Managing Government Exposure to Private Infrastructure Risks

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The privatization of infrastructure should lead to the development of new infrastructure, improvements in the operation of existing infrastructure, and a reduction in budgetary subsidies. Whether countries reap the full benefits of privatization, however, depends on how risks are allocated. If, as is often the case in developing countries, governments assume risks that should be borne by investors, they may reduce incentives for efficiency and incur significant liabilities. To solve these problems, governments need to improve their policies and restrict their risk bearing to certain political and regulatory risks over which they have direct control. When a government provides guarantees, it should attempt to measure their cost and improve the way they are handled in the accounts and budgets. Measurement and budgeting are critical to improving decisions about the provision of guarantees, to improving project selection and contract design, and to protecting governments from unknowingly entering into commitments that might jeopardize future budgets.

The resurgence of private infrastructure in the past decade should have large benefits for developing countries. Compared with government enterprises, private firms typically have stronger incentives to build and run infrastructure businesses effectively and at low cost. If prices reflect costs and the firm's profits depend on consumer demand, private firms tend to choose good projects. Privatization also encourages and facilitates the imposition of cost-covering tariffs, thus addressing the problem of underpricing that has afflicted many publicly provided infrastructure services. Greater efficiency and cost-covering prices allow firms to make investments and provide services that might not otherwise have been possible. They simultaneously improve the government's fiscal position by making available the same quantity and quality of service with smaller budgetary subsidies.

Infrastructure subjects private investors to major risks because the investments are often large and their costs can be recouped only over long periods of time. Two special features of infrastructure create additional risks. First, the investments are largely sunk; the assets cannot be used elsewhere except at great cost. Second, infra-

structure projects often provide services that are considered essential and are pro-
vided by monopolists. As a result, services are highly politicized. This combination
of factors makes investors especially vulnerable to opportunistic government actions.

Before the investment is made, the government has every reason to promise to
treat the investor fairly—to allow cost-covering tariffs and to avoid changing regula-
tions in ways that would adversely affect the investor. Once the investment is made,
however, the government has an incentive to renege on its promises. The govern-
ment can satisfy political demands to reduce prices or otherwise appropriate the
investor's profits without causing the investor to pack up and leave. Lax and Sebenius
(1981) discuss the problem in the context of mining. These incentives make returns
to private investors uncertain and more sensitive to the host government's behavior.

To protect themselves from such risks as nonpayment by purchasers, cost over-
runs, and low demand, private investors often ask the host government to provide
extensive guarantees. In other words, they ask the government to enter into some
form of arrangement that results in the net wealth of the government—not the pri-
vate investors—varying with the risky outcome. Eager to encourage investment with-
out making any cash outlays, governments often consent.

Poorly designed guarantees threaten to undermine the benefits of privatization.
First, they can blunt the private investors' incentives to choose only good projects
and to run them efficiently. If the government bears the risk of the project's failing,
the private investor will invest in projects that are more likely to fail; having invested
in a project, the private investor has little interest in maximizing its chance of suc-
cess. Second, guarantees may impose excessive costs on the host country's taxpayers
or consumers and expose them to too much risk. Because guarantees rarely show up
in the government's accounts or budgets, governments may not know the extent of
their exposure. Moreover, economic crises can trigger many guarantees simultaneously;
many of the government's contingent liabilities can thus become actual and current
all at once. At worst, the issuance of guarantees may contribute to crises by encour-
aging excessive entrepreneurial risk taking (Merton 1978). Guarantees also may lead
to asset stripping, in which a firm's insiders extract value from the firm even as they
drive it into bankruptcy or excessive foreign borrowing (Akerlof and Romer 1993;
McKinnon and Pill 1995).

