Debt management and crisis in developing countries

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Abstract

Debt management policy for governments of developing countries must balance conflicting objectives. The structure of explicit and implicit government debt influences the amount of lending private creditors are willing to extend, contractual debt service costs, the probability of default and the costs of default. Because default is not relevant for governments of industrial countries, their debt management policies are not a useful guide for developing countries. The model developed suggests that minimizing debt service costs is likely to be a very inefficient policy for governments of developing countries because such a policy increases the cost of default. © 2000 Elsevier Science B.V. All rights reserved.

1. Introduction

Recent financial crises in Asia, Latin America and Russia have demonstrated the vulnerability of the real sectors of developing countries to changes in financial market conditions. In this paper we argue that better management of governments' balance sheets might considerably reduce the frequency of crises and their associated costs.

Our approach to debt and asset management policy or, more generally, governments' financial intermediation, is influenced by characteristics of developing

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countries not shared by industrial countries. Experience suggests that a wide range of developing counties might choose or be forced to default on their domestic and/or their international debt. Moreover, renegotiations of contracts seem to generate losses in output for some interval following default. These characteristics imply that governments must manage the flow of income and expenditures as well as the nature of the financial contracts they enter into, in order to avoid crises. In particular, the benefits associated with governments' financial intermediation must be balanced against costs of associated financial crises.

The existing literature on debt and asset management assumes that, as long as the government remains solvent, there are welfare improving roles for government financial intermediation as a way to overcome a variety of market failures. Several of these arguments seem compelling when applied to developing countries. Nevertheless, the implied participation in financial markets by governments of developing countries carries with it the risk of default and the associated costs. A preliminary assessment of costs and benefits suggests to us that governments of developing countries should substantially reduce their role in financial intermediation and treat avoidance of crises as their primary objective in managing remaining positions.

We offer some unorthodox rules of thumb for debt and asset management for developing countries. The basic conclusion is that governments that might be forced into default should not borrow in order to lend. This would rule out, or severely limit, apparently unrelated activities such as unfunded pension plans and sterilized foreign exchange market intervention. This, in turn, rules out all but polar exchange rate regimes. Free floating or currency board arrangements are consistent with prudent debt management policies but intermediate regimes are not. Finally, governments should issue only one type of debt and this one type of debt should be long term, not indexed and denominated in domestic currency.

2. Debt management policy

A good place to start a discussion of debt management is a "Miller–Modigliani" theorem for the scale and structure of a government's gross assets and liabilities. The conditions under which changes in the government's balance sheet are neutral have been carefully set out in the literature (Stiglitz, 1983; Chan, 1983). If there is no uncertainty, and if representative, perpetual households consider the government's portfolio their own, it seems clear that any financial position the government takes would be fully offset by the private sector.

With uncertainty, the private sector must also offset the expected and conditional value of their net tax liabilities generated by changes in the market value of the government's portfolio. For example, if the government takes a highly leveraged position by issuing domestic currency debt in order to acquire foreign-

currency assets, neutrality would require that the private sector offset the government's position in the same or equivalent markets. This is the basic reason why sterilized intervention, or other changes in the economic exposure of the government's portfolio, have no economic effects in a neoclassical model in which the private sector and the government are assumed to have the same access to credit markets. One of the many strong assumptions necessary for this result is that households must be able to forecast their share of taxes associated with the government's capital gains and losses, as well as the gains and losses on their share of government liabilities. Clearly, the household cannot manipulate its portfolio to offset its contingent tax liability if it does not know what that tax liability will be (Fischer, 1983).

3. Portfolio management in an imperfect world

If the private sector cannot offset the exposure and leverage of the government's portfolio, portfolio management policy can contribute to or detract from residents' welfare for a variety of "second best" reasons. One of the more interesting distortions emphasized in the literature is associated with incomplete credit markets. By issuing various "new" types of debt, the government can provide vehicles that allow the private sector to increase welfare. In some cases, the new asset allows trade between generations.[1] In others the new asset has a desirable covariance with risks that cannot be hedged using existing markets.[2] The idea is that, once established, a liquid market for a new asset such as a fixed interest nominal bond of varying maturities provides free information about market expectations to the private sector. Since the information is free to all there may be under investment without government intervention. If such debt really is useful to the private sector, then investors will hold it at a lower yield. This suggests that minimizing debt service cost is a good indicator that the government is providing welfare-improving debt instruments.

