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The Management of Contingent Liabilities: A Risk Management Framework for National Governments

Christopher M. Lewis and Ashoka Mody

Abstract

Policymakers view privatization as a way of reducing the government's fiscal burden. But explicit and implicit government guarantees provided as part of the privatization process often expose governments to considerable risk—which is rarely reflected on the government's balance sheet. The contingent nature of this risk exposes governments to the possibility of sudden and substantial obligations over a short period of time, which could lead to severe fiscal problems. As the pace of privatization accelerates, governments' exposure to risk is rising, underscoring the importance of an integrated approach to risk management.

For a governmental institution, integrated risk management involves: (a) identifying and classifying the risks faced; (b) quantifying the government's exposure from these risks; (c) including those measures of risk in the budgeting process; (d) identifying the government's tolerance for risk; (e) establishing policies and procedures for structuring unexpected loss reserves; and (f) implementing systems for monitoring and controlling exposure over time. Use of integrated risk management systems will vastly improve governments' ability to manage and control risk and will enhance their efforts to improve the allocation of resources in the domestic economy.

Of course, the focal point of any government risk management program is the systems used for accounting and budgeting for contingent liabilities. Governments are often unaware of their exposure because of their use of cash-based budgets. Cash-based budgeting masks the contingent exposure and creates perverse incentives for issuing guarantees. By not accounting for the budgetary costs of issuing guarantees a simple cash budget encourages the expansion of guarantee liabilities without requiring the government to reserve against future losses. It allows political leaders to increase financial assistance to target groups without being held accountable for the costs of providing the assistance, which will be realized under ensuring administrations. To improve the allocation of resources governments should follow the lead of the private sector and move to a present value basis of accounting.

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During the transition from public to private ownership and management, governments often provide various kinds of support, including commitments to make streams of payments in the future. Some of those payments are deferred payments, and the government in effect transfers the financing off its own balance sheet as it enters into a financial lease arrangement. Some commitments are contingent, that is, they come due only if particular events transpire. Contingent obligations, such as guarantees, require no immediate cash outlay and are therefore often favored as a method of support. However, guarantees represent real liabilities and can cost as much as a third of the amount guaranteed (see Mody and Patro 1996). Moreover, these liabilities increase as government activities are moved to the private sector through privatization. Only recently have government auditors and Treasury officials begun to recognize the continuing fiscal implications of infrastructure privatization.

Contingent liabilities arise in a variety of contexts. Recently, the move to place infrastructure provision in private hands has led to a variety of guarantees that represent a significant liability for governments. In many developing countries government guarantees are also used to support other private sector activities. In addition, government guarantee programs support pension liabilities, export credits, and agricultural support. Furthermore, governments typically provide the contingent support to individuals, companies, or projects considered too risky for private financial institutions. The full extent of these liabilities is not known, because no attempt has been made to systematically estimate them. In some parts of the world, however, government guarantees may soon represent an unmanageable level of exposure, not only because of their size relative to the size of the government's balance sheet but also because their contingent nature implies the possibility of sudden and substantial obligations due over a short period of time.

However, governments have made little effort to develop their own systems for managing risk. As a result, governmental programs have been at the center of some of the largest risk-related losses. In the United States, for example, the savings and loan debacle in the 1980s cost taxpayers more than $130 billion. Other countries are facing a similar escalation of costs from deposit insurance programs. In some instances last minute government action averted a serious budgetary crisis (U.S. pension insurance). In other cases, improvements in the economy helped prevent a crisis from occurring (U.S. deposit insurance for commercial banks). In many cases, however, existing and growing contingent liabilities could significantly aggravate the next budgetary crisis.

Drawing on recent advances in the private sector, this chapter outlines a risk management agenda for national governments. It develops a framework for improving the assessment, measurement, budgetary control, and management of risks and demonstrates how this framework can be applied to contingent infrastructure liabilities. It also examines how the implementation of an integrated framework for risk management can be used to improve the ability of the government to design programs that target specific risks in a transaction, allowing the public sector to leverage private capital.

Section 1 identifies the main components of any integrated risk management system and shows how private firms use this framework to improve their own business operations. Section 2 shows how this risk management framework can be adapted to the needs of a government institution. Section 3 describes tools and techniques for identifying risk and quantifying risk exposures. Section 4 describes alternative budgetary approaches to managing the expected payouts under contingent liabilities. Section 5 demonstrates how reserves against unexpected losses enable governments to manage the volatility in budget expenditures. Section 6 highlights the advantages of a comprehensive risk management system that induces clarity of contract design, minimizes incentives that lead to a call on guarantees, and implements a regular monitoring process. The last section summarizes the chapter's conclusions.

An Integrated Enterprise Risk Management Framework

The goal of corporate risk management today is not to manage a fixed set of risk exposures of an enter-

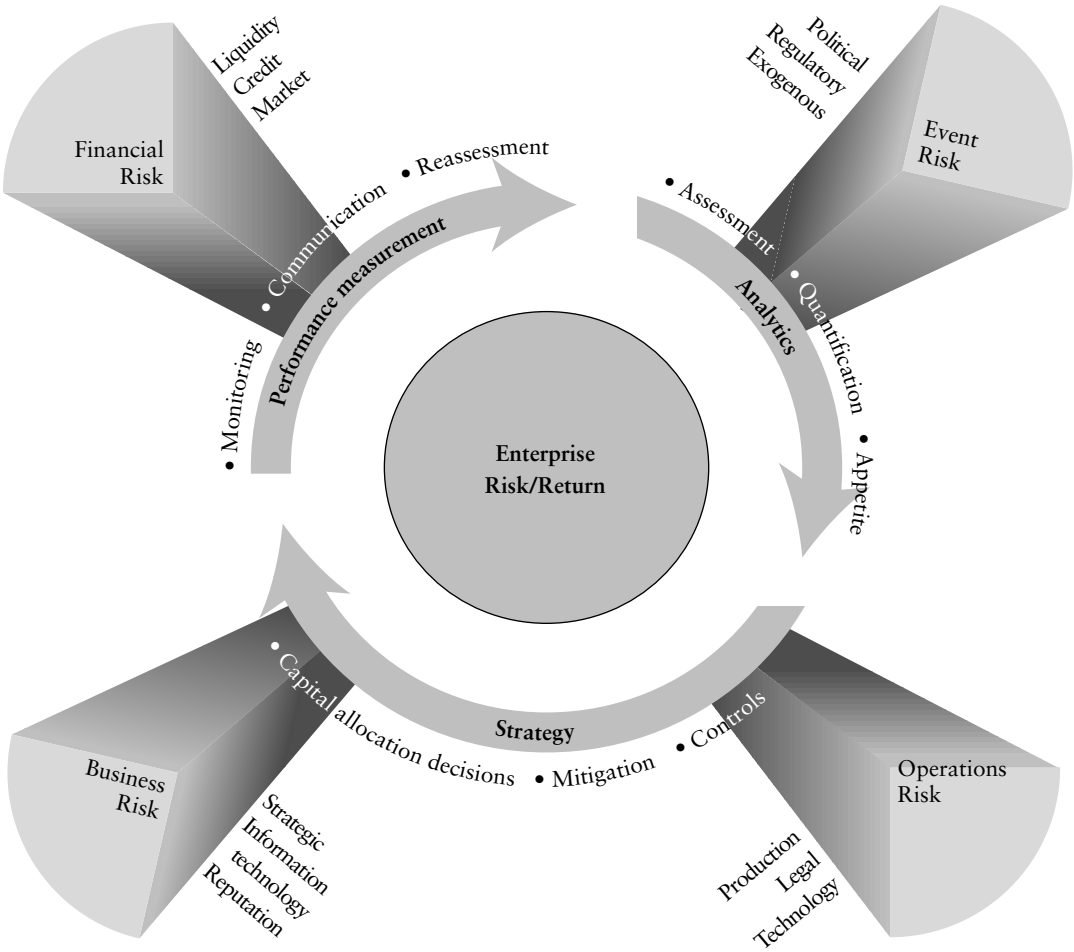
prise, but to determine the areas and lines of business in which a company is willing to retain risks in order to generate target returns. An integrated approach to corporate risk management helps a firm optimize the trade-off between risk and return so as to maximize the firm's overall risk-adjusted rate of return on equity and its shareholder value.[1]

Over the past several years many large multinational firms have implemented enterprisewide systems for risk management. Microsoft Corporation, for example, has just completed building an elaborate risk management system that quantifies more than 144 different types of risk exposures. For each risk identified as important, Microsoft determines the best approach for improving its management of exposure by insuring, transferring, mitigating, or retaining the risk. The system allows Microsoft to focus on managing the business risks associated with succeeding in its core market. Bankers Trust, Chase Manhattan, and Analog Devices have initiated similar systems.

An integrated risk management process should perform six major functions (figure 6.1):

- Identifying the firm's risk exposures
- Measuring or quantifying those exposures
- Assessing the firm's tolerance for risk-bearing
- Making strategic decisions on the allocation of capital to support risks that are borne
- Implementing risk mitigation and control mechanisms to prevent unintended losses on those risks and establishing systems to continually monitor and reassess the firm's risk exposure over time.

FIGURE 6.1
Integrated enterprise risk management: Optimizing enterprise returns under uncertainty



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BOX 6.1

Management of contingent liabilities in the Philippines

The government of the Philippines responded to a critical national power shortage by providing "full faith and credit" guarantees to private sponsors against the risk of payment default by the National Power Corporation (NPC), the public power utility buying power on long-term power purchase contracts from private generators under a BOT arrangement. The government waived its right to sovereign immunity, thereby accepting international arbitration in the event of a dispute.

Provision of free guarantees was crucial to the financing of substantial generation capacity (about 3000 MW), which alleviated the power crisis. But it meant that sponsors and lenders came to expect that such all-inclusive guarantees would always be available.