Policy Reforms to Reduce Risks

Governments issue guarantees to make projects attractive to investors, often using
risk bearing as a way to compensate for shortcomings in current and expected future
policies. One of the best things governments can do to make projects more attractive
without issuing guarantees is to put in place good policies that generally reduce risks
and raise expected returns. Stable macroeconomic policies, for example, reduce the

likelihood of large changes in exchange and interest rates and therefore lessen the pressures on governments to prevent convertibility or transferability. The regular disclosure of timely and reliable information on the state of the economy and the government's finances makes it easier for investors to forecast future revenues. Liberal capital markets permit investors to spread risks more broadly—both locally and internationally—and allocate them to those most willing to bear them. Good regulatory policies reduce the risk that investors will be exploited after they have invested. Creating nonpolitical regulatory agencies, for example, reduces investors' fears that politicians will keep service prices too low to allow an adequate rate of return. Strengthening the independence and quality of the judiciary reduces investors' fears of being mistreated by the executive. Permitting international arbitration reduces investors' fears that they will be mistreated by local courts that are not independent.

Not surprisingly, governments that have established good policies and persuaded investors that those policies will be maintained can attract private investment without extensive risk bearing. In the United Kingdom, for example, the government attracts large amounts of private investment despite its policy of not bearing even regulatory risks except where they relate specifically to a project (United Kingdom 1995). When developing countries have introduced good policies and maintained them for a few years, they have also been successful in attracting private infrastructure capital without guarantees. In Argentina, for example, the complete restructuring and privatization of the power industry has permitted the government to attract private investment without having to assume major risks or issue guarantees (Klein 1997). In Chile private firms recently have invested in telecommunications, power, and gas without government guarantees (Jadresic 1997).

In this article, we focus not on the surrounding policy environment but on the appropriate allocation of risks of private infrastructure projects among governments, private investors, and consumers. We also discuss how governments should budget and account for risks.

Types of Risk

Governments, consumers, and private investors bear various types of risk, including demand and payment risk, exchange and interest rate risk, and political and regulatory risk. They also bear implicit risk and other types of risk. See box 1 for more details on defining risk.

Demand and Payment Risks

In privatizing toll roads, the host government often commits itself to ensuring that the private owner receives at least a minimum level of revenue when demand is lower

Box 1. *Defining Risk*

In theoretical treatments of finance and government risk bearing, as well as in the applied fields of securities analysis and portfolio management, "risk" is often used to refer to the volatility of returns around an average or expected return (see, for example, Markowitz 1991 and Arrow and Lind 1970). In this sense, risk is equivalent to the statistical concept of variance, and a project's risk can increase without any change in the expected (or mean) return on the project. Investors who were risk neutral (in the sense used in economics and finance) would be indifferent to risk in this sense, and risk of this sort can be effectively eliminated by diversification if it is not systematic.

By contrast, in project finance, "risk" frequently refers to the ways in which actual results may be worse than planned. Here the benchmark is not the expected return of the project but the (generally higher) return that investors would receive if everything went according to plan. For example, investors estimate the returns they will earn on the assumption that the government will not expropriate their investment, while noting the risk of expropriation. An increase in expropriation risk in this sense does not just increase the volatility of returns, it reduces the expected return. Even risk-neutral investors would prefer to avoid these "risks." Diversification cannot eliminate this risk; it can only spread the loss among many people.

We use "risk" in the sense of variance or volatility around a statistically expected outcome. Expropriation risk, for example, is thus the volatility in returns around an expected return attributable to uncertainty over whether the government will expropriate.

than expected. This commitment shifts some of the risk of variation in demand to the government. In the El Cortijo–El Vino toll road project in Colombia, for example, the government undertook to reimburse the concessionaire if traffic was less than 90 percent of the specified level. The government agreed to pay the concessionaire an amount equal to the toll times the difference between 90 percent of the estimated number of vehicles and the actual number of vehicles (Lewis and Mody 1997).

Governments bear similar risks in other sectors. The Colombian government, for instance, provided a minimum revenue guarantee when it awarded a build-operate-transfer concession for a new runway at Bogotá's El Dorado airport in 1995 (Juan 1996). And many governments, through their utilities, have agreed to pay independent power producers a fixed amount each year that is independent of the actual level of power subsequently demanded from them.

