risk is greater than the true risk (the guarantor in turn spreads its risks of default over a large number of projects). Bland and Yu (1987), who estimated the cost of borrowing minus the guarantee fee for 445 insured and 694 uninsured bonds offered in 1985, found the net gain to be positive and inversely related to credit ratings.

Several methods are used to determine the value of guarantees. One is the "rule of thumb" approach, which compares the market value of the debt (or the relevant underlying variables) with a risk-free asset and, based on the difference, determines the value of guaranteeing the risky debt. The calculation is approximate in most cases because it does not account for the changing value of assets, but it may be the only practical approach when sufficient data are not available. A second approach is the market-valuation method, which compares similar assets with and without guarantees, and a third is based on option-pricing methods. Procedures for estimating option values differ depending upon the specific features of the underlying credit (whether, for example, the debt is junior or senior), and the specific features of the guarantee (whether it is partial or full, and whether it is available for a limited period or to maturity).

RULE-OF-THUMB METHODS. To illustrate the principles of valuing guarantees, Merton (1990b) estimated the implied value of loan guarantees for ten corporate bonds as the difference between the known market price of the bonds and an estimated default-free price (table 2).[5]

On May 19, 1990, none of the bonds was in default. Merton also assumed that there were no call provisions, that is, that none of these bonds could be retired before maturity. ("Call" features or other options require the use of option-pricing methods.)

The estimated implied value of the guarantees is rather high, varying from a low of 11.5 percent to a high of 87 percent of the market price. One explanation

Table 2. *Implied Values of Guarantees on Corporate Bonds*

		Bond price (U.S. dollars)		*Value of guarantee (U.S. dollars)*	
Company	*Years to maturity*	*Default-free price*[a]	*Market price*[b]	*Implied value*[c]	*Percentage of market price*
Continental Airlines	6	109.12	66.00	43.12	65.3
MGM/UA	6	118.24	63.38	54.86	86.6
Mesa Capital	9	127.36	95.50	31.86	33.4
Navistar	4	100.00	89.00	11.00	12.4
Pan Am	4	147.23	58.63	88.60	51.1
RJR	11	88.80	70.88	17.92	25.3
RJR Nabisco	11	141.35	76.88	64.47	83.9
Revlon	20	117.25	80.75	36.50	45.2
Union Carbide	9	102.89	92.25	10.64	11.5
Warner Communications	3	124.11	97.00	27.11	27.9

a. Estimated by discounting the expected principal and coupon payments at 9 percent, approximately the rate on U.S. Treasury bonds and notes on May 19, 1990.

b. The closing prices as reported in *The Wall Street Journal* (May 11, 1990).

c. Implied guarantee value is equal to the default-free price minus the market price.

Source: Merton (1990b).

is that these were lower grade, and therefore riskier, bonds. Moreover, the benchmark is completely risk free, which is rarely the case; more often the guarantees in practice are partial.

A simple back-of-the-envelope calculation of this type is appropriate when the guarantee covers the full term of the debt. In such a situation the risky debt is converted into risk-free debt and the value of the guarantee is computed as the difference between the two. In most situations, however, such as when guarantees provide partial coverage (only interest payments, say) and secondary-market prices do not indicate the probability of default on every payment, it is more appropriate to base the value of the debt and the guarantee on contingent-claim methods.

Despite its limitations, the rule-of-thumb approach is popular because the detailed information needed for more sophisticated valuation is often unavailable. In the case of sovereign risk assessment, for example, U.S. agencies, such as the Commodity Credit Corporation, the Export-Import Bank, and the Agency for International Development, which provide guarantees to investors or exporters, are required to operate under a uniform method of assessing sovereign risk, primarily to compute the subsidies for budgetary purposes. The problem here, unlike the Merton example, is that the market price of the underlying sovereign debt is not known.

In such cases a two-step process is followed: first, countries are placed into one of eleven risk categories, and subsidy costs for each category (and varying time periods) are established.[6] A score of 1 indicates that payment problems are unlikely, and a score of 11 indicates that severe losses are expected. (The interagency group has correlated its credit ratings with those of Moody's and Standard and Poor's.) Based on a country's category, a risk premium is calculated as the historical average of the risk premiums of commercial bonds (with the same ratings) over investment-grade bonds. (A risk premium is that part of the return to capital that compensates the lender for the risk involved.) The subsidy cost is calculated as the difference between the present value of loan payments at the Treasury rate and a rate that is the sum of the Treasury rate and the risk premium (see table 3). As the date of maturity and the risk level rise, the expected gross cost of the guarantee increases. Reserves must be set aside to ensure that funds will be available to pay off such large contingent subsidy costs.