For emerging markets, it seems likely that this argument is relevant for optimal portfolio management policy. Emerging markets lack many of the financial markets that are potentially useful to the private sector. For example, the development of a liquid market for long-term, fixed-interest government debt may fill an important gap in the ability of residents to finance long-term investment.

Another interesting class of models points to debt management as a way for the government to commit to utilizing conventional taxes rather than surprise inflation

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[1] Gale (1990).

[2] See Bohn (1988, 1990a,b) for models that evaluate different types of government debt, including foreign-currency denominated debt.

to satisfy the government's budget constraint.[3] The government can commit to price stability by issuing assets and liabilities that would not benefit from surprise inflation. The "time consistency problem" implies that the government can reduce real debt-service costs by shortening the maturity of domestic currency debt, indexing returns to inflation or replacing domestic-currency-denominated debt with foreign-currency debt. This is clearly at odds with the idea that the government should develop a long-term domestic bond market in order to "complete" the market.

4. Multiple equlibria

The lesson from the credibility literature is that private expectations concerning future inflation determine this period's debt-service costs if the government issues debt that is subject to the inflation tax. This raises the possibility that changes in private expectations can quickly generate a crisis. Under some circumstances, shifts in private expectations can lead to multiple equlibria and self-fulfilling expectations of high rates of inflation. If there are real costs associated with financial crises, the government should avoid short-term domestic debt and spread refinancing evenly over time. In this context, lengthening maturity minimizes the chance that the debt will have to be rolled over just when expectations are at a bad point.[4]

Clearly, multiple equilibrium models provide an alternative reason why governments must do more than live within their intertemporal budget constraints. These models also highlight an obvious conflict between policy objectives. The inability to commit to low inflation means that the private sector will not give up its option to alter the inflation risk premium by buying long-term bonds unless they are induced to do so by a very steep yield curve. But the possibility of shifts in private expectations means that governments should avoid relatively cheap short-term debt if they want to avoid a crisis. In the following pages we develop the idea that crises can occur without shifts in private expectations and that this suggests additional constraints on the government's participation in financial markets.

5. Default risk

While inflation is clearly a default option for developing countries, we have considerable evidence that outright default on some types of financial obligations

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[3] Lucas and Stokey (1983) argue that the inability to commit to an inflation policy is a fundamental distortion in a monetary economy. Blanchard and Missale (1994) present a model in which the maximum maturity of government debt is a decreasing function of the size of the debt.

[4] See Calvo (1988), Giavazzi and Pagano (1990), Alesina and Drazen, (1991).

is also an option. Even countries that have never defaulted are exposed to expectations that such an option is available. This additional option makes portfolio management for emerging markets more difficult and more important. Any debt management policy must be evaluated for its contribution to probability that a default will occur and for the costs of the default if it does occur. The assumption that inflation is the relevant default technology for industrial countries is consistent with the idea that alternative types of default are too costly to deserve serious consideration.[5]

A very general way to express the problem is that the government must compare the benefits of acquiring any asset with the costs associated with adding a liability to the portfolio. This includes some estimate of the contribution of the liability to the probability that some creditor group will offer terms for rolling over the liability that the debtor will reject, thereby forcing a renegotiation. The debtor must also estimate the contribution of a liability to the costs of bargaining following default.

6. Incentives and information

To understand these issues, we must make some assumptions about the incentives and information structures relevant for sovereign debtors and their creditors. Following a relatively well-developed literature for corporate finance, the key assumption is that creditors can observe that a debtor country pays or not but not the reason for nonpayment. There are two possibilities. Bad luck may erode the government's tax base so that payment is impossible or the government may choose not to pay and suffer whatever penalties creditors can impose.