Recognizing that guarantees are neither desirable nor sustainable, the government issued a consultative document in March 1995, making specific recommendations for better management of its contingent liabilities (Government of the Philippines 1995). The government acknowledged that guarantees could not be eliminated abruptly and that a transition was required during which the legitimate risk mitigation needs of private parties would be met while an improving performance gradually allowed various elements of the guarantees to be eliminated.

A key feature of the policy was unbundling risks to allow more flexible management (table). Certain core guarantees of government obligations of "fundamental rights" under a project were seen as legitimate for the government to offer to establish a record of policy performance. Other guarantees, including the guarantee of currency convertibility and the risk of nonpayment of obligations by NPC, were seen as temporary and were also subject to higher fees. The consultative document recommended withdrawing certain guarantees (such as the guarantee of currency convertibility if the Philippines attained investment grade credit rating and the guarantee of NPC payment obligations if NPC attained investment grade rating). It also recommended limiting guarantees to 80 percent of total project costs in order to require equity investors to bear their share of project risks, developing model guarantee documents that would form part of the bidding package for prospective project sponsors, and instituting internal controls (including accounting for and reserving against guarantees).

A set of model guarantee documents was produced and is now being used in specific projects. The first project to which the approach was applied was the Renon Toll Road, which runs from Manila to Cavite. The key element guaranteed was the tariff formula. Since no guarantee was provided for traffic or revenue volumes, no payment obligation akin to the power purchase agreements was incurred by the government. The guarantee of foreign exchange convertibility provided only for equal treatment, as specified in current Philippine law. The new approach is also being applied to major power projects currently under negotiation, including the $300 million San Pascual Cogeneration Facility. In all of these projects the government is using the new guarantee package to pare back its contingent liability and to provide a means for reducing liability even further when the need for a particular form of guarantee diminishes. Discussions are continuing with the sponsors. The policy is also being used for new water projects coming on stream.

Managing exposure under guarantees through unbundling risks

Risk	*Nature of guarantee*		*Fee charged*[a]
	Core guarantee	*Noncore guarantee*	
Sovereign risks			
Concession terms, expropriation, tariff formula, tax incentives	Terms define basic rules are largely under government control		None
Obtaining of licenses, permits, right-of-way	Government commits to facilitating process. Risks mot fully under central government control.		25 basis points
Foreign exchange risk			
Convertibility of foreign exchange	Government assigns priority. Risk not fully under government control		25 basis points for the priority accorded
Market risk		Not under government control.	50 basis points initially to reflect commercial risk.
Credit risk		Transitional need to make project financeable.	No initial charge. Fall-away provisions when credit benchmarks are achieved.

a. Fee charged is indicative only.
Source: Government of the Philippines 1995.

These functions are used to manage the four broad categories of risk: financial, operational, business, and event risk.

Using Enterprise Risk Management to Manage Government's Contingent Liabilities

A similar integrated enterprise risk management framework can be adopted by any government institutions to help them maximize social returns.

Unlike private firms, government needs to approach risk management from an economywide perspective. Implementation of a risk management system is useful in this regard, since it provides governments with another tool with which to identify which risks should be borne by the government and which should be borne by the private sector.

Each of the six functional areas of a comprehensive risk management system can be implemented by governments to improve management of their contingent liabilities, and specifically, their infrastructure liabilities. Of course, implementation of the framework in a particular country would require significant adjustments to reflect the structure and dynamics of the national government, the budgetary and regulatory processes, the legislative and legal environments, and the risks being evaluated.

Identifying and Quantifying the Risks

The government's exposure to loss can arise from a wide variety of events. Attempting to account for every source of exposure is not feasible. A systematic approach to identifying the principal risks is needed to ensure that all relevant exposures of a program can be classified.

One approach to risk assessment is that adopted by federal regulators of financial institutions in the United States and Europe. With limited staff resources federal regulators have evolved a top-down, risk-focused approach for conducting risk management examinations of financial institutions. Regulators first examine an enterprise's general categories of risk (financial, business, operational, and event risks) then focus their scarce resources on the highest risk areas. This process yields a risk identification lattice (figure 6.2).

Using a similar approach a government can assess its own risk exposures in a particular program. The advantage of this top-down approach is that the government can focus resources on those risk categories, classes, or risk types for which exposure is greatest. This approach economizes on scarce resources and it minimizes disruption that may be caused in the private sector by excessive government audits.

A risk-focused assessment procedure was worked out in the El Cortijo-El Vino toll road project in Colombia (box 6.2). The assessment determined that the greatest exposures for the Colombian government were from the market risks associated with traffic volatility and from construction cost overruns (figure 6.3). Early recognition of these risks allowed the Colombian government to improve its risk management techniques and contract specifications for toll road projects.

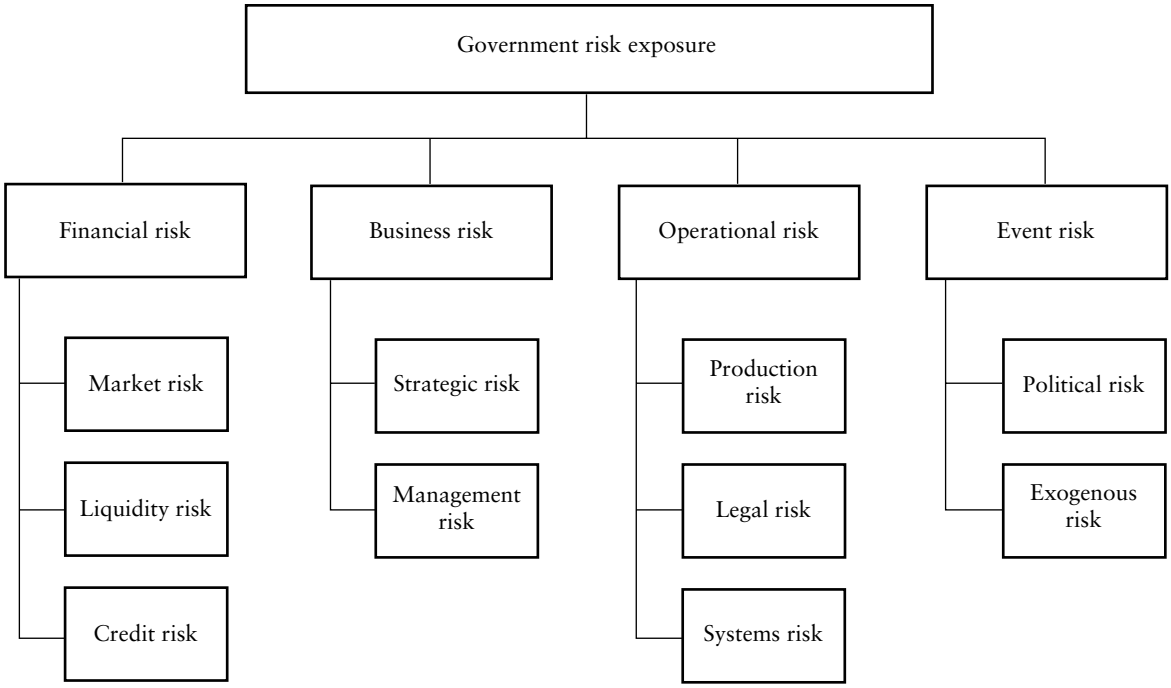
Once a central government goes through the process of identifying the risks it faces and gains a better understanding of its risk exposures, the valuation or quantification process can begin. A wide variety of techniques exists for quantifying different types of risk. The techniques used depends on the type of risk being analyzed. (Although this chapter addresses the application of these techniques to the contingent liabilities of a government, these tools can be used to manage risk on the government's entire balance sheet.)

Actuarial or Statistical Techniques

Where a large body of data exists on prior losses or data can be augmented using statistical techniques, actuarial methods that estimate future loss patterns based on prior loss experience (including trends) are often used to quantify the government's exposure to loss. Actuarial techniques, which have been used to assess insurable risks for almost two centuries, can be used to assess the magnitude of a wide variety of risk exposures.

Actuarial techniques use the loss history of a given program—or comparable programs—to estimate an annual expected loss distribution. This annual expected loss distribution is then adjusted to reflect current trends in loss frequency and loss severity, as well as any changes in the sharing of risks between the government

FIGURE 6.2
Risk identification lattice



and the insured party. If the annual adjusted loss distribution is assumed to remain stable over time (adjusting for any time trend), the distribution can be used to estimate the expected and unexpected costs of the program in any given year. Discounting cash flows using a risk-free rate of interest yields estimates in current dollars.[2]

Econometric Models

A deficiency of actuarial models is that they do not attempt to explain the patterns of loss they identify and thus cannot be used to forecast nonlinear trends in loss patterns, as in the case where the risk sharing between the government and the private sector change over time. This shortcoming can be significant, especially when analyzing the performance of credit programs that are sensitive to economic fluctuations.