Market Values with and without Guarantees

Where comparable instruments with and without guarantees are traded, guarantee values are the difference in price between the two securities, assuming that the market has fully assessed the coverage provided by the guarantee. This is the case where standard guarantees are issued for municipal infrastructure investments in the United States. Market valuation is also possible where market values of a security exist before and after a guarantee.

Hsueh and Kidwell (1988) studied the Texas School Board Guarantee Program, which received a full faith and credit guarantee from the state govern-

Table 3. *Subsidy Costs by Risk and Date of Maturity*

Risk category	*Subsidy rate*[a]			
	1 year	*5 years*	*10 years*	*30 years*
A	0.2	0.8	1.3	3.1
B	0.4	1.2	2.1	3.6
C	0.8	2.3	4.1	9.7
C-	1.8	4.5	6.5	13.6
D	3.7	8.7	11.2	20.4
D-	5.2	11.4	16.1	27.5
E	8.0	16.4	24.6	38.6
E-	11.6	23.0	33.4	48.9
F	17.9	33.9	46.5	61.8
F-	23.4	42.4	55.6	69.6
F--	32.4	54.6	67.3	78.4

a. Subsidy cost divided by loan size times 100.
Source: GAO (1994).

ment that raised the credit rating of all the agency's bonds to the highest AAA category. They found that savings on interest were highest for bonds that had had low ratings before the credit enhancement; the savings ranged from a high of 98 basis points (100 basis points equal 1 percent) for bond issues rated Baa to 40 basis points for bond issues originally rated A. Districts rated AA did not achieve any cost savings. The risk-free interest rate was slightly above 9 percent, implying a savings of more than 10 percent in interest costs for the lower-grade bonds. The study also found that the state guarantee increased the number of bidders for school bonds with a low intrinsic credit rating. Of note to public policy consideration was that as the supply of AAA-rated bonds increased following the introduction of the guarantee program, municipalities that were not covered by the program had to pay about 50 basis points more in interest than those benefiting from the guarantee.

Although private insurance firms also issue guarantees to local governments, their exposure is usually limited to a portfolio with relatively low levels of default risk. In contrast, public guarantors are compelled to take on greater risks because of equity considerations (Hsueh and Kidwell 1988). Quigley and Rubinfeld (1991) examine the cost of borrowing with private insurance (guarantees) in the secondary market for municipal bonds during 1987–89. They observed the same bond with and without a guarantee and found, on average, that insurance lowered the yield on municipal debt by 14 to 28 basis points for unrated bonds or bonds rated Baa-1 or lower, relative to an average yield to maturity of 7.8 percent for an uninsured bond. The lower gains from private insurance in the after-market compared with those from Texas state guarantees suggest that the inherent risk of the bonds insured in the secondary market is lower and the gains smaller.

A study of the loan guarantees used to bail out Chrysler Corp. shows that the U.S. government's commitment to alleviate the company's financial distress made a very significant difference to financing costs (Chen, Chen, and Sears 1986). The method adopted measured returns to the company's equity and debt following specific government announcements about and actions taken to implement the guarantee program. Both the announcements and specific actions resulted in gains to equity holders and bondholders. An interesting finding is that equity owners realized greater gains than did bondholders, who were directly guaranteed. The authors suggest that, as residual claim owners, equity holders benefit significantly even when the guarantee is targeted only to debt repayments because the guarantee improves the value of the firm and therefore the value of their equity. This finding justifies an innovative pricing approach for the guarantee. In the past, when the government bailed out corporations in financial distress (such as Lockheed Corp. in 1971), the taxpayers had, in effect, taken the downside risk but had not gained from the upside when the companies recovered. Pricing for the Chrysler loan guarantee corrected this asymmetry by including not only a 1 percent fee on outstanding debt but also warrants. A warrant is a call option on the company's equity that gives the buyer the right to buy the asset for a specified price on or before a certain date.

A study on loan pricing in the context of project finance also finds that guarantees create significant value (Kleimeier and Megginson 1994). The mean spread over LIBOR (the London Interbank Offered Rate on which the cost of borrowing is based) in the sample loans was 100 basis points. For a guaranteed loan, the spread was 55 basis points. A limitation of this study, however, is that it does not take into account the extent of the guarantees provided or the sources (host government, export-import bank, or private sponsor).

