

DEBT MANAGEMENT AND MACROECONOMIC STABILITY

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Abstract

This paper provides an overview of the channels through which the structure of public debt can affect macroeconomic performance. Its objective is to provide an analysis of factors influencing the optimal composition of the public debt, and to establish some general guidelines for public debt management in emerging economies.

The paper offers several principles for managing public debt based on theory and a study of the Mexican experience. It points out that the optimal composition of the government's debt depends on a country's circumstances, because the choice of public debt composition often involves making a tradeoff between enhancing the government's credibility and reducing the vulnerability of its budget to a variety of shocks. The study concludes that while governments should generally finance themselves at market rates using a variety of securities, the optimal composition of those securities should be heavily weighted toward long-term nominal debt for governments that have anti-inflationary credibility, and toward long-term indexed debt for those that do not.

ملخص

تستعرض هذه الورقة القنوات المختلفة التي يؤثر من خلالها هيكل الدين العام على الأداء الاقتصادي الكلي، وذلك بهدف تحليل العوامل المؤثرة على الهيكل الأمثل للدين العام، والتوصل إلى مجموعة من الإرشادات العامة لإدارة هذا الدين في الاقتصاديات الناشئة.

وفي هذا السياق، تقدم الورقة مجموعة من المبادئ لإدارة الدين العام استنادا إلى كل من النظرية الاقتصادية والتجربة المكسيكية. وتوضح الورقة أن الهيكل الأمثل للدين الحكومي يتوقف على ظروف الدولة، وذلك نظرا لأن تحديد هيكل الدين العام غالبا ما ينطوي على مقايضة بين زيادة مصداقية الحكومة والحد من مخاطر تعرض موازنتها إلى الصدمات المختلفة. وتخلص الدراسة إلى أنه في الوقت الذي يجب على الحكومات أن تحصل فيه على التمويل وفقا لأسعار السوق باستخدام مجموعة متنوعة من الأوراق المالية، إلا أن التركيبة المثلى لهذه الأوراق يجب أن تغلب عليها الديون الاسمية طويلة الأجل بالنسبة للحكومات التي لديها مصداقية في مكافحة التضخم، والديون طويلة الأجل المرتبطة بمؤشر للأسعار في حالة نقص هذه المصدقية.

I. INTRODUCTION

Maintaining fiscal solvency is probably the most important contribution the public sector can make to the preservation of macroeconomic stability. The perception of prospective fiscal insolvency has been at the root of severe macroeconomic instability in developing and transition economies over the past two decades.¹ Fiscal solvency can indirectly contribute to macroeconomic stability as well by allowing scope for fiscal flexibility. A government whose solvency is secure can borrow to finance fiscal deficits during economic downturns, thereby providing scope for the countercyclical effects of automatic fiscal stabilizers and discretionary fiscal policy.

However, preserving macroeconomic stability requires more from the government than maintaining its solvency and using fiscal policy as a countercyclical instrument. How the public sector manages its portfolio of assets and liabilities may also have an important effect on the economy's performance. On the liability side of the public sector's balance sheet, this applies not just to the mix of monetary and non-monetary liabilities that is determined by monetary policy, but also to the composition of the non-monetary liabilities themselves. This is a subject that has traditionally not received much attention in macroeconomics, but has recently come under increased scrutiny as issues such as achieving fiscal credibility and the role of balance sheet effects in triggering macroeconomic fluctuations have gained increasing attention.

This paper provides an overview of the ways in which the structure of public debt can affect macroeconomic performance.² The objective of the paper is to provide an analytical overview of the factors that the recent literature in macroeconomics has identified as being relevant in determining the optimal composition of the public debt, and to synthesize these into some general guidelines for the management of the public debt in emerging economies.

¹ The role of prospective fiscal insolvency in the Latin American debt crisis of the 1980s, in the Russian crisis of 1998, in the Ecuadorian crisis of 1999, and in the Argentine crisis of 2002 is widely agreed upon. But some observers have also blamed prospective fiscal insolvency for the Mexican crisis of 1994 (see, for example, Steiner 1995) and the Asian crisis of 1997 (Burnside, Eichenbaum, and Rebelo 1998).

² Thus it will focus on the liability, rather than the asset side, of the public sector's comprehensive balance sheet. For the purposes of the paper, the composition of the public sector's assets will be taken as given.

As a point of departure, I will take the simple view that the objective of public debt management should be to minimize the cost of servicing debt. I will show how that objective may or may not be consistent with other important macroeconomic objectives that the composition of the government's debt is likely to affect. Among these other objectives are some that can be considered structural in nature such as the promotion of financial sector development, and others that concern the safeguarding of macroeconomic stability, such as achieving fiscal credibility, avoiding fiscal vulnerability, and preserving central bank flexibility in conducting monetary and exchange rate policy.

The paper is arranged as follows: Section II considers the view that the objective of debt management policy is to minimize the cost of debt service. This view is rejected in favor of the alternative – that debt management should seek to achieve an optimal tradeoff among multiple and competing social objectives. Section III examines the conflict between the minimization of debt servicing costs and the structural objective of promoting domestic financial development. It concludes that promoting financial development requires the government to eschew financial repression, and instead to finance itself by selling securities on market terms, but this leaves open the question of the optimal composition of such securities. Sections IV-VI consider respectively the choice between indexed and nominal debt, between short-term and long-term debt, and between domestic- and foreign-currency debt. In all of these cases the government faces tradeoffs between fiscal credibility and vulnerability as well as possible constraints on the conduct of monetary and exchange rate policies. These issues are illustrated in a case study of the 1994-95 Mexican crisis provided in Section VII. The final section summarizes the analysis and extracts some simple guidelines for debt management in emerging economies.

II. MINIMIZING DEBT SERVICING COSTS AS AN OBJECTIVE OF PUBLIC DEBT MANAGEMENT

A naïve view of the optimal determination of the public sector's debt structure is that the composition of the government's liabilities should be chosen so as to minimize the costs of debt servicing. This objective is clearly not just an arbitrary one, as it can readily be given a justification on welfare grounds. Consider, for example, a government whose

objective is to maximize social welfare. In the presence of costless lump-sum taxation, if all public debt is held domestically, servicing the existing stock of debt simply represents a non-distortionary transfer within the domestic economy. But if taxes are distortionary and/or costly to collect, then raising the revenue required to service the debt imposes an “excess burden” on the economy (in the form of collection costs and the deadweight losses associated with distortionary resource-allocation effects) that can be reduced if debt servicing costs are minimized.³

Nonetheless, this view is naïve as it assumes that the objective function the government seeks to maximize when choosing the optimal composition of its debt contains a single criterion. The problem is that the single-minded pursuit of this criterion would soon be seen to entail harmful implications for other social objectives that the government also values.

To see this, note that the simplest way to minimize debt service costs is just to repudiate the entire stock of interest-bearing debt. Debt repudiation – at least to a partial extent – is (by definition) the only recourse for an insolvent government. But even a solvent government may have an incentive to repudiate.⁴ For example, the welfare-maximizing government described above could minimize the excess burden associated with distortionary taxes by simply repudiating the existing debt. This means that to sustain an equilibrium with positive levels of debt, repudiation must entail a cost that induces the government to continue to service its debt. For a welfare-maximizing government, this cost must take the form of a sacrifice of economic welfare – i.e., the impairment of other welfare-enhancing objectives.