An agreement by a state-owned utility to pay an independent power producer irrespective of demand protects the investor from the risk of falling demand for power or of new and cheaper generators coming on stream in the future. But it does not protect the investor from the risk of the utility defaulting on its obligations. To protect themselves against this risk, investors usually ask the government, which is more creditworthy than the utility it owns, to guarantee the utility's payments. In some cases, as when Pakistan sought to expand its power generation capacity, investors ask their governments to ask multilateral agencies to guarantee payments.

Exchange and Interest Rate Risks

Governments have sometimes borne the risks associated with adverse fluctuations in exchange and interest rates. The Spanish government, for example, had many private toll roads built during the 1960s and early 1970s and bore the exchange rate risk on the foreign loans that financed the roads. Gómez-Ibáñez and Meyer (1993:126) describe the government guarantees and their rationale:

> The Spanish government had required the early concessions to finance a large part of their costs from foreign debt in order to ease Spain's balance-of-payments problems and to avoid drawing away domestic savings from other projects. The 1972 law [on toll road concessions] set standards that at least 45 percent of construction costs be financed from foreign loans, at least 10 percent from equity, and no more than 45 percent from domestic loans. The early Spanish [highway] companies had trouble raising funds from foreign capital markets, however, and in return the government agreed to guarantee some of these loans and to protect the companies from exchange rate fluctuations. The 1972 law specified that the government would guarantee up to 75 percent of the foreign loans; moreover, all foreign loans would be denominated in pesetas with the government assuming the full exchange rate risk.

If the peseta depreciated relative to the foreign currencies in which the loans were made, the concessionaire's loan repayments would remain the same, but the Spanish government would make an additional payment to ensure that the foreign lenders received no less foreign currency. In the end, the Spanish taxpayers spent about $2.7 billion as a result of the guarantees.

Political and Regulatory Risks

Governments often bear certain political and regulatory risks, even when they bear none of the risks mentioned above. In the Melbourne City Link, a private toll road in Australia, private-sector parties bear most of the demand, payment, and exchange and interest rate risks. The state government bears several risks that are tied to actions taken or influenced by the government. For example, if the government subsequently bans toll roads or takes actions that deliberately reduce the profitability of the private investor, the government will compensate the investor. The government bears the risk associated with possible court findings that aboriginal land rights have been violated. And it bears the risk that workers on the construction site will strike to protest against the state government rather than as part of site-specific disputes. In another example, the government of Pakistan has a policy framework for private power generation. The government agreed to "cover certain political and govern-

mental force majeure risks, provide protection against changes in certain taxes/duties, and ensure foreign exchange convertibility for the projects" (International Finance Corporation 1996:49).

Implicit and Other Forms of Risk Bearing

Government risk bearing need not be made explicit in contracts or laws. Sometimes everyone concerned expects that the government will in fact bail out a company if it would otherwise fail. The case of private Mexican toll roads may provide such an example. They were partly financed by commercial banks, which were owned at the time by the government. Some observers have argued that the commercial banks exercised less care than they should have in assessing the credit risks they assumed. Although the Mexican government did not explicitly agree to bear the credit risks taken on by the banks, it did in the end bail them out when they got into trouble, partly as a result of the poor financial performance of the private toll roads. Some argue that the banks had expected the bailout and that this expectation had an effect similar to that of an explicit government guarantee.

   Governments bear risk in other, less obvious ways as well. They may lend directly to projects and bear repayment and perhaps interest rate risks. They may become part owners of a project and thereby bear a proportion of the overall risk of the project. Moreover, governments own a share of many firms, in an economic if not a legal sense, through the corporate tax system: if profits are high, the government gets more corporate income tax; if they are low, it gets less.

Principles of Risk Allocation

Infrastructure project risk can be allocated, at a broad level, to governments, firms, or consumers. How should governments decide whether to bear risks in a private infrastructure project? If they do decide to bear risk, which risks should they take on?