Using Contingent-Claims Theory to Price Guarantees

Unlike market-based analysis, which compares several slightly different instruments to arrive at "implied" guarantee values, contingent-claims models value the guarantee based on the underlying dynamics of the assets and liabilities. If these underlying dynamics conform to a broad class of models and follow certain assumptions, contingent-claims analysis allows estimation through direct computation or numeric simulation (a method of solving complex nonlinear equations) of the value of the guarantee based on the payout structure implied by the guarantee. (For an explanation of contingent-claims analysis, see appendix and Merton 1990a.) In evaluations of loan guarantees to individual firms, input into a contingent-claims model typically includes the market value of the firm's assets, the book value of the firm's debt, the volatility of the underlying assets and liabilities, and the time horizon of the guarantee.

Sosin's (1980) option-pricing method for establishing the value of guarantees is a useful starting point because the main findings are echoed in other studies. The guarantees he examines were similar to those used by the U.S. Department of Commerce in June 1978 to guarantee loans to the steel industry. Designed for instances in which financial assistance was not otherwise available, the Commerce Department program guaranteed up to 90 percent of the value of the loan. At least 15 percent of the cost of the project was to be supplied as equity capital or as a loan repayable in no less time than the guaranteed loan. There was no charge for the guarantee.

The value of a guarantee and who benefits from it depend on the structure of the financing. Under the steel program, new (guaranteed) debt was subordinate to existing debt. As a result the guarantee did not benefit senior debt holders. Holders of the new subordinated debt received the guarantee in exchange for lower returns. The main gain thus went to the steel company's equity holders who benefited both because the company paid lower interest rates on the new debt and also because the guarantees raised the stability and thus the value of the firm. Guarantee values are low when risk and maturity are low but rise rapidly with risky, long-term loans. According to Sosin, whose model is based on Merton (1977), the guarantee value also rises when the firm is highly leveraged because as the share of debt in total financing rises, the probability of default on junior debt rises.

Baldwin, Lessard, and Mason (1983) use the option-pricing method to determine the value of a guarantee on a $200 million loan to two firms with very different characteristics: International Harvester and Dominion Textiles (table 4). Even though the guarantees are for the same amount, the value of the guarantee is higher for International Harvester because it is more likely to default, which is also reflected in the low market value of equity in relation to the value of the firm; in addition, current liabilities in relation to the value of the firm are also much higher. These factors add up to a higher probability of default for International Harvester; hence the guarantee has a higher value.

In an assessment of a U.K. government guarantee of corporate debt, Selby, Franks, and Karki (1988) estimate the value of a £200 million loan guarantee to International Computers Ltd. in March 1981. The government's motives for

Table 4. *Risk Profile and Guarantee Value*
(in millions of U.S. dollars unless specified)

	Harvester	*Dominion*
Business risk (standard deviation of annual returns in percent)	40	20
Current liabilities	2,330	178
Long-term obligations	1,866	220
Annual payouts	304	41
Market value of equity	247	153
Value of firm	2,718	584
Value of guarantee[a]	166	10

a. Obtained by numerical simulations as outlined in Jones and Mason (1980).
Source: Baldwin, Lessard, and Mason (1983).

providing the guarantee were twofold: International Computers Ltd. was a major employer with 24,000 workers; it was also the sole manufacturer of computers in Britain and the government was eager to avoid a takeover by a foreign company. The existing debt was of various maturities.

Because the firm's debt was not actively traded, the authors measured the value of the firm indirectly, basing their estimations on the market value of equity and following Merton (1974). For a loan maturity of two years, the value of the guarantee was estimated at £83.38 million, assuming that new debt was junior to existing debt. Of this, the cost of the subsidy (that is, the gain to the equity holders and other bondholders) amounted to more than half (£42.56 million) which, in turn, is more than a fifth of the value of the loan. The rest of the guarantee value (£40.83 million) accrued to senior bondholders. The guarantee on the junior debt in effect triggered early redemption of the senior debt at its full face value—a perverse effect because of the way the guarantee was structured. The longer the maturity of the senior bond, the lower the prevailing market value of that bond is likely to be relative to its face value and, if the guarantee is triggered, the higher the wealth transfer to senior bondholders. Such a structure negates the usefulness of guaranteeing junior debt because, by de facto guaranteeing the senior debt, it dilutes, if not eliminates, the incentive of senior bondholders to monitor the firm's performance.