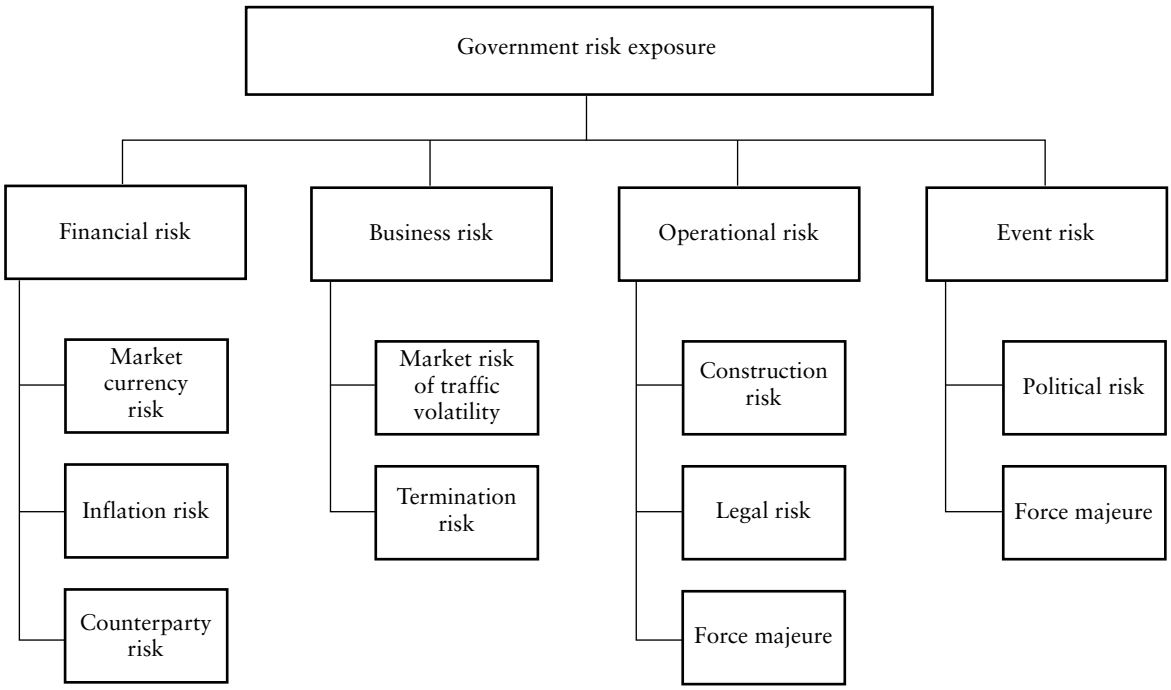
Econometric methods can be used to show how the expected loss distribution of a program may change over time based on the pattern of underlying economic or financial factors. By forecasting future movements in these factors, econometric models can be used to compute how these loss distributions may change over the life of the program. Incorporating econometric analysis into the parameterization of the expected loss distribution allows the government to:

- Model economic and financial trends that may influence the pattern of losses within a program,

BOX 6.2
Identifying which risks to guarantee in the Colombian toll road project

The Colombian government provided two basic forms of assurance to support the toll road project, a construction materials overrun guarantee and a traffic volume guarantee once road construction was finished. Under the terms of the cost overrun guarantee the government would cover 100 percent of the cost of material overruns that were 30 percent of the original construction design bid, 75 percent of the cost of material overruns that were within 30 to 50 percent of the original construction design bid, and 0 percent of the cost of material overruns that were more than 50 percent higher than the original construction design bid. The traffic volume guarantee committed the government to reimbursing the concessionaire if traffic volume falls 10 percent below the traffic volume projections agreed to in the budget for the project. If traffic volume exceeded projections by more than 10 percent, the additional revenues associated would be deposited in a reserve fund used to cover future shortfalls in traffic volume or for road maintenance and improvements.

FIGURE 6.3
Sources of risk in the El Cortijo–El Vino toll road project



allowing for more dynamic projections of losses and the incorporation of loss events for which there is no historical precedent

- Identify factors that affect loss behavior, so that actions can be undertaken to mitigate losses
- Improve the ability of an underwriter to evaluate the riskiness of program participants based on the characteristics of the participant or factors affecting the participant.

One useful application of econometric modeling is in identifying the loss patterns associated with credit risk. When the government provides a direct loan or protects a third party against the default of a borrower, it exposes itself to the risk that the borrower will default. When it lends directly, the government also faces prepayment risk exposure—the risk that the borrower will repay the loan early, leaving the government exposed to a loss of interest and to reinvestment risk. Both credit and prepayment risk can be affected significantly by conditions in the economy (such as a drop in interest rates, which usually leads to an increase in mortgage prepayments as homeowners that have higher-coupon mortgages refinance). Econometric models can be used to assess how these risks vary across time with changes in the underlying economy.

Over the past twenty years econometric models have become increasingly sophisticated and powerful, evolving from simple ordinary least squares models to logistic regressions, to nonlinear regression models and complex hazard functions. Quercia and Stegman (1992) provide a detailed review of the evolution of econometric techniques and models just within the mortgage industry. Default/prepayment models are also available for small business loans, consumer loans, and credit card receivables.

Both actuarial and econometric models require substantial data inputs on the performance of a program (or comparable program). Project finance, where deals are unique and data records are often missing or of low quality, more advanced modeling approaches are required, including stochastic simulation analysis and contingent claims models.

Contingent Claims Analysis

Contingent claims analysis is a powerful technique for estimating the value of a loan guarantee, direct loan,

or insurance program—in isolation or as part of a complex layering of risks. It is particularly useful when historical data on the performance of a program are not available. Contingent claims are assets (or liabilities) whose values on a specified future date are uniquely determined by the prices of other traded securities. The classic example is a European call option issued on an underlying stock—that is, an option to buy a stock at a specified exercise or strike price on a specified date in the future.

In a seminal paper Black and Scholes (1973) demonstrated that the price of a European call option can be valued using only the value and instantaneous variance per unit time of the underlying asset, the term of the option, and the risk-free rate of interest. Merton (1973b, 1977) followed with a more generalized theory of contingent claims pricing that allowed for the development of new models to price all types of assets whose payoff structure could be linked to an underlying security. Since 1973 techniques have been developed to value a wide array of financial and nonfinancial instruments, including complex financial options, corporate liabilities, third-party guarantees, employee compensation, insurance products, and more recently, the value of capital investment decisions, or "real options." Development of a theory of rational options pricing helped foster the expansion in the financial markets over the past twenty-five years.

Contingent claims analysis is also an extremely powerful tool for analyzing government loan guarantees, direct loans, and insurance programs. Merton (1977) used a modified form of the original Black-Scholes options pricing equation to determine the value of deposit insurance in the United States. Marcus and Shaked (1984), Pennacchi (1987b), and Cooperstein, Pennacchi, and Redburn (1995) expanded this work. The use of contingent claims analysis was also extended into other areas for assessing the value of government liabilities, including federal loan guarantees granted to corporations (Sosin 1980), mortgage guarantees (Foster and Van Order 1985; Cooperstein, Redburn, and Meyers, 1992; Kau, Keenan, Muller, and Epperson 1992), state guarantee funds supporting insurance company failures and federal pension insurance (Lewis and Cooperstein 1993; Hsieh, Chen, and Ferris 1994; Pennacchi and Lewis 1994).

This approach has been used by the federal government in the United States since 1992, when the Office of Management and Budget adopted contingent claims models for deposit insurance, pension insurance, and mortgage guarantees to help it forecast budget costs during the five-year budget window and beyond. Contingent claims models have also been used to compute a range of expected long-term costs for these programs, which have been published in the federal budget. While contingent claims models have not being used directly to determine the expected cash outlays in each year of the budget window, these models have been used as part of the federal budgetary process.

To understand how contingent claims analysis is used to value government guarantees, insurance, and direct loans, it is important to first understand the financial equivalence of each of these instruments from the perspective of risk. When a government institution issues a direct loan, it transfers cash to the borrower in exchange for a promissory note of repayment and collateral, usually in the form of a down payment and a secured interest in the value of the underlying asset that was purchased with the borrowed funds. If the loan were risk free—that is, if the probability of a loss on the loan were zero—there would be no need for the collateral interest, and the government could record the full value of the loan repayment as an asset on its balance sheet. Direct loans are rarely risk free, however, as the borrower has the option to default on the note and transfer the underlying collateral to the government. In fact, the borrower could be expected to default on the loan if the costs of default (the loss of collateral and all transactions costs, including penalties) were less than the benefits associated with continuing to make payments on the loan. Thus, as Merton and Bodie (1992) showed, the issuance of a direct loan is analogous to bundling two separate transactions—the issuance of a risk-free loan and the underwriting of a put option with an exercise price of the outstanding value of the loan and an underlying asset represented by the collateral securing the loan:

Value of Risky Direct Loan = Value of Risk-free Loan – Value of Default Put Option.

A rational borrower is expected to default on a home mortgage if the value of the outstanding loan (L) exceeds the value of the underlying house by more than the transactions costs and penalties (P) of defaulting. The payout of this default option is identical to the government underwriting a put option on the underlying value of the house (V), with an exercise price equal to the sum of the loan and the costs of default ($L + P$).

The only difference in the case of a 100 percent loan guarantee is that the transaction is unbundled. A private bank issues the risk-free loan, and the government underwrites a put option in the form of a loan guarantee given to the bank issuing the loan. Thus:

Value of Risky Direct Loan = Value or Risk-free Loan – Value of Loan Guarantee.

or

Value of a Loan Guarantee = Value of a Risk-free Loan – Value of Risky Loan.

It is straightforward to show the equivalence between the structure of an insurance policy and a contingent claim. When the government underwrites a loan guarantee the government is providing assurance to other parties that it will bear the risks associated with borrower default. A loan guarantee is thus analogous to a credit insurance policy against borrower default.

This analogy also applies to layered insurance or reinsurance policies. Excess-of-loss reinsurance provides protection for losses (L) that exceed some trigger level (T) based on what the reinsured party can absorb. Once an event exceeds this trigger the reinsurance pays some fixed proportion of losses (L), usually up to some predetermined cap (C) on the reinsurer's exposure. If losses are less than the trigger, the insurer pays nothing. If losses fall in the range between the trigger and the cap, the insurer pays out the difference between the loss coverage and the trigger. If losses exceed the cap the insurer pays the difference between the cap and the trigger. Using this basic structure, Lewis and Murdock (1996) show that the payout (P) of the reinsurance can be specified as follows

$$P = \text{Max}[0, L - T] - \text{Max}[0, L - C].$$

For a reinsurer the first term in the equation is analogous to being short (that is, having underwritten) a call option that allows the primary insurer to "call" on the resources of the reinsurer to pay for losses that exceed the threshold insurance trigger. The second term in the equation is analogous to the reinsurer's being long (that is, having purchased) a put option that allows it to "put back" to the insurer any losses that exceed the reinsurance cap. Thus the reinsurance contract is simply the difference between a put option and a call option written on the underlying exposure of the insured event, or a call spread option. If the trigger is defined as deductible a similar argument can show how a standard primary insurance contract can be expressed as a financial option.