   Two critical factors determine whether an agent should bear risk: the degree to which the agent can influence or control the outcome that is risky and the agent's ability to bear the risk. These two factors often push in different directions—the group or organization that has most control over the risky outcome may not be in the best position to bear the risk. Other things equal, risks should be allocated to the agents who can best control the risky outcome and to agents who can bear the risk at the lowest cost. Those agents are the least risk averse because they can most easily insure or hedge against the risk, or because they can spread the risk among many people. The two critical risk factors must be balanced by three other factors: the incentives to reduce risk, the transactions cost of allocating risks, and second-best considerations stemming from credibility issues and policy transitions.

Control over Risk and the Cost of Bearing Risk

The benefits of allocating risks to those who can best control them must sometimes be weighed against the benefits of allocating risks to those who can bear them at least cost. Spreading a risk among many shareholders or taxpayers may lower the costs of risk bearing, but allocating a risk to a small number of agents who have control over the risk may help ensure the success of the project. Rather than diversifying risks completely, then, it usually pays to give managers and strategic investors significant stakes in the project. A single risk-averse entrepreneur would face a higher cost of bearing demand risk than a government, but the entrepreneur would face stronger incentives to increase demand and reduce overall risk.

In a telecommunications concession, for example, the demand risk would be the risk that demand may be higher or lower than forecast. The principle of control over risky outcomes suggests that the firm should bear this risk because it can effectively increase demand by keeping service quality high. By contrast, convertibility risk— the risk that local currency may not be convertible into foreign currency—should be borne by the government because it alone controls this risk.

Using the telecommunications example, the government of a large country with many taxpayers can bear demand risk at lower cost than a small telecommunications firm. But a large telecommunications firm with lots of small and diversified share-holders can assume demand risk at a lower cost than the government of a small country. The correlation of risk with other assets of the agent bearing the risk also matters. It may not be desirable for the government to bear demand risk because the government is likely to suffer the consequences of low demand just when its tax revenues have fallen. Foreign investors may be better placed to assume this risk because they probably hold a portfolio of assets whose value is not correlated with local business conditions.

Fiscal Incentives, Transactions Costs, and Second-Best Considerations

Even when governments have implemented good macroeconomic, legal, and regulatory reforms, firms may be reluctant to invest without government guarantees because they question whether the reforms will be maintained or protected by courts. Thus, even if a country's laws and regulations are as good on paper as those of, say, the United States, investors will be considerably more wary about investing there. In such cases, governments may have to provide explicit undertakings—to allow convertibility or to compensate in case of expropriation, for example. In countries such as the United States, investors may think it unnecessary to seek certain explicit project-specific guarantees, either because the risks are negligible or because the investors are confident that the legal system and the courts will protect them in case of problems. In countries that have reformed their policies only recently, investors may want the

government to assume these risks explicitly in a contract, often one that is guaranteed by a multilateral agency.

Allocating risks that are better controlled by the government to the government will improve outcomes only if the government responds to financial incentives. Governments are generally less responsive than firms to financial incentives because government decisionmakers often do not act in the interests of the citizens. When the financial consequences of the government's risk bearing do not show up in its budgets or accounts, government may be less responsive still. If, for instance, the likelihood of the government's permitting convertibility is unaffected by any obligation to pay compensation in case of malfeasance, there is no value in allocating this risk to government. Similarly, as decisionmakers face weak incentives to lower costs, governments may be less adept than private investors at taking advantage of opportunities to reduce risk, for example, through diversification or hedging.

Transactions costs should also be considered. An allocation assigning each of a project's many risks according to each party's control over the outcome and its costs of risk bearing may require detailed analyses, tough negotiations, complex legal contracts, expensive monitoring arrangements, and possibly the high costs of settling disputes in court. The optimal allocation of risk takes these costs into account.

Second-best considerations may also come into play. According to the criteria for risk allocation discussed here, many governments in the developing world appear to bear too much risk when they privatize infrastructure. This situation, however, may still be better than the alternative of public ownership. When the government bears all the commercial risk, privatization almost always transfers some risk to the private sector. When the government guarantees the sponsor of a private toll road 90 percent of expected toll revenue, for example, the government bears less risk than it would if it owned the road and bore 100 percent of the risk. Thus, privatizing the road and providing guarantees to the concessionaire may be better than having the government build and operate it without private participation or not build the road at all. Similarly, governments that are unable to carry out all the necessary reforms to attract private infrastructure investment without government guarantees may prefer the second-best option of privatization without the full transfer of commercial risks to private investors. In many such cases, however, a direct fiscal subsidy may be preferable to a government guarantee.