When guaranteed debt has the same seniority as unguaranteed debt, the wealth transfer to bondholders without guarantees is much less and can even be negative because they have to share the proceeds of the assets with the holders of guaranteed debt. And, because prior claims are eliminated, the subsidy value of the guarantee falls to just over 10 percent, reducing the risk of default.

Borensztein and Pennachi (1990) used the contingent-claim method to value interest payment guarantees on developing country debt. In this instance, the market price of the interest payment guarantee is estimated as if the guarantee were traded in financial markets. The value of the guarantee is estimated as the value of a portfolio of two put options. When underlying conditions are good, all debt payments can be made and the guarantee is not called.[7] When conditions are especially poor, the full guarantee on all interest payments would be called. (This is modeled as a short position in a put, that is, a promise to sell at a future date an asset that the seller does not currently own—in this case the put.) The authors of this approach use the price of the developing country debt in secondary markets as a proxy for the country's debt condition. A feature of their estimation, which is not present in the earlier studies cited, is that they allow for the interest rate to vary, creating an additional source of uncertainty that raises the value of the guarantee.

The guarantees are for four years at a floating rate, with semiannual coupons tied to the yields on six-month U.S. Treasury bills. The results indicate that the value of a hypothetical current interest payment guarantee for four years ranges between the full value of interest payments when the market price of that debt is about 30 cents on the dollar to half of all interest payments when the market price of debt is 60 cents on the dollar. The high values of the guarantees essentially reflect the market's assumption that repayment is far from certain (making it unlikely that values would increase enough to prevent triggering the guarantee).

The option-price approach attaches a higher value to the four-year interest payment guarantee than does the "rule-of-thumb" approach. Thus the market values the debt at a higher level and assumes it will be repaid (which implies that the short-term interest payment guarantee will be less costly) because it is more concerned—and more optimistic—about long-run repayment.

Managing Contingent Liabilities

Because most governments do not record guarantees in the budget and no liability is entered, no reserves are set aside in the event that the guarantee is called. For example, Seguiti (1988) draws attention to budgetary practices in Italy, where, even though the government accounts for interest subsidies in the budget, guarantees are reported only if default occurs. Similarly, before enactment of the Credit Reform Act of 1990, the subsidy costs of contingent liabilities were not recorded in the U.S. budget.

Experience with loan guarantees in Canada makes the case for proper accounting. In the first half of the 1980s, the government spent about C$3 billion that had not been budgeted to pay off guarantees or provide supplementary budget support to beneficiaries of guarantees in danger of defaulting. To guard against any recurrence, the Canadian government in 1986 instituted management and budgetary procedures to minimize the risk of large disruptive payments.

The studies reviewed here demonstrate that, far from being free, guarantees entail a cost to the provider, and the more valuable the guarantee is to investors and lenders, the greater that potential cost. When markets have full information, the value is identical to the cost (the expected payment to cover default). Where market perceptions are more pessimistic than warranted, the cost may be less than the value. Thus, except when the market assessment is truly out of line with underlying conditions, governments providing guarantees must prudently manage their exposure by sharing risks with private lenders to ensure that the projects are monitored, charging fees to create the right incentives for using guarantees, building reserves in the event of default, and finally, instituting a rational system of accounting.

Sharing Risk

The principle of sharing risk with the lender through incentives to ensure good performance is becoming more widely accepted. When guarantees benefit private firms or projects, it is common to limit the guarantees to debt payments;

equity is not covered because equity holders are presumed to be willing to take on greater risk in return for higher expected returns (although as noted, equity holders also benefit from guarantees). In other cases, guarantees shift some of the risk to the project sponsors by covering less than 100 percent of the debt or by providing coverage for a limited time. In Canada risk sharing is an explicit part of the government's guarantee policy, and the government attempts to keep its exposure to a minimum. In developing countries, governments offering guarantees for private power projects have also sought to limit their exposure to sovereign or political risks and to require private investors to bear commercial risks. But because the power purchaser is often a government agency with a poor credit rating, the government ends up taking the commercial risk as well. Policy reforms to privatize the power sector and allow it to charge commercially viable tariffs will be needed to shift commercial risk to private parties. Thus effective risk-sharing depends on policy reforms.