The costs associated with debt repudiation are both direct and indirect. An obvious source of the former is the actions of creditors, who will appeal to the legal system to enforce their debt contracts and may be able to penalize the government for

³ Debt servicing can obviously be financed either by reducing spending or raising tax revenues. Following the literature on this topic, throughout this paper I will take the level of spending as given and focus on the role of taxation. As long as public spending is productive and is subject to diminishing marginal returns the welfare arguments in the text would be unchanged if the government responded to changes in its debt servicing needs by adjusting spending rather than revenues.

⁴ Thus the distinction between ability and willingness to repay.

reneging on its obligations.⁵ Moreover, creditors' ability to impose such costs may leave the status of the repudiated debt uncertain, creating a "debt overhang" problem that potentially distorts intertemporal relative prices in the domestic economy and thus may adversely affect its macroeconomic performance. Therefore, one reason that debt is not repudiated is that while it is costly to service debt, it may be even more costly *not* to do so.

Indirect costs of repudiation arise through reputation effects. Consider, for example, a simple Barro-Gordon (1983) reputational setup in which the government is expected to be bound by its debt-servicing commitments as long as it continues to service debt on schedule, but once it opts to exercise discretion (by repudiating), it will be expected to do so again at the next available opportunity. In that case, if the government ever repudiates, it will be denied the opportunity to do so again by being unable to borrow. In this case the cost of repudiation is the loss of market access. In what sense does this entail a cost for a welfare-maximizing government?

If the government cannot borrow, it must finance its expenditures through taxation or by printing money. But full tax financing of government expenditures is undesirable for a number of reasons:

a. From a neoclassical perspective, full tax financing may increase the present value of the excess burden associated with the financing of a given program of exhaustive government spending if the excess burden associated with each dollar of tax revenue is an increasing function of the tax ratio (Barro, 1979). Moreover, it distorts intertemporal allocation decisions by causing tax rates to vary intertemporally with government expenditures, thus inducing economic agents to redistribute their production and spending decisions over time.

b. From a Keynesian perspective, full tax financing (continuously balanced budgets) involves raising tax rates during cyclical downturns and lowering them during booms, thus causing fiscal policies to behave pro-cyclically.

⁵ This is the threat, for example, that Argentina's creditors are currently using to try to extract better terms in the renegotiation of defaulted Argentine government bonds.

c. From the perspective of intergenerational equity, full tax funding forces the current generation to bear the burden of public sector capital expenditures that will benefit future generations, thus violating the “benefit principle” of public finance.

Consequently, full tax funding involves unacceptable sacrifices of other valuable social objectives in the form of efficiency, stability, and equity.

The alternative to tax financing (and the associated avoidance of fiscal deficits) is, of course, to finance deficits by printing money. But the obvious implication of doing so is that the economy would be subjected to high and unstable inflation. The increased transactions costs, as well as the instability of intratemporal and intertemporal relative prices that this entails, would have adverse consequences for both efficiency and equity which have always rendered pure money financing unacceptable.

Thus, welfare-maximizing governments do not routinely repudiate debt, despite the excess burdens associated with servicing it, because to do so would entail an unacceptable sacrifice of other important economic objectives. The upshot is that for such governments, debt management policy involves making tradeoffs among competing social objectives, and cannot be reduced to a single-minded focus on the minimization of debt servicing costs.

In short, non-repudiation means that it is likely to be optimal for governments to maintain a stock of financial liabilities that includes some interest-bearing debt. This means that governments will generally be faced with a debt management problem regarding the composition of those liabilities. The problem is how to choose the composition of the debt so as to achieve desirable outcomes with regard to a set of *multiple* social objective(s). In the rest of the paper I’ll consider what some of those objectives may be, and how they are likely to be affected by the structure of the government’s debt.

III. DEBT MANAGEMENT AND FINANCIAL DEVELOPMENT

While debt repudiation may be too costly, a government may nevertheless decide that minimizing public-sector borrowing costs is the overriding consideration guiding its debt management policies, subject to the constraint that the debt be serviced on schedule. This

would suggest choosing the composition of the debt so as to reduce its carrying cost as much as possible, leaving all other considerations aside. The incentive for a welfare-maximizing government to do so is the same as the incentive it faces to repudiate debt – i.e., to minimize the costs associated with distortionary taxation.

One obvious way to seek to minimize debt servicing costs is to issue debt at below-market interest rates. The question, of course, is why anyone would choose to hold such debt, and the answer is that (by definition!) no one would. Thus, for such debt to be held, the government would have to *compel* private agents to hold it. Strictly speaking, this is more akin to a form of taxation than to partial repudiation, since creditors know *ex ante* that they will be receiving below-market returns.

Various types of policies associated with financial repression have this effect – e.g., controls on capital outflows, public ownership and management of commercial banks, as well as reserve and “liquidity” requirements imposed on private commercial banks. Such policies create an artificial demand for government securities, enabling the public sector to borrow at rates below those that would prevail if creditors had more choice in the assets they could hold.

However, while such policies may carry the benefit of reducing the government’s financing costs, they carry the important social costs of distorting resource allocation and impeding financial development. Distortions in the allocation of resources arise because the portfolio restrictions that such policies place on financial institutions compromise their ability to perform their financial intermediation function efficiently and prevent them from allocating government funds to activities that offer higher returns. Moreover, the implicit tax that these restrictions place on the financial sector reduces the incentives for investment in formal financial intermediation, potentially favoring less efficient types of intermediation. Financial development is also impaired by debt financing through these means, as opposed to the selling of government securities in an open primary market, because it deprives the market of a benchmark for pricing risk in the domestic economy (in the form of a market-determined interest rate on short-term government securities), as well as of other means for the market to aggregate and disseminate

information through the pricing of securities (e.g., through the term structure, return differentials on non-indexed and indexed bonds, etc.).

These observations suggest that reducing debt-servicing costs through financial repression is socially costly. Given that recent research suggests that financial development can play an important role in promoting economic growth, these costs may be quite large.⁶ The message is that governments that place high value on promoting economic growth are likely to find it optimal to issue liabilities that have the effect of increasing their borrowing costs in order to promote financial development. Rather than directly placing government obligations with financial institutions that are given artificial incentives to hold them, in order to promote the development of an efficient domestic financial system, it is preferable for the government to sell its securities in undistorted primary markets and to issue securities with diverse characteristics, so as to facilitate market processing of financially-relevant information.⁷

However, this prescription hardly begins to solve the problem of optimal debt management, since it leaves the government with many choices to make. For example, it can in principle issue securities denominated in domestic currency or that are indexed in some fashion (e.g., to the domestic price level or to the exchange rate), that are of short or long maturity, and that are purchased by domestic or foreign creditors. To examine the considerations that may influence such decisions, the next section will turn to other social objectives that debt management can potentially address.