Allocation of Typical Infrastructure Risks

Typical risks that governments are asked to assume in infrastructure privatization projects include political, regulatory, quasi-commercial, demand and construction cost, and exchange and interest rate risks. This section provides some practical guidelines on how to allocate these risks.

Political risks, such as expropriation, currency inconvertibility, and currency nontransferability, are directly under the control of the government. There is good reason to encourage the government not to create losses associated with any of these three risks. Thus, it makes sense for the government to assume these risks. The main issue is how the government can credibly commit itself to bearing the risk—that is, to commit itself not to create the conditions that would lead to loss or to compensate investors fully in the event of loss. Obtaining this commitment may involve approaching an agency such as the Multilateral Investment Guarantee Agency (MIGA).

Regulatory risks pose trickier questions. Should the government commit itself not to change the laws and regulations affecting the investment project or to compensate in case it does? On the one hand, these risks clearly fall under the government's control. On the other, it is sometimes desirable for the government to change laws in ways that adversely affect investment projects. It may be beneficial to increase taxes to fund needed public investment, for example, or to impose regulations to mitigate newly recognized environmental problems. In many cases, such as that of new environmental regulations, the government can bear the risk and still change policy—it just needs to compensate firms for the policy change. In other cases, however, compensation cannot be reconciled with flexibility. If governments had to compensate everyone for imposing higher taxes, for example, they could never increase their (net) revenue. Smith (1997) argues for a case-by-case approach, noting that countries with better reputations for treating investors reasonably can adopt more flexible rules.

Quasi-commercial risks arise when an investor contracts with public suppliers or purchasers that may renege on contractual commitments. In many power projects, for example, investors ask for a guarantee from the government in case the government-owned power utility fails to pay for bulk power generated by the firm. If the utility has full autonomy, there is little to be gained by a government guarantee. But if the utility is completely beholden to government decisions, government guarantees may be desirable. Increasing the agency's autonomy by privatizing it is a preferable solution.

In road, bridge, or tunnel projects, governments are often asked to bear *demand and construction cost risks*. These risks occur when variability in demand or construction costs makes profits higher or lower than their expected value. These risks are often critical, but the rationale for them in terms of the framework set out above is weak. The concessionaire usually has considerably more control than the government over construction costs and a greater incentive to avoid white elephant projects. Government policies can influence demand, but assigning demand risk to the government reduces the incentives to screen projects carefully with a view to investing only in those in which expected demand is sufficient to justify the project. At the same time, however, the toll road operator may have little control over the demand risk. As long as roads or bridges meet certain minimum standards, traffic may vary

little with increases in quality. Therefore, governments need to balance their desire to provide incentives for proper project screening with the recognition that operators often have limited control over demand.

By changing the way they regulate infrastructure, governments can reduce the demand risk faced by concessionaires and thereby reduce the concessionaires' demand for guarantees. Instead of auctioning the right to operate the service for a fixed period of time, as is typical in most road and bridge concessions, the term of the operating concession could be made to vary with demand. If demand is higher than expected, the concession will be shorter; if demand is lower, the concession will be longer. This method, which has been used in the United Kingdom for bridges, reduces risk.

In an ingenious variant of this method, Engel, Fischer, and Galetovic (1997) propose to award the concession to the bidder seeking the lowest present value of revenue, calculated with a discount rate specified in advance by the government. The concession ends when the concessionaire's revenue reaches the present value it had sought. The concessionaire still bears some demand risk—if demand is too low, revenue may never reach the target value—but it bears much less. Moreover, the investor still has an incentive to select only those projects that are likely to be financially attractive without government subsidies.