Charging for Guarantees

Governments often do not set a price for guarantees; when they do, there is no clear rationale for the price. In the steel industry program described by Sosin (1980), for example, no fees were charged. Government guarantees to cover political risk in infrastructure projects are also typically free, although this practice is beginning to change. In many cases export credit agencies charge fees for guarantees based on the riskiness of the underlying credit. Although the fees tend to vary substantially, they can be as high as 10 to 15 percent of the value of the loan (Zhu 1994).

Pricing is desirable because it creates a market test for guarantees, reduces the inevitable temptation of private lenders to seek all available guarantees, shifts at least a portion of the cost of guarantees to the consumers of the services provided rather than to the general taxpayer, and provides ongoing information on the value of available guarantees.

In addition to charging a fee for guarantees to cover downside risk, governments may seek to share in the upside potential by acquiring warrants. This was the case in the U.S. government's loan guarantee to Chrysler Corp. The possibility of using such warrants is also an element of Canada's policy on loan guarantees, although the option has so far not been used.

Accounting Principles

If the government provides guarantees and records the fees received, the guarantee program actually reduces the budget deficit. The revenues that the government obtains reinforce the incentive to issue guarantees. Moreover, guarantees are preferable to loans, which are counted at their full face value. A more appropriate accounting system that places loans and guarantees on an equal footing based on the net present value of a government commitment would eliminate this distortion. Table 5 illustrates the budget impact of a direct loan of $1,000 and a guarantee for a loan of the same amount. The full amount of the direct loan is recorded in the budget authorization and outlay, but there is no authorization for the loan guarantee because there is no cash outflow. In fact, the guarantee fee of $10 is recorded as a negative outlay, or an inflow.

In this case, because the underlying opportunity cost to the government is the same under either action, the loan and the guarantee should be recorded at the $200 subsidy cost. Thus the new accounting system decreases outlays for loans and increases outlays for guarantees in the year of disbursement. The subsidy appropriation of $200 for the guarantee and the guarantee fee of $10 must be set aside as reserves, which earn interest. This amount covers future claims caused by defaults. A contingent liability program is said to be *funded* when the premiums for the guarantees and reserves created through budgetary appropriations are equal to the expected payments. Liabilities are considered *fair* when the premiums are paid by those who benefit from the guarantees (Towe 1993).

Valuing Contingent Claims

A first step in establishing the value of claims that arise from issuing the guarantee is to distinguish between guarantees for programs and guarantees for ad hoc projects. Programs provide guarantees to a large pool of risk bearers (as in student-loan or mortgage programs). In contrast, ad hoc guarantees are issued to specific companies either to support high-risk new developments or to bail the firms out of financial distress; in either case the government views the guarantees to be in the national interest. This rationale is not unlike that advanced in developing countries for attracting private finance to infrastructure projects.

Assessing liability for loan programs is straightforward and is often based on a history of defaults. When data are not available or are not reliable guides to future liabilities, however, a forward-looking, risk-based assessment is required, and option-pricing models can be used to estimate premiums. The U.S. government is beginning to use these sophisticated methods to measure the costs of

Table 5. *Loans and Guaranteed Loans, Before and After Accounting Reform*
(in U.S. dollars)

Item	*Budget authority*	*Outlay*
Before accounting reform		
Direct loan	1,000	1,000
Loan guarantee	0	–10
After accounting reform		
Direct loan	200	200
Loan guarantee	200	200

Source: Adapted from CBO (1991).

government guarantees. Option-pricing methods can also be used for ad hoc projects where the project or the firm has either directly measurable market values and measures of risk or appropriate proxies (Babbel 1989), but the applicability of these methods is limited because many newer projects do not have sufficiently long histories to provide needed data. Market-based methods are typically not used because there are not enough traded securities with and without guarantees to estimate guarantee values.

One alternative for evaluating the cost of guarantees on ad hoc projects is to use more direct measures of default potential, such as those used by credit rating agencies. These agencies categorize project risks in great detail and assign them a rating that summarizes the risk of default. Traded securities in that risk category are then used to estimate the value of the guarantee as the difference between the value of risk-free debt and the present value of risky debt of a similar maturity. When even such estimates are not possible, it is still worth imputing an approximate cost to guarantees. In Canada, all government departments seeking guarantees for ad hoc projects from the finance ministry are required to set aside 25 percent of the value of the underlying loan from their regular appropriations. Future payments resulting from defaults are charged against the amounts set aside. This practice creates a clear opportunity cost for the department seeking a guarantee. The value of 25 percent was arrived at somewhat arbitrarily and therefore does not differentiate risks by projects; with experience, the cost will be further refined. Even when estimations are more sophisticated, however, they suffer from a series of measurement errors stemming from inappropriate assumptions about the probability distribution of losses and the parameters of the distribution. Hence, all estimates need to be subjected to stringent sensitivity tests.