The techniques used to value financial options are, then, directly applicable to the valuation of direct loans, loan guarantees, and insurance contracts granted in the process of supporting infrastructure liabilities. Governments can use options pricing theory to formulate a more accurate assessment of their aggregate risk exposure in project finance and other areas.

Valuing Guarantees in Infrastructure Projects: Applications from Colombia

In 1996 the Colombian government and the World Bank collaborated to quantify the risk exposure of three project finance transactions. The purpose of the effort was to establish the viability of a methodology to obtain estimates of the government's exposure. To the best of our knowledge this was the first time that a sophisticated contingent valuation methodology was applied to government infrastructure projects by central government.

A generalized form of contingent claims analysis was used to evaluate three infrastructure finance projects: A toll road project (El Cortijo–El Vino), a telecommunications joint venture (Telecom–Siemens), and an energy sector project (CORELCA).

To value these transactions, the diffusion process for all of the state variables underlying the risks in each project was first specified. Yearly changes in prices (including exchange rates) and demand vol-

umes were assumed to follow a correlated lognormal process. The frequency of losses as a result of event risks (force majeure, counterparty failure, termination risk, and convertibility risk) was assumed to a binomial distribution with a constant loss severity rate. The evolution of discretionary events, such as advertising costs, was assumed to follow a uniform distribution.

The means of these distributive processes were derived from the best information available on each project or from experience in other markets. Variance estimates were derived from an examination of the variability of the cash flows on each project or, when unavailable, from the best market comparable. Covariance estimates between project cash flows was based on best guesses or was assumed to be zero.

Using these estimates, the project used stochastic simulation techniques to identify the net expected loss from each project. To provide a better understanding of the decomposition of risk exposures within each project, the study also tried to analyze the marginal increase in the government's exposure associated with bearing each additional type of risk. Given the impact of diversification, marginal risk analysis understates the risk exposure of each element (Merton and Perold 1993). To compensate, any residual risk was allocated to each risk category in proportion to the overall risk exposure (table 6.1).

The market risk exposure associated with traffic volatility and the risk of construction overruns were identified as the largest risks in the El Cortijo–El Vino toll road project. The total expected loss to the Colombian government from these two guarantees was about $4.2 million. A small counterparty risk associated with the failure of Corfigan, the reinsurer of the construction companies involved in the project, was also identified.

Regulatory/market risk and construction risk were identified as the largest risks the telecommunication project. Regulatory/market risk exposure—stemming from Colombia's deregulation of telecommunications, which ended the monopoly held by Telecom—was estimated at $10 million. The second largest risk in the venture was construction risk, estimated at $9.8 million. Whether this risk is borne by Telecom or Siemens is not clear from the contracts. Telecom has nominal responsi-

BOX 6.3

Providing support to the Barranquilla power plant expansion in Colombia

The government of Colombia supported the $755 million expansion of the 240 megawatt Barranquilla thermal power plant in various ways. The new 750 megawatt plant will be constructed by TEBSA to provide power to CORELCA. TEBSA, Termobarranquilla S.A., is a special purpose vehicle, capitalized by the old Barranquilla thermal plant, now jointly owned by CORELCA and ABB Distral. CORELCA is an undercapitalized, state-owned power distributor on Colombia's Atlantic Coast that runs a narrow-margin energy distribution service.

Government support in the expansion of TEBSA consists of a power purchase agreement between CORELCA and TEBSA, three guarantees, and a subordinated loan.

- CORELCA enters into a power purchase agreement with TEBSA, under which CORELCA agrees to make capacity payments to TEBSA for the first twenty years of the plant's operation. As long as the plant is operational CORELCA has to pay a schedule of fees that start high and decline over time.
- The Ministry of Energy then guarantees CORELCA's ability to make these capacity payments to TEBSA in the case of a CORELCA default. That is, FEN essentially underwrites a put option giving CORELCA the right to put the capacity payments issued under the power purchase agreement, along with the right to future revenues from the power from the TEBSA plant, to the government in the event that CORELCA fails.
- The Colombian government then provides a guarantee that FEN will be able to honor its commitment to make payments under the CORELCA power purchase agreement if CORELCA defaults.
- To prevent CORELCA from failing FEN takes a subordinated debt position in CORELCA to help ease a short-term liquidity crisis that would have forced CORELCA into insolvency.
- Ecopetrol, the supplier of gas to TEBSA and CORELCA, guarantees force majeure payments.

The government's exposure in the CORELCA energy project was estimated at $67 million. In this project, the Ministry of Finance used guarantees and subordinated debt to support a marginally profitable energy distributor (CORELCA) that, in turn, supported the development of a new thermal power plant through a power purchase agreement providing twenty years of capacity payments. Most of the government's exposure originated from the fact that retail energy prices may be insufficient to support CORELCA's operations, causing CORELCA to default.

bility for obtaining the licenses necessary to install new lines and assign operational lines to customers, while Siemens bears the responsibility for installing the lines and switches. However, when the contract was revised early in the project to account for initial delays, Siemens was held harmless for any construction overruns. Thus, it was unclear which construction risks Siemens would actually bear in the future.

The loss variances for each project were also analyzed, and scenario analyses were run to monitor how the risks of each project changed under varying conditions (figure 6.4).

Scenario analysis is an extremely important tool as governments review their exposure to a project finance transaction in the context of more general fiscal policies. In the toll road project, for example, such analysis can reveal the impact of anti-inflationary fiscal policy on the government's exposure to traffic volume guarantees. Scenario analysis is also useful in analyzing alternative approaches to perfecting the government's interest in a particular infrastructure project. For example, along with a Power Purchase Agreement, the Colombian Government took a subordinated interest in CORELCA. As a result, any action that is designed to increase the value of the energy guarantee also must be evaluated based on its impact on the value of the subordinated loan granted to CORELCA.

Risk-Adjusted Performance Measures: A Transition to Budgetary Control of Risks

Once its risk exposure is quantified the government can use the information as a control mechanism by publishing it in the national budget, using it to establish exposure limits or credit limits, or using it to develop risk-adjusted performance measures. Such measures could be used to reward programs that deliver social benefits with the least risk to the public budget. If, for example, two programs yield the same social benefits and the same expected costs, the program with the smaller variability in cash flows should receive more budget funding and be subject to less oversight.

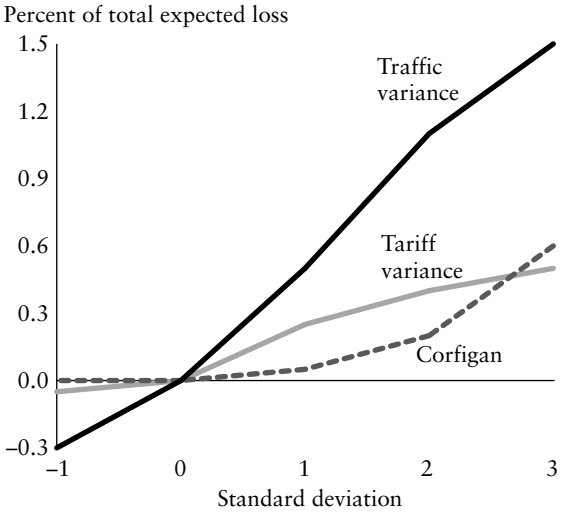
For private companies risk-based performance measures often attempt to measure the return generated by a particular product line relative to the amount of capital that the product line places at risk. That is, companies look at the risk-adjusted return on capital. For national governments the driving mechanism is the budgetary process, and risk management must focus on how the budgetary process can be improved to provide stronger incentives for risk management.

Many governments face significant legal, regulatory, and political hurdles in moving from current budgetary practices to a full accounting of the risks of contingent liabilities. Implementing risk-adjusted performance measures allows governments to manage their exposures to contingent liabilities even if an immediate change in national budgetary policy is not feasible. Nonbudgetary control mechanisms for contingent liabilities could be employed during a transition to a new budgetary system, on a permanent basis for liabilities grandfathered during a change in budgetary policy, or as a permanent management solution if the government failed to enact a change in the budget law. These alternatives include publishing information on government exposures, establishing credit quotas (exposure

Table 6.1
Expected government losses in Colombian infrastructure projects
(millions of U.S. dollars)

Type of risk	*El Cortijo–El Vino toll road project*	*Telecom-Siemens joint venture*	*CORELCA energy guarantees*
Market risk	3,100	2,500	52,000
Construction risk	1,100	9,800	0
Counterparty risk	250	100	5,000
Currency risk	0	–1,300	2,000
Force majeure	200	300	7,000
Termination risk	–150	200	1,000
Regulatory risk	0	10,100	0
Total	4,500	21,700	67,000

FIGURE 6.4
Sensitivity analysis for the Colombian toll road project



limits), and earmarking future funds to cover guarantee costs. Similar performance measures can be developed to meet the needs of countries looking to make incremental changes to their budgetary policy or as a mechanism for smoothing the transition to a full budgetary accounting of contingent liabilities.

Budgeting for Expected Costs

Governments need to make risk-return trade-offs when deciding which programs to fund each budget year. While these decisions seek to maximize risk-adjusted social returns rather than financial returns, a clear understanding and accounting for program costs and risks is critical in making these decisions. Unlike private sector corporations few governments set aside budgetary resources to cover the full expected costs of financial guarantee or insurance programs, a far simpler task than establishing reserves to cover unexpected costs. Instead many governments choose to budget only for expected cash outlays associated with a guarantee or insurance program in the next budgetary period.