Before doing so, however, it may be worth emphasizing that the message of this section carries through to the sections that follow. Promoting financial development means *both* eschewing financial repression *and* issuing securities with diverse characteristics to facilitate market aggregation and dissemination of financially-relevant information. Thus, the latter objective remains important even in liberalized and highly

⁶ See Levine (1997).

⁷ Indeed, to avoid the harmful consequences of financial repression, in recent years many governments in developing countries have opted not to continue seeking a reduction in their borrowing costs by administrative means, but to borrow domestically at market rates by issuing securities that are voluntarily purchased by private agents. Williamson and Mahar (1998) provide a survey of financial reform in developing countries.

developed financial markets.⁸ The issues to be discussed in subsequent sections concerning the *relative* weights of different securities in an optimal debt management strategy do not alter the conclusion of this section that the set of securities issued should be diverse.

IV. CREDIBILITY AND HEDGING: INDEXED VERSUS NOMINAL DEBT

Assuming that government interest-bearing liabilities consist of securities that are issued in open markets and that are expected to be serviced on contractual terms, what type of debt should the government issue? This section will consider whether it is optimal for the government to issue nominal debt (i.e., debt denominated in the domestic currency), or whether at least some share of its debt should be indexed to the domestic price level. For now, we take the maturity of the debt as given, and assume that all debt is long-term debt. The section that follows considers the role of short-term debt and the question of optimal debt maturity.

Recent research has emphasized that, even if the government's solvency can be taken for granted, the existence of a large stock of long-term nominal debt may have important macroeconomic consequences.⁹ These consequences help us understand the conditions that affect the optimal share of the government debt that should be indexed to the price level. As we will see, the key issue concerns a tradeoff between the government's anti-inflationary credibility and risk to the government's solvency or to the economy's welfare caused by fluctuations in distortionary taxes.

a. Time Inconsistency

A potential consequence of a large stock of long-term nominal debt is that it may aggravate the time-inconsistency problems that can be associated with monetary policy when the central bank lacks a pre-commitment mechanism. In the simplest Barro-

⁸ For example, in the United States the desire to facilitate the information-processing role of financial markets and to promote financial development by enriching the set of securities available to individuals played key roles in the debate during the decade of the 1990s over whether the U.S. government should issue indexed bonds, and these arguments were ultimately persuasive in inducing it to do so (see Campbell and Shiller 1996).

⁹ Note that the stock of long-term nominal debt can be large either because the stock of government liabilities is large or because a large share of liabilities take this form. The distinction is irrelevant to the discussion that follows.

Gordon no-precommitment rational discretion equilibrium, welfare-maximizing central banks face a temptation to inflate because unanticipated inflation can increase output. From a welfare-maximizing perspective, an increase in real output is desirable if an unavoidable distortion in the economy makes the “natural” level of output sub-optimally low. The restraint on the government’s temptation to inflate arises from quadratic social costs of inflation.

The presence of long-term nominal debt may aggravate this temptation by reducing the social costs of inflation. Since the contractual interest rate on such debt is fixed, an increase in the rate of inflation acts like a capital levy, reducing the real value of such debt, thus permitting a reduction in the level of distortionary taxation required to service it – in effect, the existence of long-term nominal debt increases the base of the inflation tax. The social gains from reducing the level of distortionary taxation partly offset the social costs of inflation, thus magnifying the government’s incentive to act in a discretionary manner and engineer an inflationary surprise. This increased incentive to act in a discretionary fashion would have the effect of increasing the economy’s equilibrium rate of inflation. The equilibrium rate of inflation would be sub-optimally high in this case compared to a pre-commitment (non-discretionary) equilibrium, because since there is no “surprise” inflation in equilibrium, the level of real output is the same in both equilibria, while the inflation rate is potentially substantially higher in the discretionary equilibrium. Thus, the effect of a large stock of long-term nominal debt is to increase the magnitude of the social loss associated with the discretionary equilibrium.

How can this problem be resolved? One mechanism proposed by Calvo (1988) is that, since the government’s credibility problem is aggravated by the existence of long-term nominal debt, the problem can be ameliorated by increasing the share of long-term debt that is indexed to the domestic price level, and the role of nominal debt in undermining the government’s credibility could be eliminated entirely by full indexation of the debt. Notice that a government that is more likely to resist inflation than the public gives it credit for, would find the issuance of indexed debt particularly attractive, because in addition to whatever credibility gains it may achieve by issuing this type of debt, it

would also reduce its debt servicing costs by doing so, since the real interest rates that it would have to pay would be reduced.¹⁰

These arguments suggest that the optimal share of long-term nominal debt (as opposed to indexed debt) in the government's portfolio should be zero. Since reliance on indexed debt would eliminate the possibility of a "bad" equilibrium, the question then becomes why nominal debt exists at all.

b. Stabilization of Tax Rates across States of Nature

One answer is given by Bohn (1988). Consider a world of uncertainty in which the government's budget is subject to random shocks. Suppose that markets are incomplete, in the sense that the government cannot structure its debt in the form of state-contingent contracts with payoffs conditioned on the shocks to the government's budget (such contracts would promise larger payoffs to creditors when shocks are favorable and smaller ones when they are unfavorable). In that case, shocks to the government's budget will require offsetting discretionary changes in tax revenues. If raising tax revenue by altering tax rates is subject to convex costs, then variability of tax rates across states of nature increases the *expected* burden of distortionary taxes and thus reduces economic welfare. Indeed, if the government's budget is sufficiently vulnerable to shocks, and the variability of shocks is sufficiently large, the social costs of raising the required revenue in the face of adverse shocks may be large enough to trigger an optimal default. Therefore, organizing the government's finances so as to achieve equalization of tax rates across states of nature is a desirable goal.

What does all of this have to do with the structure of the government's debt? Suppose that, in an attempt to minimize time-consistency problems, all debt is indeed indexed to the price level. Then, while this may reduce the government's incentive to *intentionally* try to engineer inflationary surprises, in a world of uncertainty unexpected inflation may nevertheless occur. Suppose that unanticipated inflationary shocks to the economy have the property that they give rise to positive correlations between the price

¹⁰ This assumes, of course, that the government has better information about its future intentions than the private sector does.

level and the government's financing needs.¹¹ In that case, the additional revenue that would have to be raised by the government through distortionary taxation would be greater, the extent to which the government's debt is indexed to the domestic price level would be greater, and fully indexed debt would have the effect of *maximizing* the variability of distortionary tax rates.

Bohn's basic observation is that, in the presence of uncertainty and with incomplete markets, nominal debt can provide the government with a valuable hedge and can improve welfare by reducing the excess burden of raising the level of tax revenues required to finance a given plan of exhaustive public spending. The reason is that, in the face of shocks of the type just described, an increase in the price level would reduce the real costs of servicing the debt at just the time when the government's financing needs are increasing, and a reduction in the price level would increase the real burden of servicing nominal debt at just the time when the government can most afford it. Thus, the existence of nominal debt helps to stabilize tax rates across states of nature, and as shown above, such stabilization is welfare-improving. Of course, this benefit would need to be offset against the adverse credibility effects described previously, but since such effects would tend to be nonexistent when the stock of nominal debt is zero, in general this argument would justify at least some positive level of nominal debt.

c. The Optimality of Nominal Debt

These arguments indicate the tradeoffs that the government faces in choosing the optimal composition of debt between indexed and non-indexed liabilities: it can enhance its credibility by opting for a larger share of indexed debt, but only at the expense of increasing the vulnerability of its budget to certain types of shocks, thus making the economy more susceptible to the distortions associated with variability in tax rates across states of nature and possibly even increasing the likelihood of default. What considerations should govern this choice?