As noted earlier, the longer the period of time during which the risk is covered, the greater the exposure and the higher the value of the contingent claim. A corollary of the time dimension is that the value of the guarantee changes over time; typically it declines. Not surprisingly, the U.S. Credit Reform Act requires a continual valuation of liability because, during the life of a long-term loan, certain risks—adverse external shocks, say—may be accentuated. This legislation spells out procedures to measure the cost of federal credit programs.

The U.S. Credit Reform Act

Under the provisions of this 1990 act, which applies to most federal loan and loan guarantee programs (but not to federal insurance activities), the cost of interest subsidies and defaults in credit programs must be estimated on a discounted present-value basis when new credit is extended, and the costs must be recorded in the budget. Thus credit programs are made equivalent to other federal spending.

Since fiscal year 1992, the budget has had to reflect the outlays needed to cover the cost of subsidies associated with new loans and loan guarantees. The subsidy cost of a loan guarantee is defined as "the present value of cash flows from estimated payments by the government (for defaults and delinquencies, interest rate subsidies, and other payments) minus estimated payments to the government (for loan origination and other fees, penalties, and recoveries)" (GAO 1994). The cost of a particular loan or loan guarantee is charged against the relevant agency. New guaranteed loans cannot be disbursed unless Congress has passed an appropriation for the subsidy. The full cost of the subsidy is recorded as an outlay when the loan or the guaranteed loan is disbursed. In addition, the costs of credit assistance must be reestimated in the budget at the beginning of each fiscal year following the year in which the disbursement is made.

Not everyone agrees that the legislation is beneficial. Weil (1992) argues that budgetary accounting is a veil that is not necessarily effective in a world where the government and all agents discount actions undertaken. Thus, whether the guarantee is accounted for when it is issued or at the time of default should not influence taxes or welfare, although under the act, budget deficit estimates are higher early on than they would have been under the previous system and decline later. Weil concedes that when agents are "myopic," setting aside reserves against contingent liabilities induces the right behavior. But he notes that the Credit Reform Act introduces accounting inconsistencies by including only some guarantee programs and excluding others. For example, dropping large-ticket programs (such as deposit insurance) from the purview of the legislation reflects a political decision adopted to hold down the reported size of the budget deficit. Thus Weil is skeptical of the subsidy calculations that will be provided under the law. In particular, he cautions against the use of option-pricing techniques, which are highly sensitive to the assumptions used. Finally, he notes that when the government does guarantee a loan, it does not always have to self-insure by taking the guarantee on its own books. Where possible, he suggests, it should sell the guarantee, thereby eliminating the need to monitor the performance of the loan and make revenue adjustments in response.

In a comment on Weil, Taylor (1992) argues that credit reform was only one element in meeting the objectives of the 1990 Budget Act, which placed caps on discretionary spending and linked entitlement spending with taxes. As a consequence, any new entitlement program had to be balanced by a cut in other programs or an increase in taxes. Excluding loan guarantees from the discipline imposed by the Credit Reform Act would have led to an explosion of loan guarantees, given the caps on budgetary spending. Although the inconsistency created by not including all guarantee and insurance programs is undesirable, excluding loan guarantees from budgetary discipline would have been worse, Taylor concludes.

System of Accounts

The Credit Reform Act created five accounts for each federal agency that administers credit programs: a credit program account, a financing account, a liquidating account, a noncredit account, and a receipts account. Subsidy costs are expressed in terms of budget authority and outlays in the program and the financing accounts. There are separate financing accounts for loans and guarantees.

The program account receives an appropriation from Congress for the administrative and subsidy costs associated with a credit activity (for details of budgeting for administrative costs, see CBO 1992). For the agency, the budget authority is equal to the appropriation, and its outlays are the subsidy costs that occur when the loans are disbursed. Thus, in their annual request for appropriations, the agencies need to include estimates of subsidy costs for new loans and guarantees. If an agency exhausts its subsidy appropriations in a fiscal year, it cannot provide further credit assistance in that year. When a loan or a guaranteed loan is disbursed, the financing account receives the subsidy costs from the program account. In addition, the financing account records borrowings from the Treasury, guarantee fees, recoveries from past loans, and payments made to cover defaults. If the subsidy estimates are accurate, the financing account inflows and outflows should balance over time.