Present Value versus Cash Budget

Private companies, especially banks and other financial institutions, tend to recognize the present value of expected costs of a product or liability in the year in which the liability is issued, discounting to reflect the time value of money. Private institutions compute virtually all investment decisions, expenditures, plans, and budget forecasts on a present value basis. The use of present value accounting is especially important in areas in which private firms are required to mark-to-market the value of assets or liabilities. But, even where assets and liabilities can be carried at cost, or book value, present value budgeting helps in establishing loss reserves or a capital budget.

In contrast, most government bodies account for credit and insurance products using a simple cash-based system of budgeting. Under a cash-based system of budgeting, a government equates the budgetary cost of issuing financial assistance with the cash outlay created by the transaction in the current budget year. Thus when a government issues a direct loan, the entire face value of the loan at the date the loan is issued is recorded as a budgetary cost, with loan repayments recorded as cash inflows in subsequent years. Simple cash-based budgeting thus treats the disbursement of a direct loan as a grant equal to the entire face value of the loan, with subsequent repayments representing offsetting receipts for the government. Loan guarantee and insurance programs are not recorded as costs in a simple cash-based budget until a claim is made at some future uncertain date. In fact, since any premium revenue from a government insurance program is recorded up front in exchange for the insurance policy, while claims are not recorded until some uncertain date in the future, a simple cash-based budget may record an insurance program as a net revenue gain. This inconsistency creates a budgetary incentive for policymakers to raise premiums rather than reduce the likelihood or severity of claims insured. Cash-based budgeting thus misrepresents and masks the aggregate exposure associated with loan guarantees and government insurance programs and creates perverse incentives for selecting one form of financing assistance over another.

To see how these incentives skew decisionmaking, consider the different ways in which the government could help finance a $100 loan to a private infrastructure provider. If the government provides a 10 percent

loan subsidy, the cash budget cost would be $10 in year one. If, instead, the government provided the loan directly, the cash budgetary cost in year one would be $100—the full face value of the loan. If the government agreed to guarantee a loan made by a private bank, the budgetary cost of the guarantee would be zero (or negative if a guarantee fee is collected) the first year. Thus, while the economic and financial value of the three different forms of financial assistance are equal, a legislative body would favor the guarantee option.

Even more problematic, by not accounting for the budgetary costs of issuing guarantees, a simple cash budget encourages the expansion of guarantee liabilities without requiring the government to reserve against future losses. Without budgetary control these contingent liabilities grow, and the government's exposure to sudden increases in future budgetary costs increases. These unanticipated increases will raise government deficits, require a realignment of budgetary expenditures away from future expectations, and create an enormous political backlash against the government's guarantee programs.

By not aligning the budgetary impact of direct loans, loan guarantees, insurance, and grant programs with their true economic costs at the time commitments are made, a simple cash budget creates an intertemporal myopia and/or moral hazard. Tracking the cost of guarantee claims only as the claims are incurred as opposed to when the commitment was made enables political leaders to provide financial assistance without having to account for the costs of providing the assistance, which will be realized under ensuing administrations. This form of myopia can quickly lead to an escalation in guarantee costs as ensuing administrations increase their financial assistance to favored parties. Only by enforcing budgetary controls at the time the financial assistance is committed can the appropriate budgetary incentives be realigned to eliminate this moral hazard.

Use of a present value system need not affect or distort cash-based estimates of the government's fiscal deficit, since the effect on the deficit is not recorded until actual cash payments are disbursed from the reserve fund. Adoption of a present value method of guarantee budgeting simply forces agencies to set aside reserves up front for the expected costs of the guarantee issued.

Appropriate Discount Rate

To discount nominal cash flow streams to compute the present value of expected losses, private companies typically follow one of two procedures. Under one approach projected cash flows are discounted using a risk-adjusted discount rate based on the firm's cost of capital. (For more on industry cost-of-capital estimates see Fama and French 1997.) Under a second approach risk-adjusted cash flows are discounted using a risk-free rate of interest, usually proxied by the short-term U.S. Treasury bill rate, LIBOR, or overnight interest rates.

In computing a government's exposure to credit and insurance programs using contingent claims analysis, the second approach is used, and no consideration of the appropriate risk-adjusted discount rate is needed. In cases in which cash flows do need to be discounted by a risk-adjusted interest rate, the government must determine the appropriate discount rate policy. In the United States, the government uses its cost of funds as the discounting factor (as reflected by the U.S. Treasury rate with the same maturity as the loan guarantee or direct loan).[3] The alternative approach considered in the United States was a "benefit-to-borrow" approach, in which the discount factors would be computed from the discount rates used by private sector agents when computing the benefits of the government program. The problem with a risk-adjusted discounted rate approach, especially for contracts with embedded options, is that the appropriate discount rate becomes a function of the riskiness of the contract payouts.

The Federal Credit Reform Act of 1990

Prompted by the explosion of loan guarantees issued during the 1980s and a recognition of biases created by a simple cash-based system of budgeting, the United States changed the budgetary treatment of direct loans, loan guarantees, and grants in 1992.[4] Under the new budgeting system created by the Federal Credit Reform Act of 1990, each of these

forms of credit was valued using a financially equivalent metric—the expected present value of future costs. The budgetary cost of credit is defined as the present value, discounted at Treasury interest rates of comparable maturity, of the expected cash outflows from the government minus the expected cash inflows to the government.[5] The shortfall between borrower fees, repayments, and interest and the amount needed to cover the principal of the loan and the Treasury's cost of borrowing represents a cost to the government. Likewise the difference between the fees borrowers pay to the government and the cost of guaranteed loan defaults (and/or interest subsidies) represents a cost. When agencies seek budget resources (budget authority and budget appropriations) to carry out a credit program in the budget process, they must estimate and request the full expected present value of future costs—including default, interest, and other costs—associated with loan guarantees or direct loans to be issued in the forthcoming budget year. Funding to cover the expected present value of future costs is charged against the appropriation for an agency when the direct loan or loan guarantee is issued and the government's commitment is extended. These costs, or subsidies, must compete for budgetary resources on the same basis as other government spending.

Credit reform requires more careful record keeping than a simple cash budget. Agencies must identify loans or classes of loans by the appropriation used to fund the transaction, their maturity and date of origination, and their subsequent cash outflows and inflows. In addition, programs are required to develop risk categories based on the characteristics that determine the likelihood of default and other costs. These records are used to reestimate the value of the subsidies provided for loans or loan guarantees, adjust ex post budgetary expenditures relative to ex ante expectations, and improve the subsidy calculations for new loans or guarantees. This tracking also helps agencies underwrite, service, and control losses on loans or guarantees.

The Federal Credit Reform Act significantly improved the budgeting process in the United States. By revealing the true fiscal implications of direct loans, guarantees, and grants, the new budgeting system allows policymakers to make decisions on the form of financial support on the basis of the underlying needs of the targeted population rather than on the specific budgetary treatment of alternative financial structures.

The Federal Credit Reform Act does have shortcomings, which provide useful guidance for future budgetary reforms in the United States and elsewhere. First, coverage of unexpected losses is not included as part of the cost of a program. This failure to incorporate some measure of unexpected loss represents a serious shortcoming given that most loss distributions associated with central government guarantees are asymmetrically skewed against the government. Second, incentives remain to use "cheap" insurance structures to cover loan guarantees. Government insurance programs are financially equivalent to guarantee programs and should be treated in a consistent budgetary framework. Third, program agencies must make substantial investments in new information systems technology. In the United States, new investment in information systems placed a strain on many of these agencies. Governments adopting credit reform must recognize at the outset that funds need to be available for this investment. Finally, credit reform requires that agencies reestimate the subsidy costs of their programs on a regular basis so that the government's exposure can be recalculated and appropriate funding is set aside to cover future costs. Appropriate discipline is required to ensure that agencies do not underestimate subsidy costs with the knowledge that any shortfall will be made up in someone else's watch.

Learning from the experience in the United States, New Zealand has implemented a similar budgeting approach. Their program covers all contingent liability exposures (including insurance), and the government has published a present value budget for both contingent and noncontingent expenditure and revenue flows.

Risk Preferences and Reserve Policy

In addition to budgeting for the full expected present value of costs from credit and insurance programs, governments need to set aside reserves against unexpected losses. Preparing for unexpected losses prevents the

political backlash associated with redirecting scarce public resources to cover the sudden increase in costs, obviates the need for political battles over additional funding, and eliminates the perception that any sudden increase in costs represents program mismanagement.

Setting up reserves to protect against such events can mitigate these problems by reducing the number of events for which the executive branch or administering agency needs to seek additional budgetary resources to cover program costs and by reducing the size of any budgetary requests that are made. Because the United States government did not reserve against unexpected losses, it incurred high political costs as a result of the $130 billion in losses charged to U.S. taxpayers during the thrift crisis of the 1980s.

When a private corporation examines its exposure to risk, its management committee must determine the amount of capital and reserves that the company wishes to hold in excess of expected costs to cover unexpected losses. For an institution with multiple lines of business, determining the appropriate level of capital or reserves is a complex procedure that takes into account both the variability of losses for each product line and the correlation between product returns and the opportunity cost of capital. Management must also weigh the expectations of the company's shareholders and stakeholders, rating agencies, and its business partners in determining an optimal level of capital for maximizing shareholder value. The level of capital or reserves held by an enterprise reflects its relative risk aversion and its ability to withstand a specific level of unexpected losses. Thus a firm seeking a AAA rating will hold considerably more capital against unexpected losses (say, capital to cover a 99 percentile event over a 1-year period) than a firm seeking an A rating (capital to cover a 90 percentile event).

Determining the Aversion to Unexpected Losses

Setting aside reserves for unexpected losses reduces the frequency with which the executive branch needs to go to the legislature for special appropriations or a special incomes bill. If the government wants to go to the legislature only once every thirty years for a given guarantee, it needs to find the level of loss protection that will allow it to do so. Once the proper valuation tools are in place the government can set reserve policy based on an assessment of its aversion to making frequent requests for funding to the legislature.