Countries with little or no risk of bad luck, and the associated unavoidable default, will favor debt structures that insure maximum punishment following a default that could be avoided, that is, a strategic default. The problem for both the corporate and sovereign debtors is to determine how different numbers or types of creditors affect the optimal debt structure. The corporate case has been modeled as follows. All the managers, potential managers, creditors, and potential creditors look forward to the bids that each will make following a seizure of the firm's assets. The composition of debt "matters" under any set of assumptions where the value of the asset to individual participants in this game depends on the behavior of the other participants. Bolton and Scharfstein (1996), for example, assume that

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[5] In the literature, default is generally referred to as a capital levy. A onetime surprise tax on holders of debt is equivalent to a default on that debt. Capital levies were extensively discussed as an option for reducing the large debts accumulated during World War II. See Eichengreen (1990) for an excellent discussion of the economics and political economy of this era.

new managers earn lower returns on the asset and incur costs of evaluating the assets. In order to distinguish between one and many creditors, they also assume that each creditor has the right to seize a well-defined asset and that these assets are worth more when used together than separately. The ability of a creditor to block coalitions that can best utilize the seized asset provides the result that the number of original creditors "matters" for the expected value of the investment to the initial manager.

The structure of the game that determines the equilibrium for different debt structures is quite specific to the assumptions appropriate for corporate finance. Some of these assumptions do not travel well to the case of sovereign debt. But the intuition we want to pursue for the case of sovereign debt does emerge in the "corporate" models. In general, the government and the corporate "manager" must consider both the contribution of a given debt structure to the probability that a default will occur and the costs of that default should it occur.

The assumption that makes a corporate or sovereign model interesting is that which insures that conflict resolution generates dead weight losses for all the participants. In the corporate finance model outlined above this is a static problem in which the salvage value of the company's assets depends on the structure of debt. For sovereign debt it seems natural to model the dead weight losses that result from the passage of time during which the creditors and debtors restructure the existing debt. In international finance this has been a well-known argument over the effects of a debt overhang. During this interval we will assume that the ability of residents of debtor countries to utilize the domestic capital stock is impaired. Since this also reduces the creditors' potential income there is a coordination problem that is related to the structure of the debt. This might be modeled as a war of attrition (Drazen and Grilli, 1993) where creditors' uncertainty about the attributes of the debtor and other creditors generates delay in settlement.

Clearly if there are one creditor and one debtor, they might assess each other's bargaining power and, rather than watch the asset melt, will divide the spoils.[6] However, if the two sides are uncertain about the other's preferences or have very different expectations about a "fair" division, some waiting and dead weight losses are likely. The equilibrium condition is that each creditor, and if not liquidity constrained the debtor, compares the marginal cost of waiting with the marginal benefit of winning. The benefit is the probability that the other side will concede in the next instant times the difference between the winner's and loser's share of what remains of the asset. If there are a "few" creditors, they will have to assess the others' expected returns for delaying a settlement. If there are very many creditors, it might be difficult to arrange any agreement for a very long time.

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[6] This type of bargaining is assumed, for example, in Bulow and Rogoff (1989). In that model the adversaries evaluate one another and immediately agree to a payment.

For sovereign debt, the lack of collateral (or the means to seize it) means that some alternative threat is necessary to provide an incentive for repayment. The typical threats that have been modeled involve trade sanctions or prohibition of future borrowing. The trouble with these enforcement mechanisms is that the former has never been observed and the latter seems very weak relative to the amount of debt observed. Moreover, if countries had the ability to impose such sanctions they should do so regardless of the debt. An alternative is to assume that creditors can block the use of assets acquired by the debtor government. The threat evaporates as the assets depreciate. This provides an end to the recontracting game that seems more consistent with experience. Sovereign debt reschedulings are eventually resolved.

7. A sovereign debt model

Assume a world which lasts for three periods. In the first period, a foreign creditor lends the government K to buy assets, where K is a dollar amount. The risk-free interest rate is assumed equal to zero.

The government uses K to import an asset that in the second period yields x with probability θ and zero with probability $1 - \theta$. The asset lasts for one more period but depreciates uniformly during the period and yields a certain return y if utilized for the entire third period. The government agrees to pay z in the second period. If the government pays less than z, the creditor has the right to impair the government's use of the asset until a new agreement is reached for a share of the residual value of the asset, y.