The liquidating account is a temporary account that handles liabilities incurred through loans and guarantees made before October 1, 1991. This account continues the cash treatment used before passage of the reform legislation. It has permanent, indefinite budget authority (that is, it does not need an annual appropriation) to cover any losses. The noncredit account is for activities such as grants, which were earlier included with credit accounts. The receipts account collects any negative subsidies in those cases in which the federal activity shows a profit.[8]

Budgeting for Eximbank

New accounting practices are being used for U.S. government-guaranteed loans to exporters of U.S. goods by the Export-Import Bank (Eximbank). Before credit reform, the Eximbank's net cash flows, new credit, income statements, and balance sheets were recorded in three separate budget documents. The operating income in any year lumped together payments from decisions reached in many different years. Thus the accounting system did not provide even a rough estimate of the cost of credit assistance in any given period.

Table 6 shows how credit reform affects accounting for Eximbank. Before credit reform, the revolving fund would have simply shown net outlays of –$823.1 million. The net "outlays" would be negative because salaries and expenses were paid from a separate administrative account so that other allocations were less than repayments received. Under the credit reform law, the estimated subsidy costs (sum of the subsidy cost for loans and guarantees) are reflected in the budget in Eximbank's program account and are separated from nonsubsidized cash flows. When the loan or guaranteed loan is disbursed, the financing account receives the subsidy cost for that particular loan. The liquidating account handles all loans and guarantees made before October 1, 1991.

Table 6. *Budgetary Treatment of Eximbank*
(in millions of U.S. dollars)

	Before credit reform	*After credit reform*
Existing revolving fund	-823.1	—
Program amount	—	264.8
Financing account (loans)	—	425.6
Financing account (guarantees)	—	-458.5
Liquidating account	—	-1,014.0

— Not available.
Source: OMB (1995).

The outlays consist of disbursements of tied aid (in which a condition of the assistance is the purchase of a given product or service), disbursements of subsidy costs associated with credit assistance, and administrative expenses. All other cash flows are treated as a means of financing and recorded in the financing account, which is not part of the budget.

Conclusion

As instruments for supporting private enterprise and attracting private finance to priority endeavors, guarantees provide significant value. Their value increases with the underlying riskiness of the project and the maturity of the loan being guaranteed. This survey shows that the value in the case of high-risk, high-maturity loans can be worth hundreds of basis points in interest costs or, equivalently, that expected default payments can be a very substantial portion of the loan.

Any policy using guarantees thus needs to address several tradeoffs. In guaranteeing loans the government takes on the risk of default and thereby reduces the incentives of the lenders and project sponsors to monitor project performance actively. To create an incentive for continued project monitoring and to filter out lenders who have little ability to manage risk, governments seek to share risks with private lenders by guaranteeing less than the full amount of the loan. The amount of risk-sharing in the cases surveyed has not been large, but governments are increasingly conscious that they need to lower their exposure and, as the Canadian example shows, some movement in this direction is likely. The value of the guarantee also depends upon the structure of financing. Guaranteeing junior debt creates incentives for senior debt holders to be vigilant but raises expected costs to the guarantor.

The high value of loan guarantees, the costs of losses, and the trend toward budgetary discipline have led countries to adopt a more rational approach to accounting for subsidies to ensure that the costs of guarantees are evident to decisionmakers. Although problems exist in estimating subsidy costs, experience will make it easier to estimate these costs more precisely. Better data would make it possible to predict future performance on the basis of past experience and would also permit the use of sophisticated contingent-claim valuation methods for pricing guarantees.

The growth of contingent liabilities, especially those associated with guarantees to lenders and other investors in private infrastructure projects, has become a source of concern in many developing countries. Some governments have chosen to restrict guarantees severely or even deny them. Guarantees against certain risks are often required, however, to finance the project. Where guarantees must be provided, the methods described in this article become relevant. The use of these methods is under serious consideration in the Philippines and Colombia. In the first instance, the methods adopted are likely to be less sophisticated than some of those described here; however, any effort at good housekeeping will be a step in the right direction.