Distributions of potential guarantee payouts are complex. Rather than specifying a probability threshold in terms of the probability of default, which would be unwieldy, common practice is to describe it in terms of the standard deviation of losses. Depending on the type of distribution, deciding on the appropriate multiple of the standard deviation as the threshold will result in a particular default frequency.[6] Many companies set capital and reserves to cover a two or three standard deviation movement in their underlying risks.

Another important factor in determining the level of reserves is the government's leverage preferences, that is, the opportunity cost of holding funds in reserve as opposed to spending the resources on programs. On the one hand, holding more funds in reserve will increase the liquidity of the guarantees that the reserve supports, increasing the value of the guarantee and allowing the government to leverage more private sector funding in the guarantee program. On the other hand, reserving funds in a separate account reduces the amount of money available for other public sector projects. If the net benefits of additional public spending exceed the liquidity benefits of adding to the guarantee reserve, the government may want to direct additional funds toward public spending.

When a private company assesses this trade-off between holding reserves or investing in other programs, it usually has a targeted economic return that helps guide its capital policy. For a government the comparable concept is social economic return. Calculating social economic return requires a complete asset-liability management program that goes beyond the valuation of infrastructure liabilities or other forms of direct loans, loan guarantees, and insurance. This chapter focuses solely on reserving against contingent liabilities without considering a broader asset-liability management policy.

Establishing a Reserves Policy

Once a government can assess its risk tolerances and goals, in terms of both which risks and the level of loss

it is willing to bear, it can establish reserves against unexpected losses ("risk capital") within its credit and insurance programs.[7] To do so, however, a government needs to determine whether reserves will be set based on the additive unexpected loss exposure of each guarantee or on a portfolio value-at-risk approach to account for portfolio diversification, what the investment policy of the reserves will be once they are established, and where the reserves should reside.

Additive versus Portfolio Reserve Requirements. The first decision that a government needs to consider when setting up a reserve for unexpected losses is the measure of unexpected loss against which to capitalize. Under an additive reserve standard the government calculates the unexpected loss exposure of each of its contingent liabilities (that is, examines the sensitivity of each guarantee valuation to changes in the underlying factors) independently. Then for a given confidence level and time interval it determines the amount of unexpected loss it wishes to cover for each guarantee, taking into consideration the opportunity cost of capital. The government then identifies the average cash reserve required to fund these unexpected losses. Finally, the individual cash reserve balances are aggregated to arrive at a total unexpected loss reserve. This additive approach for setting capital or unexpected reserves is supported by bank regulatory capital standards for financial institutions.

The problem with the additive approach for setting unexpected loss reserves is that it fails to account for portfolio diversification—the fact that pooling imperfectly correlated risks will reduce the variance in the expected loss of a portfolio. As a result the risk of the overall portfolio will be overstated, and more protection against unexpected losses would be provided than originally sought by the government (Merton and Perold 1993). The alternative is to calculate the aggregate loss distribution of the government's portfolio of risks, using a value-at-risk approach that incorporates cross correlations between guarantee exposures and then set reserves to cover unexpected losses based on the unexpected loss profile of the whole portfolio.

Value-at-Risk Methodologies. The sensitivity of the value of a portfolio to changes in underlying market factors and the joint probability distributions of changes in the underlying market factors affect the level of risk capital in a portfolio of risks. Examining these two elements allows the maximum possible loss within a known confidence interval to be determined over a given time horizon known as the portfolio's Value-at-Risk (VaR). For private financial institutions a variety of approaches are used to calculate portfolio VaRs. The most widely referenced, although not the best, model is the RiskMetrics™ model, published by J. P. Morgan (1996).[8]

Specifying the position sensitivities and the underlying variance-covariance matrix of market rate innovations is a nontrivial exercise and requires a number of simplifying assumptions even for actively traded securities. For example, portfolio-normal VaR approaches assume that portfolio returns are normally distributed. RiskMetrics™ and Delta-Normal approaches assume that asset returns are jointly normally distributed, implying linear asset payoff profiles and normally distributed portfolio returns. Delta-Gamma methods assume that innovations in market rates are normal, but that payoff profiles are approximated by local, second-order terms (Wilson 1997). Many of the criticisms of VaR models deal with the reasonableness of these simplifying assumptions for a given application as opposed to the underlying approach. Wilson (1997) and Duffie and Pan (1997) provide a good summary of the advantages, disadvantages, and common critiques of different VaR methodologies.

Value-at-Risk for a portfolio of infrastructure liabilities. Government infrastructure guarantees can be analyzed as contingent claims, and a VaR model can be applied to government infrastructure liabilities. The shortcoming of most VaR approaches, including RiskMetrics™, in evaluating the risks associated with a portfolio of options is their failure to reflect the nonlinear payoff functions of options. Most of these approaches would thus not be suitable for calculating the VaR associated with a portfolio of infrastructure liabilities.

One VaR approach that attempts to incorporate the nonlinearity in options portfolios is the Delta-Gamma approach (Wilson 1997). Unlike Delta-Normal

approaches such as RiskMetrics™, the Delta-Gamma approach uses a second-order Taylor series approximation of a portfolio's value function around current market rates to incorporate direct and cross-market convexity risk (the rate of change in the value of an instrument given an incremental change in the underlying asset's price) and vega risk (the change in the value of an instrument given an incremental change in the underlying asset's volatility). Convexity and vega risk represent two of the more important risk factors in a portfolio of options. Assuming that market rate innovations have a joint normal distribution, the Delta-Gamma approach solves for the VaR in a portfolio of options by searching for the market rate events that result in the worst VaR within a given confidence interval. As such the approach can be a useful tool for banks computing the VaR of an options portfolio over short periods of time.

The approach is less useful for analyzing the VaR of government guarantees over longer time intervals, since it analyzes only how local changes in the underlying market rate factors affect the value of an options portfolio. This approach may be reasonable for computing the one-day or two-week VaR of a financial options portfolio. It is considerably less useful for examining the unexpected loss exposure of infrastructure liabilities over many years.

A powerful alternative VaR approach that can provide a more accurate depiction of the government's longer-term risk exposure is using contingent claims analysis in concert with stochastic simulation and scenario analysis. Given an accurate contingent claims model and the "true" specification of the process governing changes in the price of the underlying asset, Monte Carlo analysis can be used to examine the sensitivities of infrastructure liability exposures to small and large movements in the underlying risk factors. Monte Carlo simulation is not commonly used by financial institutions because of the massive computing resources required to evaluate a large portfolio of financial options. In analyzing infrastructure liabilities, however, where the number of government guarantees outstanding in any one portfolio is more limited, Monte Carlo simulation techniques can be very effective. The combination of contingent claims pricing and Monte Carlo simulation allows a richer array of policy variables to be analyzed to assess the impact of different policy actions on the value of an existing guarantee or infrastructure liability program.

Investing reserves. One important issue in structuring reserves for unexpected loss is the investment policy of the reserve fund. Should the reserves be invested in government debt securities, corporate debt, equities, or some combination? This issue has been hotly debated in the United States, where government agencies typically to invest all reserve fund assets in U.S. Treasury securities. Recently, many federal agencies have asked to be allowed to invest a portion of their reserve funds in the stock market, arguing that investing in the stock market would allow them to accumulate larger reserves.

One serious problem with investing reserves in the stock market is that funds may not be available when needed to cover losses. Consider, for example, a reserve fund established to pay for unexpected losses on government guarantees against interruptions in housing construction that is invested in S&P 500 stocks. Given its sensitivity to interest rate movements, construction activity is very cyclical, falling sharply during economic downturns. As construction activity falls construction company earnings drop, increasing the probability of a company failure and a major interruption in construction activity for projects supported by a government guarantee. The performance of the construction industry is also highly correlated with the S&P 500 (the industry beta is about 1.25). Therefore, if the probability of a call on the government's construction guarantee rises, the value of reserve funds invested in the S&P 500 will fall, decreasing the value of the reserves. The more severe the economic downturn, the more likely the government's guarantee will be exercised and the more likely that the value of the reserve funds invested in equities will be insufficient to cover unexpected losses. In this example investing the reserve funds in equities actually decreases the value of those reserves compared with investing in short-term government securities.

The objective in investing the reserve fund should be to maximize the value of the assets in the fund when the costs to the government increase—that is, to invest the reserve funds in assets that provide the best hedge

against the government's cost for a given return. Investing the reserve fund in assets whose value is negatively correlated with the value of the guarantee requires very active asset management strategies, however. The government may be better served by managing its assets and liabilities at the balance sheet level rather than on a per program basis. To do so, the government would invest all reserve fund assets in government securities with the same durations the loan guarantee, direct loan, or insurance programs for which the reserve is established. The government could then hedge its net balance sheet position with investments that limit its exposure to those macroeconomic risks that the government deems consistent with public policy. Of course, investing in government securities in this manner is equivalent to reducing the government's gross debt position, implying the need to examine reserves policy as a governmentwide asset-liability issue.

Investing construction guarantees reserve fund assets in government securities would provide a hedge for the government, since rising interest rates would cause the value of the construction guarantees (and costs) to rise and the price of government securities to fall. The government may thus find it advantageous to fund any guarantee costs by issuing new cheaper debt instruments—in effect, substituting for the securities in the reserve fund. If all of the government's guarantees are in an external currency, the government then could purchase currency forward to hedge against its net currency exposure.

The government also needs to decide if it will hold its offshore in a foreign currency or domestically in the domestic currency. In the case of project finance guarantees the same logic that applied to the investment policy of reserves applies to the management of foreign exchange risk. If the project finance guarantees are denominated in dollars, the government should consider investing the reserve fund in dollar assets and possibly keeping the reserve offshore to circumvent convertibility risk issues. This policy would greatly enhance the market's value of the guarantee and provide the government with greater leverage from the guarantee program. However, any decision on the location of the reserves must be made in the context of the government's broader foreign currency risk management program.

Complementary Measures for Reducing Risk

Designing clear contracts, introducing incentives to reduce the incidence of calls on guarantees, and regularly monitoring performance under the guarantee contracts can limit the government's exposure to risk.