Floating-rate loans fund many infrastructure investments, making the projects' profits highly sensitive to changes in interest rates. Projects often involve considerable foreign financing. If project revenues are in local currency and the investors want to earn foreign-currency profits, foreign investors will suffer if the local currency depreciates. Ensuring that the right parties bear *exchange and interest rate risk* is thus important to the success of the project. Should the government accede to investor demands to assume exchange and interest rate risks?

At first glance, our framework appears to suggest that the government should bear infrastructure risks because it can better control them. Private investors have almost no control over the exchange rate or prevailing interest rates. If governments bear such risks, they have a financial incentive to adopt macroeconomic policies that tend to prevent depreciation or increases in interest rates. Such policies may also have a useful signaling effect. Governments that plan to adopt imprudent macroeconomic policies will find risk bearing expensive. Most likely, governments that choose to issue such guarantees will act reasonably (at least if politicians are concerned about the government's fiscal position).

Mas (1997) argues cogently, however, that three other factors often outweigh the incentive and signaling benefits. First, it is difficult to separate the effects on project profitability of exchange or interest rates and business decisions. Losses from currency depreciation, for example, could be blamed on the government, which allowed the currency to fall, or the firm, which left itself exposed by borrowing in foreign currencies. Second, in flexible exchange rate regimes, exchange rate guarantees may have undesirable as well as desirable incentive effects on the government. The guar-

antees discourage governments from allowing their currencies to depreciate in the wake of a terms-of-trade shock, for instance. Third, many governments and the taxpayers that back them may already be exposed to the risks associated with interest rate and exchange rate shocks. An adverse terms-of-trade shock, for example, might lead to both a depreciation and a decline in local incomes, forcing the government to compensate investors just when its tax base has shrunk. Foreign investors would not face this problem and may be in the best position to bear the risk.

Measuring and Budgeting for Risk

Whichever risks a government does take on, it needs to consider how it can measure them and incorporate them in its accounts and budgets. Otherwise, the government will have difficulty making good decisions about whether to assume risks and may even court financial disaster.

As a simple step in improving the monitoring and management of risks, the government can compile and publish a consolidated list of its contingent liabilities and the maximum amounts it stands to lose. The New Zealand government, for example, presents this information in its statement of contingent liabilities (table 1).

Calculating Expected Losses

The identification and listing of guarantees has limited usefulness. In particular, it does not provide information on the likelihood of losses. It reveals maximum possible losses, without indicating which losses the government should expect. Governments would find it useful to quantify not only the maximum possible loss but also the likelihood of losses and, therefore, the expected loss.

Sometimes it is simple to estimate expected losses. For example, the government might guarantee a payment of $1 million by one of its state-owned enterprises. For a 10 percent chance that the enterprise will default (and a 90 percent chance that it

Table 1. *Statement of Contingent Liabilities: Summary Table, New Zealand, 1997 and 1998*
(millions of New Zealand dollars)

Quantifiable contingent liabilities	As of May 31, 1998	As of May 31, 1997
Guarantees and indemnities	504	536
Uncalled capital	2,866	2,248
Legal proceedings and disputes	437	971
Other contingent liabilities	1,297	1,177
Total quantifiable contingent liabilities	5,104	4,932

Source: Government of New Zealand, available at *http://www.treasury.govt.nz.*

will make the full payment), the government's expected cost of the guarantee is $100,000. For more realistic cases, the expected cost may be more difficult to calculate. There may be more than two relevant possibilities, and the estimation of the probabilities may be extremely difficult.

Nevertheless, the calculation of expected losses is sometimes feasible using relatively straightforward techniques. The most tractable cases are those in which the government has issued a large number of similar guarantees for many years and has recorded information on defaults. In such cases analysts can calculate the expected cost of the guarantees in the same way as, say, car insurance premiums are calculated. The reforms the U.S. government enacted with the Federal Credit Reform Act of 1990 are examples of this (Lewis and Mody 1997).