Appendix: The Basic Black-Scholes Option-Pricing Analysis

In this analysis, a guarantee is akin to a put option because the lender has, in effect, an option to sell the debt at an agreed-upon price. Such an option—which can be on various underlying assets (bonds, stocks, currencies, or commodities)—gives its owner the right to sell that asset for a specified price (called the exercise price) on or before a certain date. (If the option can be exercised only at maturity, it is referred to as a European option; in contrast, an American option can be exercised anytime before maturity.)

The price paid by the buyer of the option is referred to as the option premium. A fair premium is equal to the present value of the cash flows from the option. The methodology used to compute this premium is referred to as option pricing or, more generally, as contingent-claims valuation.

Black and Scholes (1973) determined the premium for a European stock option in terms of parameters that are directly observable or that may be estimated using historical data (such as the current price of the underlying asset, the volatility of the return on the asset, the time to maturity, the exercise price of the option, and the risk-free rate of interest). The formula assumes that the stock price follows a particular stochastic—Ito—process and pays no dividends during the life of the option; that given the price today, the stock price in the future has a log-normal distribution; that the risk-free rate of interest and the asset's volatility are constant; and that there are no transaction costs or taxes.

Given the assumptions about the behavior of the asset price, a six-month put option on a $100 stock, carrying an exercise price of $90, a risk-free interest rate of 10 percent a year, and a volatility of 50 percent a year, would be priced at $6.92. A higher exercise price, longer time to maturity, and greater volatility would lead to a higher option price.

Underlying the model is the concept of *no arbitrage*—alternative assets with identical future cash flows and risk characteristics should all have the same price today. In the context of options, the basic method relies on being able to form, at a specific moment in time, a riskless portfolio of the option and the underlying asset. The no-arbitrage condition implies that such a riskless portfolio will earn the instantaneous risk-free interest rate and thereby determines a partial differential equation that describes the evolution over time of the relevant variables. Because the same sources of uncertainty affect both the underlying stock and the option, there is a correlation between the stock price and the option price; hence, the riskless asset is formed by buying either the asset or the option and selling the other.

Subsequent researchers have been able to relax the Black-Scholes assumptions and hence extend the conditions under which derivative securities can be priced. Cox and Ross (1976) discuss option pricing under alternative processes, including processes with jumps. Merton (1976) discusses option pricing when the underlying returns are discontinuous. Geske (1979) discusses valuation of compound options—a stock option is compound when, for example, it is valued based on the underlying value of the firm, not on the stock price. Roll (1977) derives an analytical formula for American call options with stocks whose dividends are known. Hull and White (1987) discuss option pricing on assets with stochastic volatilities.

Source: Hull (1993); Black and Scholes (1973); Merton (1973).

Notes

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1. Similarly, for budget purposes, government loans should be recorded at the value of the subsidy rather than the full value of the principal amount.

2. This conclusion apparently conflicts with the findings of a 1988 study by Selby, Franks, and Karki; but in that study, guarantee of junior debt is accompanied by a de facto guarantee of senior debt, and so the incentive effects disappear.

3. As a practical matter, the put option need not be on the assets of the firm itself, since these are unlikely to be liquid and tradable, but rather on other assets that are heavily correlated with the value of the firm, including the prices of the firm's inputs and outputs (Babbel 1989).

4. Option-pricing techniques are a class of contingent-claims valuation methods. Contingent-claims analysis usually refers to the general framework for "pricing," or costing out, various claims that are contingent on certain triggering events or conditions but are not necessarily linked directly to a tradable security. Options pricing, on the other hand, is viewed as the subset of contingent-claims analysis associated with pricing financial option products based on an underlying tradable security.

5. The price of a bond is the value in current dollars of future cash flows (principal and coupon payments) discounted at a rate that reflects the risk of default. If there is no de-

fault, the appropriate discount rate is the yield on Treasury securities of similar duration. The bonds Merton used were not actually guaranteed but carried an implied cost of being guaranteed.

6. The eleven categories are A, B, C, C-, D, D-, E, E-, F, F-, and F--.

7. This is modeled as a "long position," that is, buying a put option with exercise price $D\ (1 + ij)$, where D is the principal of the debt and ij is the interest rate applicable for the jth payment).

8. When subsidy costs are negative, no appropriations are required. For such a program, the negative budget authority and outlays are transferred from the financing account and recorded in the federal budget as proprietary receipts. These receipts are not available for use by the agencies unless the authority to do so is provided by law.

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