- First, a critically important factor is the extent to which the government can precommit its future actions. The greater the amount of precommitment available

¹¹ Perhaps because they reduce income levels and thus tax revenues, because they raise real interest rates and thus the government's debt-servicing costs, or because they represent unexpected changes in government spending, as in the face of wars or natural disasters.

to the government, the greater the hedging benefit of nominal debt relative to its credibility cost. Thus, a greater ability to precommit suggests a *lower* optimal degree of indexation and therefore a larger optimal share of nominal debt. In the limit, if the government can fully precommit, there is no credibility benefit to indexation. In this case if positive inflation shocks have adverse effects on the budget, hedging considerations favor the issuance of nominal debt.

- Second, the choice depends on the social costs of inflation relative to those associated with distortionary conventional taxation. The higher the social costs of inflation, the more important it is to avoid the discretionary outcome. The severity of the excess burden associated with higher tax rates is also an important consideration. The less severe the excess burden associated with higher tax rates is, the lower the benefit from stabilizing tax rates across states of nature. In the presence of lump-sum taxes, for example, the benefit would be nil. High social costs of inflation and access to relatively non-distortionary forms of taxation would argue for a *larger* share of indexed debt.
- Third, given an incomplete ability to precommit, the costs associated with a larger share of nominal debt (a lower degree of indexation) depend on the additional incentives it creates at the margin for the government to inflate. Thus the optimal degree of indexation should *increase* with the level of debt, since a given increment to inflation has a larger positive budgetary impact the larger the stock of nominal debt.
- Fourth, as already mentioned, the tradeoff depends on the empirical importance of shocks that give rise to a positive correlation between the “shadow value of reducing debt” and the price level. Not all shocks would have this effect. For example, as Bohn himself points out, monetary shocks that cause unanticipated changes in interest rates and the price level to be negatively correlated would tend to reduce the real value of debt service in the presence of nominal debt at precisely the time (i.e., under states of nature) when it is *least* needed. The incidence of such shocks will in turn depend in part on the structure of the government’s budget, since the structure of expenditures and revenues will

determine the sensitivity of the government's primary balance to the domestic price level.

- Finally, it also depends on the variability of the shocks just described. The correlation between the “shadow value of reducing debt” and the price level depends both on the frequency with which such shocks arise relative to other types of shocks, as well as on their magnitude when they do arise. The greater the variance of shocks, the more valuable the hedge provided by nominal debt.

The upshot is that the tradeoff between credibility and vulnerability that the government faces in choosing between nominal and indexed debt depends on a variety of characteristics of the domestic economy. Theory can pin down the relevant considerations, but does not suggest that either type of debt is superior to the other under all circumstances.

V. SHORT-TERM VERSUS LONG-TERM NOMINAL DEBT

The previous section considered the tradeoff between nominal and indexed debt, holding the maturity of the debt constant. Leaving aside for the present the possibility of indexing the debt, and thus taking all debt to be nominal, this section turns to the issue of debt maturity – i.e., a consideration of the choice between short-term and long-term nominal debt.

As we will see, just as is true in choosing between nominal and indexed debt, the choice between short-term and long-term debt involves a tradeoff between credibility and vulnerability. The difference is that short-term nominal debt may not be as effective as long-term indexed debt in projecting credibility, and that short-term debt leaves the government vulnerable to different types of risk than does indexed debt. In particular, while short-term nominal debt protects the government's finances from the inflation shocks to which indexed debt makes it vulnerable, it exposes the government to real interest rate and rollover risk. In addition, the existence of a large stock of short-term debt may constrain the conduct of monetary policy when the government's perceived solvency is precarious. Through that channel, it may also render an economy that

operates with an officially-determined exchange rate vulnerable to self-fulfilling currency crises.

a. Credibility vs. Vulnerability Once Again

i. Why do governments borrow short-term?

In a world characterized by asymmetric information and moral hazard, lending at short maturities is a device used by creditors to monitor and control borrowers. The recurrent capacity to repay loan principal is used by creditors as a signal of continued solvency, and the threat of withdrawing funds, or renegotiating lending at potentially much higher interest rates serves as a disincentive for borrowers to behave in ways that undermine the interests of their creditors. Thus, when information and moral hazard problems are acute, short-term loans will be relatively cheap compared to long-term loans. Under these circumstances, the objective of minimizing borrowing costs will tempt governments to opt for short-term financing.

The second reason why governments may choose to borrow short-term is to enhance their credibility. Short-term debt differs from long-term debt in that the interest rate on short-term debt is continuously renegotiated, and creditors can adjust the contractual interest rate so as to be compensated for the effects of anticipated inflation in reducing the real values of their claims. This means that unlike money and long-term nominal debt, the government cannot regard its short-term liabilities as part of the inflation tax base, and this reduces the incentive to renege on inflationary commitments that gives rise to the time-inconsistency problem. Thus, governments can issue short-term debt to “tie their hands” in the future and deprive themselves of the temptation to inflate which arises from a large inflation tax base. In this way, governments can enhance the credibility of their anti-inflationary commitments.

ii. Short-term debt and time inconsistency

But just how effective is short-term debt in enhancing credibility? At least two reasons have been proposed for doubting its effectiveness. The first is that government may indeed be able to tax short-term debt with inflation that the public can anticipate. The second is that the existence of short-term debt can make the economy vulnerable to

multiple equilibria, in which the “bad” equilibrium is characterized by low credibility and high inflation.

Concerning the first of these, the key point is that an increase in anticipated inflation can be used by the government to ‘tax’ short-term debt if it is associated with a reduction in the equilibrium value of the real interest rate. Calvo (1989) has proposed one mechanism through which this could happen. Specifically, with perfect capital mobility the nominal interest rate is pinned down by uncovered interest parity. Under officially-determined exchange rates, if the central bank can engineer an increase in the inflation rate that exceeds its preannounced rate of exchange rate depreciation, the real interest rate will fall. Under these circumstances, the government can erode the real value of short-term debt by increasing the rate of inflation.

Turning to the second problem, Calvo (1988) has argued that the existence of nominal debt with an interest rate that is responsive to expected inflation (as would be true of short-term debt) makes the government vulnerable to confidence crises that can result in high-inflation equilibria.