The cost of some unique guarantees can also be estimated simply. Full credit guarantees, in which the government guarantees the repayment of a loan to another party can, for example, be calculated by looking at the interest rate charged on guaranteed and nonguaranteed loans. If a firm pays 15 percent interest on its nonguaranteed debt and 10 percent on loans guaranteed by the government, the annual value of the guarantee is 5 percent of the amount borrowed (Mody and Patro 1995).

Analysts can value guarantees and contingent liabilities, including more complicated ones, using the techniques developed in the past 25 years to value financial derivatives (such as options, futures, and swaps). Extending a credit guarantee, for example, is equivalent to the government's selling a put option to the lender, which gives the lender the right to put the loan to the government. The valuation of some guarantees requires the skills of financial specialists, however, and the feasibility of timely, reliable, and cost-effective valuation has not yet been widely tested. But the possibilities are not merely theoretical: guarantees in both Colombia and the United States have already been valued using option pricing techniques (Lewis and Mody 1997).

Valuing the government's guarantees and other contingent liabilities—and not simply noting maximum exposure—has important advantages. By calculating the expected cost of the government's guarantees, analysts can more easily compare guarantees with cash subsidies. When guarantees are not valued, a government may prefer to provide a guarantee instead of a subsidy, even if the guarantee costs more than the subsidy, because a future administration may bear the hidden costs of the guarantee. When guarantees are valued, policymakers are more likely to make decisions on the basis of real rather than apparent costs and benefits.

Incorporating Expected Losses in Accounts and Budgets

If analysts can reliably calculate expected losses, the government should incorporate the estimates in its accounts and budgets. Most governments have cash-based bud-

gets and accounts. The budget authorizes the government to incur certain cash expenditures; the accounts show how much cash the government has received and spent. Noncash items, such as the depreciation of assets during the year and revenues earned but not received in cash (including taxes owed but not yet paid), do not appear in the budget or the accounts. Such governments do not report their balance sheets or net worth.

Although governments should include guarantees and other noncash items in their cash-based budgets and accounts, fully incorporating those items would require a switch away from cash-based systems. With standard accrual accounts and budgets, many noncash expenditures show up in the government's budget and in its operating statement. The government has no fiscal incentives to prefer these noncash expenditures to cash expenditures. Standard accrual accounting discloses guarantees (as in table 1), but it records them as expenses only for probable and quantifiable losses (Afterman 1997). From an economic point of view, this distinction between probable and improbable losses is not always useful; a 10 percent chance of losing $1 million is worse than a 90 percent chance of losing $100,000. Economists find it more useful to estimate the present value of the expected loss arising from the contingent liability.

An ideal system of accounting and budgeting would record the expected present value of all active contracts. Under such a system, a government would have no fiscal incentives to issue guarantees instead of giving subsidies of equivalent value. Both types of contracts would show up as expenditures affecting the deficit, and both would require appropriation by the legislature. Although full present-value accounting and budgeting are not feasible, governments can implement accrual accounting—and systematically record significant and quantifiable present values—even when losses are not probable. With accrual accounting, governments can take a crucial step toward the better management of guarantees.

Measuring Risk as Well as Expected Losses

Estimating, reporting, and budgeting for expected losses is important, but expected costs do not tell the government and those that monitor it everything they need to know. Just as guarantees with the same maximum exposure differ significantly if the expected loss differs, guarantees may differ even though they have the same expected but different maximum losses. The whole range of possible outcomes—that is, risk in the sense of volatility—matters.

Governments should develop systems for summarizing and reporting the major risks as well as the expected costs they face. They could use value-at-risk reporting, in which organizations report the largest loss that can be incurred with a probability greater than, say, 1 percent or 5 percent.[1] Value-at-risk reporting applies statistical theory to the description of assets and liabilities. For example, a bank may report

that its daily value at risk at the 1 percent level is $10 million, meaning that there is only a 1 percent chance, under normal market conditions, that it will lose more than $10 million in the next day (Jorion 1997). Although banks were the first organizations to report value at risk, the principles behind such reporting apply to all organizations. Governments should think about how they can apply these principles to their own operations and what useful estimates they might be able to publish.