Designing Appropriate Contracts

A comprehensive risk management system forces agents to critically assess the distribution of risks within a particular direct loan, guarantee, or insurance program (box 6.4). The recent debate over the provision of catastrophic disaster assistance in the United States highlights the importance of a comprehensive risk management system. Over the past five years insurance companies in the United States have recognized that they are overexposed with respect to property damage from natural disasters. Recognition of this overexposure led to many early legislative initiatives by the insurance industry calling for the federal government to provide direct insurance or reinsurance for disaster coverage. As the debate over the government's role in disaster risk evolved and the issue was more narrowly defined as an incomplete market in the intertemporal smoothing of large idiosyncratic risks, however, the U.S. government recognized that providing a mechanism for financing only the higher layers of disaster losses provided a more targeted and efficient solution (Lewis and Murdock 1996).

The process of comprehensive risk management also forces a government agency to ensure that any guarantee or assistance has clearly defined terms that are aligned with the agency's management objectives. The contracts in the Colombian Telecom joint venture allocate construction risks clearly. However, when the contract was restructured after an initial construction delay in the project, Telecom assumed all of the costs—leaving Siemens with the same net present value benefits as in the original contract. Management of the contract sent a signal to Siemens that Telecom will bear a larger portion of the construction risks than envisioned in the original contracts.

When the management of government assistance deviates from the terms of the assistance being provided, the government is perceived to provide an implicit

guarantee. Although an implicit guarantee does not contractually obligate the government to provide assistance, where the public believes the government will step in to provide assistance when needed an implicit guarantee becomes explicit. Examples of implicit guarantees abound, including the "too-big-to-fail" and 100 percent depositor protection concepts for deposit insurance in the United States and federal support of government sponsored agencies in most countries.

Faced with implicit guarantees the government should either make the guarantee explicit and manage the guarantee as an assumed risk or explicitly deny any obligation and willingness to provide assistance when needed. By doing neither the government reinforces the perception that an implicit guarantee will be honored and increases the political pressure to support the provision of government assistance in the event that support is needed, while maintaining no control over the management of this conditional exposure. (For more on implicit guarantees see Kane 1996).

The government must first assess which party (public or private) has the best access to information needed to objectively and most accurately assess the riskiness of the underlying risks. The government must then assess which party is in the best position to monitor, control, and service the risks once they are underwritten. If the government is in the best position to underwrite the risks directly, direct credit should be considered, with credit assistance targeted to the area of concern. The government should then determine whether it also has the information and skills to most effectively monitor and control the risks or whether a private servicer should be employed to service the loans. Where the government delegates servicing, it must have the systems for monitoring the performance of the servicers.

Even if the government has the best access to information on a particular risk, it may choose to provide assistance in the form of a guarantee targeted at a specific layer instead of providing direct credit, since a contingent guarantee can be more narrowly focused at the market failure. In the Colombian toll road, for example, instead of providing direct financing for the toll road construction, the government purchased the engineering specifications (a public good provided free) and then provided a more narrowly defined guarantee, thereby obtaining a more targeted structure. Because guarantees and insurance can be narrowly targeted they can be used to get the private sector to absorb as much risk as possible.

Where the private sector is better able to underwrite and service the underlying risks but some government assistance is needed, public-private risk-sharing is often the best solution. In this case pro rata guarantees and insurance in which the private sector and the government share all losses on a particular risk equally are often the best form of assistance, since the firm shares an equal percentage of the losses across all types of risk. Risk-sharing provides the private entity with an incentive to price the coverage appropriately, ensuring the government that the private sector will not shift additional risks to the taxpayer.

Other risk-sharing mechanisms within and between classes of risk are also feasible. However, they usually require more government oversight and more government underwriting expertise.

Box 6.4
Improving risk management on the Colombia toll road project

In soliciting bids for the Colombia toll road project the government asked prospective concessionaires to bid on construction projects based on only a preliminary set of engineering designs. Recognizing that these designs provided insufficient detail, the government granted cost overrun guarantees that would compensate the concessionaire for cost variances within a wide band around the submitted bid. While the guarantee served the purpose of attracting qualified bidders, the structure of the guarantee allowed the concessionaire to extract a near certain rent from the government of about 35 percent of the original bid costs.

After critically assessing the risk transfer associated with these toll road projects and quantifying the risks in the El Cortijo–El Vino project, the Colombian government changed its toll road guarantee program. The government now commissions more detailed engineering studies before it solicits bids to limit the uncertainty inherent in the bidding process and provides a narrow guarantee. The new policy was less expensive than the old one but provided the same benefit to the concessionaire. The change made the Colombian toll road project more efficient—delivering a higher risk-adjusted rate of return by reducing the government's risk of delivering a fixed benefit.

The tools and techniques associated with risk management are also helpful in analyzing the structure of government programs that share responsibilities between the federal and state level. In the United States, for example, several programs combine the national government's ability to redistribute resources across economically diverse regions with the ability of state and local governments to identify investment needs at the local level. The national government funds the program, while state and local government provide the underwriting and administrative function. This federal-state partnership is a potentially powerful combination that is analogous to a parent company providing a guaranteed source of financing to a subsidiary established to perform a particular service.

Such federal-state partnerships are not without risks, however. If the federal government providing the funds does not retain oversight of the underwriting function, the national budget remains at risk. But if the federal government is overly prescriptive in setting regulations for the program, the flexibility of the state and local entity to identify specific needs in the local community is reduced. The goal is to reach the optimal trade-off between the delegation of project selection and federal oversight of the underwriting performance of the state facility (box 6.5).

Minimizing the Frequency and Financial Impact of Calls on Guarantees

Governments need to implement strong risk management programs to limit their contingent liability exposure to additional loss shifting by the guaranteed party. Mitigation actions attempt both to reduce the frequency of the government's losses and to minimize the financial impact of those guaranteed events that do occur. Risk controls attempt to minimize the ability of the guaranteed party to shift additional risk to the government (through moral hazard, adverse selection, and other forms of distribution shifting).

Governments can reduce their contingent liability exposure to risk in many ways. They can require the guaranteed party to hold a certain amount of capital or collateral to serve as a first-loss protection barrier for the project, thereby aligning the guaranteed party's incentives to remain vested in the project with the government. They can place restrictions on the use and investment policy of reserves that are held by the guaranteed party to ensure that the value of the reserves is unimpaired during periods in which a loss event is likely. They can structure the government's support to promote pro rata risk-sharing, where a private party shares risk equally with the government for some, or all, types of loss. Since the private party in this transaction bears the same risk per dollar of exposure as the government, public-private risk-sharing allows the government to benefit from the private sector's pricing of risks. Finally, the government can levy risk-based guarantee fees that both reduce the budgetary cost of issuing guarantees and improve the alignment of incentives between the guaranteed party and the central government. (Fees can be estimated using the techniques identified earlier, including contingent claims techniques.)

Limiting the ability of private agents to shift additional losses to the government reduces the budgetary costs of issuing guarantees and enhances the allocation of scarce budgetary resources by limiting rent-seeking behavior.

Monitoring Performance and Reestimating Risks

Once the government has implemented budgetary and reserves systems for its contingent liabilities and decided which risks it chooses to cover, it should communicate these decisions and risk management guidelines to the agencies responsible for implementing the guarantee programs. The government should evaluate the performance of agency personnel based on their ability to meet these goals. In this way the government can obtain a proper alignment between government risk management objectives and the performance of the agencies administering the programs.

To be effective comprehensive risk management system must implement systems for monitoring the changing risk exposure of its portfolio. As experience has shown, techniques for assessing risk are only as good as the information on which the models are based. Over time institutions change, markets evolve, and new information on risk exposures is obtained. In many instances risks that were previously unknown or unquantifiable are revealed through a series of loss

BOX 6.5

Revitalizing urban areas through federal-state partnerships in the United States

Under the Community Development Block Grant (CDBG) program in the United States, states and local communities receive federal grants to help finance community development projects designed to transform abandoned urban neighborhoods into viable local communities for mixed-income households. The program also provides grants to support the financing of capital projects designed to create new centers of economic activity in areas that have become economically depressed. Opportunities for investment are selected by the state and local community and are financed with the federal grants.

The CDBG program is an important part of the effort to revitalize urban centers in the United States. State and local communities were often unable to use the CDGB program, however, because investments in local community revitalization required a large up-front infusion of funds, not a gradual annuity in block grant funding. To address this concern the U.S. Congress enacted the Section 108 Community Development Block Grant Loan Guarantee Program, which provides federal loan guarantees on development loans obtained by the state and local communities for economic development. The program has enabled state and local governments access to up-front financing for their development projects.

The federal government used two risk mitigation techniques. First, it collateralized the loan guarantees with a state's ability to receive future block grant funds. If a state triggered the federal guarantee by defaulting on a loan, the state would lose access to all future block grant funds until the loss on the loan was repaid by the federal government using that state's future block grant money. The federal government also established strict criteria, based on project underwriting performance, for which states and local communities could participate in the loan guarantee program. These oversight functions were seen as critical to the success of the overall program.

The CDBG program has its shortcomings. Since the funds are not an entitlement, collateralizing the loan guarantee against a discretionary source of Congressional funding provides a very limited form of collateralization. Nevertheless, the program provides a good illustration of the power of federal-state partnerships, the problems faced in structuring a federal-state risk-sharing agreement, and the risk management tools needed to assess the risks of each entity's exposure.

events, leading to radical changes in risk assessment. The governments thus need to have a systematic approach for quickly incorporating new information on its changing risk exposures into its pricing of new contingent liabilities and for making adjustments to the expected costs of previously issued liabilities (reestimates). Development of these systems improves the government's accounting of expected loss and limits opportunities for moral hazard, adverse selection, and other means of shifting additional risk to the central government.