The mechanism is as follows: as indicated above, the government’s incentive to inflate in the absence of pre-commitment depends on the reduction in other forms of distortionary taxation that it can achieve by doing so. This depends not only on the size of the inflation tax base (which will determine the revenue from inflation), but also on the size of the budget gap to be filled, which will determine the benefits from inflationary taxation (if the distortionary costs of tax revenues are a convex function of the size of the revenues, these costs will increase with the size of the budgetary gap to be filled). Thus the temptation to inflate is an increasing function of the debt service payments to which the government is obligated. That means that it depends both on the interest rate as well as the size of the nominal debt. But if creditors come to believe that the elimination of some of the real value of short-term debt through inflation is a possibility, they will demand a premium in the yield on such debt so as to compensate them for expected inflation and for bearing the attendant risk. But this, of course, will increase the government’s debt-service obligations and its incentive to inflate.

The positive dependence of the incentive to inflate on the value of the nominal interest rate, and of the nominal interest rate on the perceived incentives for the government to inflate create the possibility of multiple, self-fulfilling equilibria. That is, the high nominal interest rates caused by a lack of confidence may indeed induce the government to inflate the debt away. Therefore, two equilibria could arise: a good equilibrium with low inflation and low nominal interest rates, and a bad equilibrium with high inflation and high nominal interest rates.

iii. Risk exposures with short-term debt

Just as indexed debt renders the government's budget vulnerable to price level shocks, short-term debt leaves it vulnerable to the risks associated with rolling over the debt. In the multiple-equilibria case just examined, this took the form of possible movements in nominal interest rates – i.e., the emergence of inflationary expectations that would actually induce the government to inflate the debt away. But real interest rates may also fluctuate for exogenous reasons (e.g., changes in country risk premia associated with international contagion), and such movements, like price-level shocks in the case of indexed debt, may induce sub-optimal variability in tax rates.

But matters may be worse than that. Recall that Calvo (1988) argued that the presence of a large stock of short-term domestic-currency debt could give rise to self-fulfilling confidence crises that would result in high equilibrium rates of inflation and high nominal interest rates on government debt. However, that is not the only form that a confidence crisis can take. Specifically, Alesina, Prati and Tabellini (1991) have noted that a large stock of short-term debt can create vulnerability to self-fulfilling confidence crises in which otherwise solvent governments default on their debt obligations.

To see how this can happen, recall that what creates the possibility of a "bad" equilibrium in the Calvo framework is the government's reluctance to make the fiscal adjustment required to meet a crisis-driven increase in debt service requirements. The Alesina, Prati and Tabellini model relies on a similar mechanism. In that model, convexity of tax collection costs increases the (utility) cost of raising an incremental amount of public sector revenues the larger the amount of revenues the public sector has to raise. Consider how this affects government decisions concerning the servicing of

short-term debt. As long as creditors are willing to roll over any short-term debt coming due on similar terms as when the debt was originally contracted, the government does not have to raise additional revenue to service the debt. But if creditors increase the real interest rate they require in order to roll over the debt or, in the extreme case, if they refuse to roll over the debt at all, the government can only continue to service the debt by increasing tax revenues, either in the future (if creditors increase the interest rates they demand to roll over the debt), or in the present (if they refuse to roll over on any terms). The key question is whether the government will continue to service the debt on schedule when it has to raise more of its own resources to do so.

The answer depends on how large an impact higher real interest rates or a refusal to roll over would have on the incremental revenues that the government has to raise. Because interest rates are free to adjust and principal payments are higher, the shorter and more bunched debt maturities are the more sensitive the need for incremental revenues will be to any increases in rollover costs or to a refusal of new lending. Thus, an increase in interest rates required to roll over debt or to a refusal of new lending are more likely to be met with a refusal by the public to raise the revenues required to service the debt the shorter and more bunched debt maturities are.

Of course, if the public sector is perceived as unlikely to honor its debt obligations, then creditors will be reluctant to take on the government's short-term liabilities. That means that reluctance by creditors to roll over debt in fear of default can be self-fulfilling: when creditors become unwilling to roll over short-term debt the government is more likely to default, because it would then be called upon to make payments out of resources that would be too costly for it to raise. Therefore, a short maturity structure of the public debt may increase the likelihood of a confidence crisis on the debt: the shorter and more concentrated debt maturities are, the greater the government's vulnerability to confidence crises. In this case, such crises take the form of "debt runs."

Giavazzi and Pagano (1991) summarize these results by noting that the likelihood of a Calvo-style bad equilibrium depends on three things: the size of the public debt, its maturity structure, and the time pattern of maturing debt. The logic, as explained above,

is that when a substantial amount of debt has to be serviced at a point in time, and if a confidence crisis breaks out at that moment, the Treasury would have to refinance a large portion of its debt on unfavorable terms.¹² The utility cost of doing so would be high, and thus the likelihood that the government will repudiate is greater. This makes the confidence crisis more likely to happen. They argue that under these circumstances, good debt management calls for the issuance of long-term indexed debt to push the economy to a good equilibrium, since such debt cannot be monetized away and does not create large short-run amortization obligations.

b. Short-term Debt and Monetary Policy

In addition to increasing vulnerability to debt runs, the sensitivity of the government's budget to changes in interest rates when it maintains a large stock of short-term debt can affect macroeconomic stability in more indirect ways. In particular, when the stock of interest rate-sensitive short-term debt is large and the government's solvency is precarious, the adoption of tight monetary policy carries the risk of triggering fiscal insolvency by increasing the government's debt servicing costs. Under these circumstances, therefore, the central bank will be constrained from adopting policies that it may otherwise have found necessary to stabilize the economy in response to shocks.

This is bad enough under floating exchange rates, since one of the virtues of adopting a floating exchange rate regime is to allow scope for an independent monetary policy in response to shocks that are asymmetric with those of a country's trading partners. This constraint essentially renders such scope asymmetric, permitting monetary policy to act when expansionary policies are called for, but not (or at least only to a limited extent) when contraction is indicated.

But under officially-determined exchange rates, this constraint can be a recipe for severe macroeconomic instability, by making the economy vulnerable to self-fulfilling currency crises. The logic of second-generation models of currency crises suggests that, in assessing the sustainability of an exchange rate peg, speculators evaluate the benefits and costs to the central bank of sustaining a high-interest rate defense of the exchange

¹²A crisis here could refer to fears either of repudiation or devaluation, since either would affect the return on domestic-currency debt.

rate peg. When speculators perceive that the costs to the central bank of sustaining a high interest rate defense exceed the benefits of sustaining the peg, they will judge the prospects for a successful attack to be good, and that will make an attack more likely. Since the vulnerability of the public sector's solvency to high interest rates is precisely the type of factor that would be perceived by the central bank as making the costs of sustaining a high interest rate defense unbearably high, the combination of a large stock of short-term debt with a precarious fiscal position greatly increases a country's vulnerability to a successful speculative attack.

This issue is of more than academic interest, since observers have judged it to have played a key role in some of the more important currency crises of the 1990s. In the Exchange Rate Mechanism (ERM) crisis of 1992, for example, the de-linking of the Italian *lira* from the ERM may partly have been induced by the recessionary conditions prevailing in the Italian economy at the time. However, the very large stock of Italian government debt and its sensitivity to market interest rates has been considered by many observers to have played a key role in the government's reluctance to raise interest rates to levels that would have been necessary to defend the *lira*. Similarly, in the 1999 Brazilian crisis, fiscal vulnerabilities associated with short-term government debt seem to have played an important role in inducing the government to float the *real*, despite the key role that the exchange rate peg had played in the *Real Plan*'s exchange rate-based inflation stabilization since 1994.