During the third period the asset is not productive if a negotiation for sharing y is in progress. The value of the asset declines during the third period from y to zero. This specification of the punishment technology is appealing because it means that the creditors are only able to interfere with the government's ability to utilize the assets acquired with the foreign funds and for only as long as the assets last. The alternative interpretation that the creditors can punish the debtor forever and without regard to the seriousness of the offence is less appealing. One might think of a subsistence economy lifted temporarily to a higher level of output by an infusion of foreign capital, but once the capital depreciates the creditor has no way to push output below the initial level.

If the government can pay, which occurs with probability Θ, it will consider a strategic default. The temptation to keep z, the contractual payment in period two, is compared to the value of y that the government expects to capture following a negotiation with the creditor(s). The incentive constraint for the government to pay z if x occurs is

$$2z < y - gyt_s \tag{1}$$

where gyt_s is the expected share of y that goes to the government following a strategic default and a negotiation lasting $0 < t_s < 1$. The value of strategic default depends on the expected duration of the negotiation in period three. If x is less than z, the government is "solvent" but illiquid in period two and we assume for now that the difference is "rolled over" into a payment due at the end of period three. This simple expression highlights what we believe is a fundamental feature of international debt contracts. By entering into a contract that is difficult to renegotiate the debtor can credibly commit to repayment when it is able to repay.

If the government cannot pay, which happens with probability $(1 - \Theta)$, there is a similar negotiation. The problem is that the contracts have been designed to make the necessary renegotiation just as costly. One difference between the two states of nature is that following a strategic default the government has "secret" resources that can be used to overcome the coordination problem and speed a settlement. This probably accounts for clauses in international debt contracts that blocks buy-backs of debt at market prices.

After taking all this into account, the creditor must expect to make a fair rate of return

$$\theta(z) + (1 - \theta)\,cyt_b - K = 0 \tag{2}$$

where cyt_b is the share of y that goes to the creditor following an unavoidable default.

Note that gy, cy, t_s and t_b are a complicated function of the structure of debt and that t_s will generally not be equal to t_b but they are probably related. Thus, a country with a very small chance of bad luck would choose a debt structure that generated costly renegotiation following a strategic default. But that debt structure might also generate costly renegotiations following an unavoidable default.

Following a strategic default, the debtor has resources that might help speed a settlement. For example, secret buy-backs of sovereign debt may have helped some debtor countries reduce their debt following the 1982 debt crisis. But in the case of sovereign debt, it is difficult for the government to conceal assets from its creditors and knowing a debtor is withholding payment might make creditors even more unwilling to settle. International organizations may have some power to punish strategic default because they can withhold additional credits following default.

The problem for the government is to design a debt structure that maximizes its net revenue from investment. The general form of the government's net revenue function is

$$\theta(x + y - z) + (1 - \theta)\,gyt_b = R \tag{3}$$

Substituting Eq. (2) into Eq. (3), we arrive at:

$$R = \theta x + y - K - (1 - \theta)\,yt_b \tag{4}$$

The first three terms of Eq. (4) are the first best expected return on the asset if there is no default. The fourth term is the dead weight loss associated with rescheduling. A full description of how a portfolio of debt might be designed to maximize the expected value of Eq. (4) is very difficult. A result that stands out is that the optimal debt structure is related to the probability that the investment will fail for reasons beyond the control of the debtor government. Analytic and simulation solutions for this problem are topics for future research. In principle, the key parameters could be estimated from data on how long it takes to renegotiate different debt structures and how costly is the renegotiation.

In fact, the difficulty of the problem when viewed in this context makes us very skeptical about the effects of recent suggestions for altering the architecture of the international monetary system. Any change in the rules of the game that reduce the costs of renegotiating international contracts also reduces their value as a commitment mechanism. It is not surprising, for example, that industrial countries have not been willing to incorporate clauses in bond contracts that would reduce the voting majority necessary to renegotiate bond contracts. Since industrial countries are very unlikely to experience an unavoidable default, they have no reason to favor debt structures that can be renegotiated at lower cost.