To comply with the tracking requirements mandated by the Federal Credit Reform Act, government agencies in the United States were forced to update their outdated budget and accounting systems. This improvement in information processing and tracking systems led to a substantial increase in both the quantity and quality of information available on government programs—information that policymakers have used to guide future reforms or program development. Although the costs associated with implementing new risk management systems were significant, the benefits associated with better risk processing systems are believed to have exceeded the costs. The Federal Credit Reform Act also required agencies to implement systems for computing reestimates on a timely basis as part of the overall budget process. Under this system federal agencies are supposed to reassess the expected costs of each year's activity in their credit programs at regular intervals and use this information to alter the expected costs for newly issued direct loans or guarantees.[9] Furthermore, if the change in the expected costs of previously issued direct loans or guarantees is significant (that is, it deviates from prior estimates by more than 5 percent), the agency is required to seek additional budgetary resources to fund the additional exposure. Similar systems can be implemented in other central governments for all forms of contingent liabilities.

Conclusion

The explosion of infrastructure liabilities has created the need for risk management techniques with which to manage governments' exposure to contingent liabilities. Because guarantees involve no immediate cost to the government, they do not appear in the govern-

ment accounts, and funds are not budgeted to cover them. This failure to account for guarantees leaves governments vulnerable to large unexpected demands on their resources. It also skews government decision-making in favor of guarantees over subsidies, since guarantees require no legislative approval and funding.

Quantifying the value of guarantees using enterprise risk management techniques can help governments reduce risk, improve project and contract design, and reduce the incentive to offer guarantees rather than subsidies. Moreover, by budgeting for expected losses and setting aside reserves against unexpected losses, governments can avoid potentially serious fiscal problems and the political backlash that occurs when contingent liabilities come due.

By implementing an economywide risk management system, governments can manage risk from all sources of revenue and expenditures as part of a broader risk management strategy. Adopting such a system will provide governments with a valuable tool with which to better allocate scarce resources and risk within the economy.

Notes

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1. The risk-adjusted rate of return represents the difference between the rate of return earned on an investment and the risk-free rate of interest less the market's premium for bearing the risks associated with the investment.

2. For example, the general formula for an insurance policy, which we demonstrate below as equivalent to a combination of guarantees or options, can be expressed as follows (Patrick 1990):

$$Premium = \frac{f(Expected\ Loss\ Distribution)}{(1 - EL)(1 - r)}$$

where *EL* is the insurer's expense loading—enabling it to cover its administrative costs—and *r* is the targeted economic rate of return. The term f(.) prices the risk of the insured portfolio based on the expected loss distribution. At a minimum, f(.) incorporates the mean expected loss and the variance of the expected claims distribution. However, a more accurate approach also would incorporate higher moments of the loss distribution since the actual loss distribution associated with many risks are not asymmetrically distributed around the expected value (or mean). Note, this approach is comparable to a discounted cash flow analysis, where *r* is the risk-free rate of interest.

3. Technically, a more appropriate implementation of this concept would use the Treasury rate with a maturity comparable to the duration of the federal guarantee or direct loan.

4. The Federal Credit Reform Act did not change the budgetary treatment of insurance programs, creating a clear inconsistency in the U.S. budget. However, the Office of Management and Budget in the Executive Branch has endorsed budgetary reforms designed to end this anomaly and the Congressional Budget Office, the General Accounting Office, and the Congressional Research Service have all acknowledged that putting insurance programs on a consistent basis is the next major budgetary reform.

5. Note, by using the Government's cost-of-funds to discount expected future costs, the United States creates a disconnect between the budgetary costs of a program and the costs that should be estimated as part of any benefit-cost analysis justifying the program, which would be estimated using a (higher) private sector discount rate.

6. For a normal distribution, which is the most likely distribution for the overall portfolio exposure, the relationship between variance and expected distribution function is well known.

7. While we limit our discussion on the establishment of reserves to all credit and insurance programs, given the focus on infrastructure liabilities, the principles discussed here apply more broadly to all government risks.

8. As an illustration, J. P. Morgan's RiskMetrics™ VaR formula can be expressed as follows:

$$\mathrm{VaR} = \rho\sqrt{\omega' \sum \omega}\sqrt{\Delta t}.$$

where ρ is a constant representing the desired one-tail confidence interval for the standard normal distribution, $\sum$ is the N x N annualized covariance matrix of security (or guarantee) returns, ω is the N x 1 vector of portfolio position weights, and Δt (or τ) is the time interval expressed as a fraction of a year (J.P. Morgan 1996).

9. Guidance provided by the Office of Management and Budget has indicated that regular intervals should translate to every year for the first five years of a program

and then every fifth year after year five or when there has been an identifiable material change to the risk exposure of the program.

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Comments on "The Management of Contingent Liabilities"

Clemente del Valle, Director General, Ministry of Finance and Public Credit, Colombia

Mody and Lewis present a useful approach to the management of contingent liabilities. Their proposed methodology shows how to identify and value contingent liabilities and outlines procedures on how to incorporate their costs to government, with special emphasis on budgetary aspects. This methodology and these procedures need to be formalized and institutionalized to ensure their sustainability over time. The Colombian case provides a good example in several areas.

The role of a good regulatory framework in making guarantees unnecessary is well recognized. Good project and contract design can also help reach this goal. If guarantees are necessary, however, it is important to have a public institution or entity entrusted with establishing policies on guarantees. In particular, this entity needs to define guidelines on the distribution of risks by sector between the government and private firms. It also needs to unify criteria across sectors and across the various levels of government. In Colombia a commission comprising the Finance and Planning Ministries plays this role. The commission is championing a law that requires public institutions, especially at the municipal level, to formally record important obligations, to value the guarantees, and to reserve against the contingent liability. The law also envisages the creation of a national fund for this purpose.

The lack of historical data on the occurrence of events that are being guaranteed against limits the usefulness of actuarial or econometric methods for measuring risks and expected losses. The Colombian government finds it more useful to use a model based on contingent claims theory and Monte Carlo simulations. This allows projections to be made based on multiple scenarios with different probabilities in order to determine the probability of bad states of the world. The government is trying to make the model more user friendly. Better measurement of losses and the probability of their occurrence will improve the structure and coverage of guarantees.

Fiscal discipline in the use of guarantees is a top priority of the Colombian government. However, the proposal to provision for guarantees and to establish a fund is not always politically or financially feasible. For this reason the government is exploring other complementary ways to provide discipline. First, a recent law establishes limits on the ratio of interest payments to current savings (60 percent) and on the ratio of debt stock to current income (80 percent) for all public entities. This obliges the entities to reflect the impact of guarantees. It can also be used in conjunction with the proposed guarantee fund, thereby ameliorating its impact on the entity's cash flow position. Second, where it is not possible to provision for guarantees at the time they are given, future obligations should be programmed and budgeted at least one year in advance. Third, guarantees should be clearly accounted for. An interesting alternative to the guarantee fund, at

least from a liquidity point of view, is the standby credits of the World Bank, which are being proposed in the Tobiagrande-Puerto Salgar toll road.

A sovereign asset-liability management system can help ensure debt sustainability as part of an economic development strategy. Such a system allows integrated treatment of the risks associated with both explicit and contingent liabilities within an economic framework, and can be implemented without moving to the ambitious schemes of Australia and New Zealand, where balance sheets and statements of profit and loss are produced. The systems used in Ireland and Belgium, which provide an institutional framework for the modern and efficient management of risk, may prove more fruitful. The Colombian government, with the help of the World Bank, is developing such a system. Although the process is slow, it should help reduce the abuses of the current system and gradually be adopted at all levels of the public sector. It is crucial to create a culture of risk awareness in government, in which the potential impact of risk is recognized. Doing so will create incentives to rationalize, value, control, and manage risks in an integrated way, which will require a significant investment in human capital.

David L. Roberts, Duff & Phelps Credit Rating Company, New York

As Lewis and Mody note, the risks that many governments assume in order to attract private investment in infrastructure can by quantified, introduced into the budgeting process, and reserved against. Where this is done, projects will be pursued only when both social and private ex ante rates of return are positive, and the risk of large adverse shocks to the budgets and economies can be minimized.

Few would dispute that governments need better ways to account for the contingent liabilities they undertake, and few would take issue with the theoretical approach outlined by Lewis and Mody. The problem is how to implement the theory in practice, when information on probability distributions, price variances, and contingent state outcomes is sparse. While Lewis and Mody show in their examples from Colombia that it is possible to value real guarantees, it is not clear exactly how the estimates were arrived at or how robust they are. This may give a false air of specificity to the analysis. While governments need to recognize that contingent liabilities are capable of analysis they should also be aware that these analyses themselves are subject to uncertainties and can require expensive and time-consuming but nevertheless inexact estimates.

In outlining guidelines for incorporating contingent liabilities into the government budgeting process, the authors show that cash budgeting leads to significant distortions in government liabilities and to biases in the types of government support used. The temptation for governments to provide guarantees without budgeting for their costs is apparent. But Lewis and Mody go beyond this point to recommend establishing reserves for unexpected losses in the same fashion as a risk-taking corporation. This may not be feasible. Governments may find it impossible to self-insure against catastrophic losses, or they may find that the backlash by voters, foreign capital providers, and credit rating companies may be unacceptably high.

Another strength of the paper is that it suggests ways in which a risk management system can improve contract design and project management. By undertaking careful studies of the risks associated with the toll road project before the bidding, the government of Colombia reduced risks for both the private and public sector. Conducting an analysis of risk will ensure that governments understand the risks they are taking on. Even implicit government guarantees, which arise in the case of large banks, large construction firms, and politically sensitive projects, can also prove costly, as both the government and the private sector may be uncertain of the government's support.

Lewis and Mody have shown that both implicit and explicit liabilities can be appropriately priced, budgeted for, and managed. If they could also show that risk management can be done reliably, quickly, and comprehensively, the prospects for improved infrastructure finance would be markedly improved.