VI. DOMESTIC-CURRENCY VERSUS FOREIGN-CURRENCY DEBT

So far we have considered the choices between nominal and indexed debt, as well as between short-term and long-term nominal debt. In both cases, the analysis suggested that what was involved in these choices was a tradeoff of credibility against vulnerability. In the case of short-term debt, macroeconomic stability was also affected by the potential constraints imposed on an independent stabilization instrument, monetary policy.

This section turns to the choice between domestic-currency (i.e., nominal) debt and foreign-currency debt. As in the previous cases, the choice between domestic-currency and foreign-currency debt involves a tradeoff between credibility and vulnerability. Also, the type of vulnerability created is specific to the type of debt

instrument that is adopted to increase credibility. As in the case of short-term debt, the existence of a large stock of foreign-currency debt may impose constraints on the actions of the central bank when the government's solvency is at risk. But in this case the constraint is on exchange rate policy rather than on monetary policy. Finally, there is an interesting interaction between the analysis of the implications of short-term debt and those of foreign-currency debt. This section takes up each of these issues in turn. Since the basic analysis is by now familiar, the discussion can be brief.

a. Credibility vs. Vulnerability

As is true of indexed debt, the issuance of debt denominated in foreign currency can be used by the government as a tool to gain credibility, since such debt cannot be inflated away. However, the gain in credibility comes at a cost: the assumption by the government of exchange rate risk. An exchange rate depreciation triggered by independent events will increase the government's debt-servicing costs, and thus potentially subject the economy to undesirable fluctuations in distortionary taxes. The story, then, is the same as before. What changes in this case is the type of risk exposure absorbed by the government in its attempt to gain credibility. It is worth noting that, as in the case of indexed and short-term debt, foreign-currency debt is likely to be cheaper than domestic-currency debt, precisely because the government, and not its creditors, takes on the foreign-currency exposure and attendant risk. Thus, the objective of minimizing borrowing costs is likely to once again align itself with that of enhancing credibility to induce reliance on foreign-currency debt.

But how large is this particular type of risk exposure likely to be for the government? It is easy to see that the answer would tend to depend on the currency composition of the government's finances, on the probabilities associated with exchange-rate changes, and on the expected magnitude of such changes if they occur. Clearly, if the government holds a large stock of foreign-currency assets (e.g., foreign exchange reserves) or if a large part of its revenues are indexed to the exchange rate (e.g., the government derives substantial revenues from the country's export earnings); it can sustain a correspondingly large stock of foreign-currency debt without exposing itself to exchange-rate risk. Similarly, if the risk of exchange rate movements is slight (say because the government maintains a credible hard peg, or because the variety of possible

conditions that would render a self-fulfilling speculative attack more likely to succeed – such as a high degree of capital mobility – do not hold), then again the risk exposure associated with foreign currency debt may not be inordinately high.

b. Foreign-Currency Debt and Exchange Rate Policy

As mentioned previously, the presence of a large stock of foreign-currency debt is also likely to affect macroeconomic stability indirectly, through its effects on the actions of the central bank. Under floating exchange rates, this creates an asymmetry in the conduct of monetary policy, since the central bank is provided with an incentive to resist depreciation, but not appreciation of the currency. Under “soft” exchange rate pegs, on the other hand, the central bank’s exchange rate policy, not its monetary policy, is constrained when the stock of foreign-currency debt is high and the government’s solvency is precarious. Under these conditions, the central bank will have a strong incentive to avoid devaluation or a regime change that would result in a substantial depreciation of the currency. It is interesting to note that, while this may preclude an exchange rate adjustment when one is actually called for, thus undermining macroeconomic stability, it may also serve the role of making the economy less vulnerable to self-fulfilling crises, since speculators will know that the central bank will have a strong incentive to resist an attack.

Again, the issues discussed in this section have been of tremendous practical importance among developing countries. Fiscal vulnerability to exchange rate movements as a result of large stocks of foreign currency debt played a large role in generating the government insolvencies associated with the Latin American debt crisis of the 1980s. Additionally, some observers have also blamed a large stock of *contingent* government liabilities that were essentially indexed to the exchange rate for triggering the Asian crisis of 1997 (see Burnside, Eichenbaum, and Rebelo (1998)).

It is worth noting an important potential interaction between short-term debt and foreign-currency debt: the “debt run” outcome described in the last section as a potential risk incurred by the government by carrying large amounts of short-term debt may actually be much more likely when this debt is denominated in foreign exchange. To see why, notice that the government may always avoid defaulting on short-term debt

denominated in domestic currency in the event of a run by simply printing money, as long as it is willing to live with the resulting inflation. In other words, when short-term debt is denominated in domestic currency, the government at least has a choice between default and inflation. No such choice is available when the short-term debt is denominated in foreign exchange. Since the government cannot print foreign exchange, in this case if its liquid reserves are insufficient to pay off the creditors who “run,” it will face a choice only between resorting to distortionary taxation and defaulting.

VII. A CASE STUDY: MEXICO 1994

The issues discussed in the previous sections can be illustrated rather vividly in one of the most severe recent episodes of macroeconomic instability in emerging economies: the Mexican crisis of 1994-95. The story of Mexico's descent into financial vulnerability in 1994, culminating in a currency crisis at the end of the year and a sharp economic contraction in the following year, is by now well known. Mexico in fact had two crises at the end of 1994 and beginning of 1995, a garden variety balance of payments crisis at the end of 1994, and a public sector debt run in early 1995. The two phenomena were, of course, closely linked.

Mexico did not enter 1994 with a public sector solvency problem. By international standards, the stock of government debt outstanding was relatively small. Mexican public debt had been reduced from 67 percent of GDP in 1989 to a little over 30 percent in 1993. The reduction in the debt-GDP ratio was achieved in part through the use of privatization revenues to retire debt, and in part through operational surpluses on the fiscal accounts.¹³ Of the total public debt, about two-thirds was external (mostly long-term, as a result of the restructuring of the Brady Plan in 1989), and one-third domestic, with average maturity of about 200 days.

However, Mexico did enter 1994 with an exchange rate problem. Symptoms of overvaluation of the officially-determined exchange rate for the *peso* included a large cumulative real exchange rate appreciation in the early 1990s, a substantial current

¹³ Of US\$20.2 billion in privatization income obtained in 1991-92, no less than 60 percent was used to retire debt (Steiner 1995), and operational surpluses of 2-3 percent of GDP were achieved from 1990 to 1993.

account deficit, and slow economic growth. All of these made devaluation a possibility. The government had, in fact, depreciated the *peso* substantially in the context of a widened band adopted in November of 1991. The role of the exchange rate as a nominal anchor in the context of the Solidarity Pact and doubts about whether the observed real appreciation may have been an equilibrium phenomenon, however, made the authorities reluctant to undertake a discrete exchange rate adjustment. Three exogenous events in the first quarter of 1994 magnified the pressures in the foreign exchange market: an uprising in Chiapas province in January, the announcement of a tighter monetary policy by the U.S. Federal Reserve board in February, and the assassination of presidential candidate Luis Donaldo Colosio in March. These events intensified expectations of devaluation. The exchange rate moved to the top of its band in the first quarter of 1994, the central bank suffered a large reserve loss and, from March on, a large premium emerged on the domestic-currency denominated portion of the government's debt (CETES) over the dollar-denominated portion (TESOBONOS).