8. Liquidity crises

In the above framework, we assumed that conditions one and two always hold ex ante and that creditors do not force a solvent debtor to default. A more complete model would take into account the possibility that some creditors might find it in their narrow interest to force a default if the debtor is illiquid. This would look like a solvent default in that following a good outcome in period two, the debtor is unable to make the payment z unless some creditor agrees to provide additional credit. Suppose there are initially two "gentle" creditors. These two see it in their mutual interest to roll over the debt of the solvent creditor as assumed above. But now suppose that one of the gentle creditors is bought out by a "tough" creditor. Also assume the tough creditor expects to get all of the residual value of the asset following a strategic default. In this case the tough creditor might do better by forcing default. The remaining gentle creditor could still save the day by buying out the tough creditor but this means rolling over the entire gap between x and z rather than its share. If there are many gentle creditors this could be a difficult coordination problem.

9. Adverse selection and debt service costs

Other things being equal, tough creditors will offer relatively good terms as the probability of default rises because they expect to recover a greater share of their

contractual payments at the expense of other creditors. But the tough bargainer does not internalize the dead weight loss associated with the loss in output generated by her actions. It follows that market prices are distorted and are a misleading guide for management of the debt.[7] In particular, as default becomes more likely, debtors may be tempted to choose debt that minimizes contractual payments. This would be a mistake since the cost of this structure of debt in default states might be very high.

To avoid misleading market signals, it might be optimal to create as few instruments and classes of creditors as possible. If there are no "niches" in which particularly hostile creditors can gather, they might self-select out of the credit supply. The industrial countries have adopted just such a rule. In general, industrial country governments issue one class of liabilities with a range of maturities but with no implicit or explicit seniority among credits or creditors. An alternative might be to borrow from a very large number of creditors that cannot block the use of the asset during renegotiation. The point is that at present we know very little about the cost of alternative debt structures following default. Recent proposals to "reform" the structure of international financial arrangements (Eichengreen,1999; G-22, 1998) are unlikely to make headway until these issues are better understood and subjected to empirical testing.

If only one type of debt is issued how should it be indexed? In our view the dominant consideration is the government's limited ability to generate changes in the foreign-currency value of their principal asset — that is, conventional tax revenue. It follows that governments cannot afford to issue foreign debt, or more precisely foreign-currency-denominated debt, even if that debt helps commit the government to price stability. For governments with revenues from oil or a single commodity this means that financial debt should be partially indexed to these commodities. But for most countries potential changes in the real exchange value of their domestic currency implies that domestic-currency-denominated debt is preferred to foreign-currency debt. Real exchange rate changes have been large, unexpected and uncorrelated with other economic variables. There is no apparent way to hedge a mismatch between government receipts and foreign-currency debt. Indexing the debt to the domestic price level might be optimal but it should be remembered that giving up a tax base for inflation increases, other things equal, the probability that the government will have to default on indexed debt.

10. Third parties

Another important factor that conditions the negotiation among private creditors is the possibility that third parties, in this case governments and international

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[7] Other creditors will complain and the market value of their claims will fall but this might not be perceived as a problem for the debtor.

organizations, might be induced to enter into the negotiations. Dooley (1995) develops the hypothesis that the nearly 10 years of depressed economic activity in debtor countries following the 1982 debt crisis was caused by the prolonged negotiation between private and official creditors. In that episode commercial banks knew that a prolonged recession in debtor countries would eventually force the official sector to buy out private creditors and this expectation blunted the incentives for private creditors to renegotiate the debt. Moreover, the gradual amortization of private debt made possible by new credits from the official sector after 1982 was fully consistent with those expectations.

More recently, the substitution of dollar-indexed, short-term debt (Tesobonos) by the government of Mexico for short-term domestic currency debt (Cetes) in the months leading up to the December 1994 crisis may have contributed to a quick renegotiation of the debt. The existing literature on debt management would emphasize the fact that by indexing the liability the government altered its incentives to inflate and devalue the currency. Thus, the probability that default in the form of inflation and devaluation would be optimal was reduced and this reduced debt service costs.