Taking a Government-wide Approach to Risk Measurement

Expected losses can be measured individually and then aggregated; the government's total expected loss from issuing several guarantees is simply the sum of the expected losses associated with each guarantee. Normally, risks cannot be estimated individually and then summed because the total risk depends on the relationships between the individual risks.

A government worries not about the risk relating to any one guarantee, but the riskiness of its portfolio of assets and liabilities. The reporting of risk exposures is most useful when done for the government as a whole. Therefore, measuring the true risks associated with infrastructure privatization requires an assessment of the riskiness of all of the government's operations. Exchange rate guarantees, for instance, are likely to be more risky if the government also has net debt denominated in foreign currencies. A depreciation of the local currency may simultaneously increase debt service payments and trigger payments under the guarantee.[2] A portfolio-wide approach also allows the government to judge the importance of the risks associated with infrastructure privatization relative to the risks associated with government debt, pensions, the banking system, and debt owed by city and provincial governments.

The creation of consolidated accrual accounts—incorporating present values where practicable—is a step toward portfolio-wide risk monitoring. Combined with other information on likely future revenues and expenditures, the balance sheet can provide an indication of the government's vulnerability to exchange rate, interest rate, and other shocks. It can indicate the relative importance of monitoring and managing infrastructure guarantees on the one hand and debt on the other. Ultimately, governments should aim to measure portfolio-wide value at risk. The achievement of that goal appears to be a long way off, however.

Risk Management

A government is in a good position to consider managing its portfolio only when it has good information on the risks to which its total portfolio is exposed. It can manage to reduce those risks, for example, by entering into derivative contracts to hedge against changes in exchange rates or commodity prices. Whether the govern-

ment should act to reduce risk (rather than just reduce expected costs) is perhaps an open question. It is analogous to the firm's decision about whether to attempt to reduce the variance of shareholders' returns or simply to maximize the expected value of the returns.

Citizens, like shareholders, are usually risk averse. The policy decision is whether the government should manage risk on their behalf or publicize its risk exposure and permit taxpayers to diversify and hedge their portfolios in ways that give them the risk exposure they want. In practice, citizens often lack sophistication in considering risk. Moreover, because of transactions costs or government restrictions, citizens may have limited opportunities to hedge against government risk. In that case, governmental risk management may be desirable. It would aim to achieve a level of risk the government finds acceptable, given its citizens' risk preferences, at the lowest possible cost.[3]

Conclusion

Whether infrastructure privatization will realize its potential depends on how government allocates the risks facing privatized businesses. Government can increase the benefits of privatization by assuming risks it can control itself (convertibility risk, for example), but it should normally avoid bearing other risks. That way, investors face strong incentives to select projects well and to run those that they do select efficiently.

In many infrastructure privatizations, governments have assumed risks that investors should bear, both because the investors have been understandably wary of taking on the considerable risks involved and because governments have been able to offer guarantees without incurring any immediate cash costs. A government can thus take two steps to improve the environment for risk allocation. It can reduce the extent of the risks investors face by pursuing stable macroeconomic policies, disclosing information, implementing good laws and regulations, and liberalizing financial markets. And it can improve the way it measures, budgets, and accounts for the guarantees it does give, so that the costs and risks are clear at the time the guarantees are issued—not only when the government must subsequently pay up.

Notes

1. For more on the analysis of value at risk, see Jorion (1997); J. P. Morgan's "RiskMetrics" documentation, available at *http://www.riskmetrics.com*; and the various reports available at *http://www.contingencyanalysis.com*.

2. In the extreme case of a guarantee for a risk that is negatively correlated with the value of the government's portfolio, assessment of risk in isolation would lead the government to think the guarantee created risk, when in fact it reduced it. In other words, because the value of this guarantee tends to fall when the value of the rest of the government's portfolio rises, and vice versa, the total volatility of the government's wealth would be greater without the guarantee.

3. A useful short summary of risk management for countries (as opposed to governments) can be found in Claessens (1992). Claessens and Qian (1991) apply the techniques to African countries.

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