An exchange rate crisis materialized through the interaction of these expectations of devaluation with the perception that the government would be unwilling to mount a high interest rate defense of the currency. A sustained tight money defense did not seem likely because of a combination of ongoing recession (likely due to the perceived overvaluation itself), the poor state of the domestic financial system, and upcoming elections in the fall of 1994, which appeared to be much closer than they had been historically.

The government reacted to the emerging balance of payments crisis in two ways. First, it undertook sterilized intervention during the first quarter of the year, expanding the stock of credit to keep the monetary base relatively constant as foreign exchange reserves declined. Second, it shifted the composition of public debt from CETES to short-term TESOBONOS. The share of TESOBONOS in total debt rose from less than 5 percent at the beginning of 1994 to over 55 percent by the end of the year. The share of privately-held CETES, on the other hand, went from 60 percent of total debt in February to 20 percent by November. The government benefits of this debt transformation consisted, of course, of lower debt servicing costs, thus protecting the public sector's operational balance, but in view of the situation in the Mexican balance of payments at

the time, and the government's insistence that devaluation was not an option, there is every reason to believe that a desire to project credibility in order to counteract devaluation expectations played a role in the government's debt management decisions.¹⁴

The combination of deposit insurance and an officially-determined exchange rate in Mexico made the entire stock of M2 a potential dollar liability of the government, backed only by the stock of foreign exchange reserves. This precarious government liquidity position and consequent vulnerability to a confidence crisis were clearly magnified by debt management. By converting longer-term domestic-currency liabilities into short-term dollar liabilities, the Central Bank was essentially using (net) foreign exchange reserves to pay off those liabilities. By the time of the crisis in December 1994, M2 in US dollars amounted to \$110 billion (Calvo and Mendoza, 1996), and TESOBONOS maturing in early 1995 were another \$17.8 billion (Sachs, Tornell, and Velasco, 1995). Foreign exchange reserves at the end of October were \$17 billion, compared to a minimum level of \$10 billion targeted by the Central Bank. At this point the government's vulnerability to a liquidity crisis was severe. An attack merely awaited a coordinating mechanism.

The first attack came in mid-November, when reserves fell by \$5 billion. The coordinating mechanism was clear: the new administration took office on December 1, and markets anticipated that the outgoing administration would devalue as a present to the incoming one (by removing the onus for doing so from them). The attack was halted by a public statement by President-elect Zedillo supporting the Solidarity Pact. The new administration took office with reserves of \$12.5 billion. There obviously was not much room to maneuver. Markets suspected that the exchange rate was on the new administration's agenda, and a press leak to that effect led to large capital outflows.¹⁵ By December 20, after only 3 weeks in office, the new administration effectively devalued by raising the ceiling on the exchange rate band by 15 percent. This was not perceived as enough, and the crisis was on, resulting in a float on December 21.

¹⁴ Werner (1995) presents evidence that the government altered its mix of instruments in response to interest rate differentials.

¹⁵ As reported in the *New York Times*, March 2, 1995.

The interesting subsequent development for present purposes is that the immediate aftermath of the float was an increase in sovereign risk. Weekly TESOBONOS- US T-bill interest rate differentials began to climb steeply in the third week of December, rising from 1.7 percent in the second week of December to nearly 20 percent by end-January 1995. On the surface, this is a puzzle, for at least two reasons. First, given the Mexican government's low stock of debt and its fiscal track record, why should sovereign risk have been a problem? Second, why should sovereign risk *increase* after a devaluation? If an overvalued currency was the main obstacle to growth, as Dornbusch and Werner (1994) had previously suggested, one would have thought sovereign risk would have fallen as growth prospects improved, especially since a renewal of growth and a reduction of domestic interest rates would have improved the prospects of the domestic financial system.

One interpretation is that the premium reflected not a *solvency* problem, but *liquidity* risk, and that the latter must be related to the BOP crisis. What were the links? The BOP crisis made the public sector more vulnerable to a debt run by lengthening the maturity of its assets and shortening that of its liabilities. The asset structure was made less liquid through the loss of liquid foreign exchange reserves, which were replaced on the asset side of the Central Bank balance sheet by illiquid claims on development banks as a result of sterilization. On the liability side, the endogenous change in the maturity structure of government debt also made its liabilities more liquid. A bunching of maturing short-term debt in the first half of 1995 made a run more likely. Moreover, the change in the currency composition of debt magnified the size of the *peso* repayment obligations after the devaluation.

This leaves the question, however, of why creditors may have converged on the view that in the event of a public-sector debt run, default was a possibility. Faced with large short-term payment obligations, there are four things the government can do in the event of a debt run: (i) generate a fiscal surplus of sufficient size to service the debt; (ii) borrow from non-market sources; (iii) print money; (iv) default (by stretching out payments, etc.). To analyze what the government would have been likely to do, creditors would have had to look at both the feasibility and the consequences of each of these options. Since reserves were essentially depleted and official borrowing in sufficient

magnitude had not been arranged as of January, borrowing from non-market sources was problematic. On the other hand, because the payments due were large, the distortions that would have been associated with generating a fiscal surplus of sufficient size to service the debt (e.g., tax distortions, and an aggravated recession) as well as with printing money (in the form of increased inflation) would have been large. This left defaulting as a realistic possibility, triggering the debt run. The implications of the run were that the macroeconomic costs of the exchange rate adjustment were greatly magnified.

The combination of draconian fiscal adjustments under financial duress and very high domestic interest rates, combined with exchange rate overshooting as a result of the loss of confidence, resulted in a very severe recession in Mexico during 1995, despite the eventual resolution of the crisis through the provision of sufficient liquid official funds in March to pay off the government's liquid debt.

In short, it appears that inappropriate debt management was an important culprit in the 1994 Mexican crisis. The government's focus on reducing debt servicing costs and defending the credibility of its commitment to peg the value of the *peso* (within a band) caused it to adopt a high level of exposure to exchange rate and rollover risk. When an adjustment in the exchange rate could no longer be resisted, rollover risk increased sharply, and the "bad" equilibrium came to pass in early 1995. *Ex post*, at least, any marginal gains in credibility and reduced debt servicing costs that the government achieved in mid-1994 were clearly outweighed by the risk exposure it accepted in return.

VIII. GUIDELINES FOR PUBLIC SECTOR DEBT MANAGEMENT

What can we learn from theory and the Mexican experience about the management of the public debt in emerging economies? By way of summary and conclusion, this section will draw out some general principles suggested by theory and evidence.