Our model emphasizes a different aspect of the same policy. The substitution of Tesobonos for Cetes changed the nature of the rescheduling exercise that followed the 1994 crisis. The recontracting in this case was resolved quickly by forceful intervention by official creditors. In retrospect the issue of Tesobonos was a very good idea if the decision of official creditors, in this case the U.S. government and international organizations, to lend quickly and in large amounts was due to their unwillingness to fight a long costly war with a well organized and a powerful group of holders of Tesobonos.

11. Implementation of a debt management policy

While many countries have established debt and asset management procedures in recent years most have focused on managing a very limited set of financial assets and liabilities. The widespread practice of establishing a "benchmark" portfolio for foreign-currency-denominated assets and an independent benchmark portfolio for foreign-currency-denominated liabilities violates the fundamental rule that risks are associated with portfolios. The problem with separating asset and liability portfolios is that there is a perfectly predictable covariance of minus one between the value of similar assets and liabilities denominated in the same currency.

But merging portfolios of financial assets and liabilities is only the tip of the iceberg. We cannot evaluate an activity's contribution to risk until we know how the associated balance sheet items interact with all of the other positions that comprise the balance sheet. Developing country governments have diverse and highly leveraged portfolios. Important examples of activities that generate assets

and liabilities include foreign exchange market intervention, deposit insurance, lender of last resort commitments, state owned enterprises, membership in international organizations and social insurance commitments. Moreover, governments in developing countries are probably more exposed to capital gains and losses than they realize. At a minimum, governments that manage exchange rates must consider the implicit liability to guarantee the domestic currency value of assets and liabilities in the domestic banking system. If a government decides to liberalize its domestic credit markets, prudent debt management policy would immediately recognize an implicit liability that will arise if important institutions prove not viable in this new environment. A good portfolio is one that balances the welfare gains from each activity with the costs generated by that activity's *contribution* to default risk.

An elementary principle of financial management is that risks are associated with portfolios, not with the behavior of individual assets and liabilities. It follows that the first and perhaps most difficult step in implementing a coherent debt and asset management policy is to set out a comprehensive balance sheet for the government. This is a difficult task both conceptually and empirically. Although only a subset of the government's marketable assets and liabilities are actively managed, sensible debt management policy is concerned with the value of the entire portfolio. The values of assets such as the stream of conventional tax receipts are difficult to quantify because they are not marketable assets, but variations in the values of such assets are an important part of the risk profile of the government's portfolio. Moreover, implicit and derivative assets and liabilities must also be quantified.

12. Conclusions

Governments may have a variety of good reasons to engage in financial intermediation. But while benefits are associated with individual activities, costs are associated with that activity's contribution to the risk and return profile of the whole portfolio. Optimal debt and asset management policy balances the welfare gains from each activity with the costs generated by the marginal contribution of that activity to default risk. In evaluating costs we depart from the literature on debt management for industrial countries in that we focus on the probability that the government will choose or be forced to default on some or all of its obligations. This type of analysis is familiar in corporate finance but has not been widely applied to the problem of sovereign finance.

Some of the conclusions that emerge from the analysis are striking and contrary to lessons drawn from models that do not focus on default. Governments should avoid asset and liability structures that are likely to trigger default and it should avoid debt and asset structures that prolong and intensify the decline in economic activity that follows default. The usual objective of choosing a risk/return trade

off along an efficient frontier implicitly ignores default risk. Such portfolios can be very costly in that they can both raise the probability of default and the costs that follow. In fact, we argue that apparently costly portfolios in terms of debt service costs are likely to be preferred when the cost of default is included in the decision making process.

Finally, it seems likely to us that welfare gains usually associated with financial intermediation are probably quite small relative to welfare losses associated with the larger, and larger variance, portfolios created. If this is the case, governments of emerging markets should avoid financial intermediation. An important aspect of this is to limit implicit assets and liabilities associated with exchange rate and lender of last resort commitments. If such commitments are in place, the government should aggressively regulate the behavior of the private sector in order to control the growth of implicit liabilities.

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