The appropriate conduct of fiscal policy mandates that there will be times when, for tax-smoothing, countercyclical, or intergenerational equity reasons, it will be optimal for the government to borrow. Preserving this option requires that repudiation of the public debt be undertaken only when it does not permanently impair the government's

future capacity to borrow – i.e., only under exceptional circumstances that are clearly outside the government’s control, or in the context of a clearly-identified and credible regime change. This means that debt-service payments will inevitably exert a claim on the resources of most emerging-economy governments.

Because raising the resources to service debt is costly, and the marginal cost of doing so is likely to increase the larger the volume of resources that have to be raised, managing the composition of the debt with the objective of minimizing debt service costs is justifiable from the perspective of a welfare-maximizing government. However, a single-minded pursuit of this objective could be socially harmful, in the sense that it may imperil other, equally worthy, social objectives. Reliance on financial repression to reduce debt servicing costs is a clear example. The static and dynamic efficiency gains that are sacrificed when financial repression stunts the development of the domestic financial system suggest that socially this is an extremely harmful way for the government to reduce the costs of meeting its financing needs. The implication is that the government should finance itself by issuing securities that are sold on market terms. The objective of promoting financial development also suggests that the government should issue a diverse set of securities in order to facilitate information aggregation and dissemination in financial markets.

These broad principles, however, leave the optimal composition of this diverse set of securities unspecified. In principle such securities could be of varying maturities, and could be denominated in domestic currency or indexed to the domestic price level or to the exchange rate (i.e., denominated in foreign currency). An important consideration in making these choices concerns their impacts on the government’s credibility. Specifically, a government that lacks the ability to precommit its future actions (or those of its successors) will face a time-inconsistency problem that could be aggravated by the issuance of long-term nominal debt, since debt issued in that form essentially increases the base of the inflation tax. Such a government, therefore, may find it advantageous to issue debt in a form that is less susceptible to taxation through inflation – e.g., indexed debt, nominal debt with short maturities, or debt denominated in foreign exchange. Since these types of debt provide creditors with more information and control (in the case of short-term debt), or protect them from the risks of inflation or devaluation (indexed debt

and foreign-currency debt respectively), the objective of enhancing credibility is likely to dovetail with that of reducing the government's borrowing costs, as in the case of Mexico.

However, the reduction in borrowing costs and enhancement of credibility come at a price: that of increasing the government's vulnerability to price level increases, real interest rate shocks, or exchange rate shocks. Moreover, when the government's solvency is at issue, excessive reliance on short-term debt or foreign-currency debt may severely constrain the actions of the central bank. Thus, the question becomes how to optimize these tradeoffs.

The answer is, of course, a careful calculation of the benefits and costs associated with each option under a country's particular circumstances. For example, the credibility gains to the government from avoiding the issuance of long-term nominal debt may be significant only when the government otherwise lacks the ability to commit itself credibly not to inflate such debt away. When will this be so? The government will lack anti-inflationary credibility when it actually retains the discretion to use the inflation tax, when it lacks credibility on other grounds (e.g., when it has not previously invested in a reputation for resisting incentives to act in a discretionary fashion), and when its revenue needs are high and conventional taxation is highly distortionary. In combination with a large stock of nominal long-term debt, these factors would make a high-inflation discretionary outcome likely, and thus a government with these characteristics that wants to achieve a low-inflation outcome in the future would have a strong incentive *not* to issue long-term nominal debt.¹⁶

In other words, the existence of long-term nominal debt is only one factor in the government's decision to devalue or inflate. Creditors can rationally expect the government to forgo the option to inflate away the real value of their assets if the government is institutionally unable to do so, if it is perceived as placing a high value on the credibility of its policy announcements, and/or if inflating creates few net benefits from the government's perspective, because the conventional taxes that are avoided by

¹⁶ The international evidence suggests, in fact, that governments are indeed reluctant to issue long-term nominal debt when they lack credibility. For an application in the context of inflation stabilization, see Missale, Giavazzi, and Benigno (1997).

using the inflation tax are not highly distortionary. Thus, a government can expect to achieve few credibility benefits from avoiding long-term nominal debt if it has previously created institutions that limit its inflationary discretion (e.g., by increasing the independence of the central bank), if it has established a reputation for nondiscretionary behavior, and if it has chosen levels of expenditure and has mobilized sources of taxation that tend to minimize distortions.¹⁷ Because the additional credibility gains achievable by foregoing long-term nominal debt would tend to be small under these circumstances, avoiding vulnerability becomes relatively more important. Thus, optimal debt management would suggest heavy reliance on long-term nominal debt.

If these conditions do not hold, then optimal debt composition shifts toward indexed, short-term, or foreign-currency debt. How should governments choose among these as credibility-enhancing devices?

The arguments presented in Section V suggest that short-term debt may have important deficiencies in this respect because it may be vulnerable to the inflation tax, may give rise to multiple equilibria, and makes the government vulnerable to real interest rate and rollover risk. Thus, it is hard to make a strong case for short-term debt as a credibility-enhancing device when other means to enhance credibility are available. But short-term debt is preferred by creditors who face information asymmetry and moral hazard problems, so the best case for the government's liability portfolio to incorporate short-term debt is to enable the domestic financial market to accumulate and disseminate information about the risk-free interest rate. In this role, however, the magnitude of short-term debt should be limited to a size that does not jeopardize the government's solvency in the event of a spike in interest rates and does not excessively expose the government to rollover risk. The former will obviously depend on the strength of the government's finances, while the latter will depend on its ability to avoid "bunching" in short-term debt maturities, on its capacity to repay the principal on short-term debt out of liquid assets or current revenues, and on its access to quickly-disbursing and sufficiently sizable non-market sources of short-term finance.

¹⁷ When credibility problems become extreme, the government's financing problems may become sufficiently severe as to warrant the adoption of institutional devices that greatly circumscribe the government's freedom of action -- i.e., adopting a currency board or joining a currency union.

These arguments suggest that the brunt of the credibility-enhancing burden (if one exists) should fall on long-term indexed and foreign currency debt. Assuming they are both equally effective in enhancing credibility, the question becomes which of the two minimizes the government's vulnerability to unexpected shocks. The currency composition of the government's financial assets and budget plays an important role in this regard. If the government has minimal foreign currency assets and its revenues are not particularly sensitive to exchange rate changes, then incurring a substantial amount of foreign currency debt would create a currency mismatch in the government's comprehensive balance sheet that would leave it heavily exposed to exchange rate risk. The possibility of such mismatches is likely to make the government's net worth substantially more sensitive to changes in the exchange rate than to changes in the price level, and coupled with the likelihood that nominal exchange rates are likely to fluctuate more than the average price level, particularly in emerging economies maintaining a floating exchange rate, the use of foreign currency-denominated debt instead of indexed debt as a credibility-enhancing device is likely to have relatively larger impacts on the government's vulnerability to shocks. If so, then for governments that lack anti-inflationary credibility, long-term indexed debt would appear to dominate foreign-currency debt as a credibility-enhancing device.

In short, the optimal composition of the government's debt depends on a country's circumstances. While governments should generally finance themselves at market rates using a variety of securities, the optimal composition of those securities should be heavily weighted toward long-term nominal debt for governments that have anti-inflationary credibility, and toward long-term indexed debt for those that do not.

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