Anton V. Serikov

The Problem of Debt Overhand and How to Deal With It

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Department of Economics

Abstract

Debt overhang in developing economies is an issue that must be addressed in order for these economies to grow. A debt burden that is high relative to the economy's output results in a low credit rating by the rating agencies, which in turn leads to a higher price on further borrowing by the affected countries. Several remedies have been proposed (and used in practice) to resolve the problem of debt overhang. The purpose of this paper is to examine the proposed remedies with an emphasis placed on debt buybacks in the context of the existing models, as well as to attempt to add on to these existing models.

Introduction

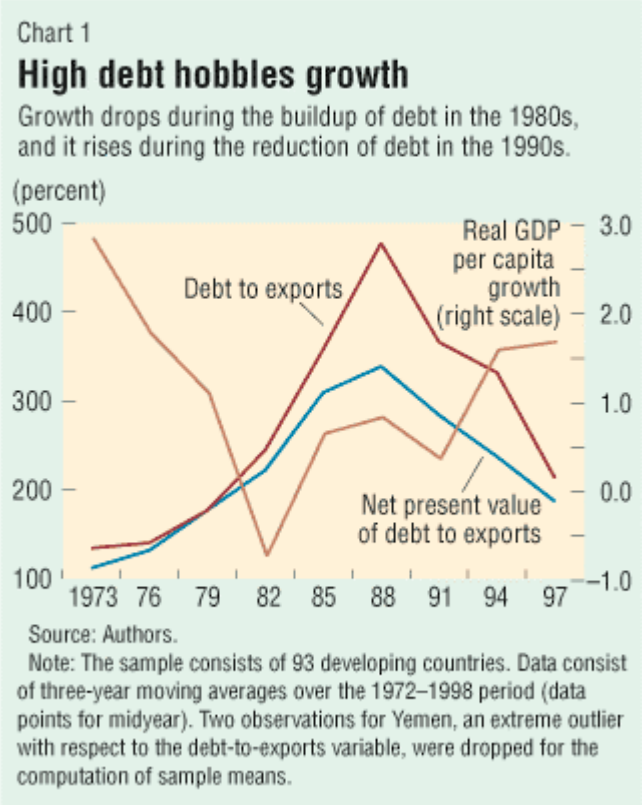
A high debt burden generally means that a significant portion of government revenue must be devoted to debt servicing. Once options for short-term increases in revenue have been exhausted, other areas of government spending must shrink to accommodate debt servicing. One area of spending likely to be reduced is public investment expenditure. Reduced public investment can ultimately lead to lower growth rates in the following ways:

i. A reduction in total investment (since public investment is often a significant proportion of gross domestic investment);

ii. A reduction in private investment, because some private investment is complementary to public investment (Diaz-Alejandro, 1981)

iii. A fall in the productivity of investment because of lost externalities from certain types of public investment (such as physical infrastructure).

This relationship between the debt burden and growth, intermediated through the fiscal account, is called the “crowding out” effect (Serieux and Samy, 2001). The costs of debt overhang provide the basis for the necessity of a relief from it. The fact that high indebtedness is a problem that needs to be addressed is not a secret. Pattillo, Poirson, and Ricci (2002) examined the effect of foreign debt reduction on economic growth and concluded that this effect was significant. Their results are summarized in the following graph.



Patillo et al. argue that their study empirically shows that reducing foreign debt burden of highly impoverished countries (HIPCs) leads to increased economic growth of these countries. Although the above graph cannot stand as evidence that eliminating debt results in higher growth and not vice versa, Patillo et al. note that there appears to be a growth differential of about 2% between HIPCs and countries with little debt (more than

95% of GDS and less than 95% of GDP, respectively). Thus, debt overhang seems to be an important factor in a given economy's growth.

In this paper I will discuss several schemes that could reduce debt overhang and bring about economic revitalization of the debtor. Particular emphasis will be placed on debt buybacks. Literature on debt buybacks varies significantly, and due to the difficulty of reliably quantifying costs of default, mathematical treatments such as the one by Bulow and Rogoff (1988) predict that buybacks, although beneficial for the creditors, are not in the debtor's interest. This paper will attempt to show that at least under some circumstances, debt buybacks might, indeed, be beneficial for the debtor and in certain cases maybe the only plausible solution to the overhang problem.

Debt Rescheduling (Refinance) Schemes

Of the several ways to deal with the problem of debt overhang discussed below, debt rescheduling is the least promising. In fact, it is little more than window dressing used to mask the problem and postpone the inevitable (default) as long as possible (Sachs, 1989). Costs of such a postponement include withholding of new loans to finance good investment opportunities that end up being passed up, as well as the debtor engaging in risky ventures with high risk of default in an attempt to either succeed and enable itself to payoff the debt, or fail, thereby bringing on the inevitable default. It is the creditors and not the equity holders who stand to gain from the returns to a new investment. Indeed, the shareholders (in our case the sovereign debtor) can only benefit if the investment has a very high rate of return that re-establishes the firm (country's) solvency. Thus, the shareholders will prefer highly risky investments that offer at least a small chance of a very large payoff. By undertaking a risky investment, the shareholders

gain a small chance at re-establishing the value of their claims, while they impose a high expected cost on the creditors, who will suffer in the likely event that the risky investment flops. For these reasons, it is unlikely that existing creditors will be willing to make new loans to an insolvent debtor, unless the creditors are able to achieve some management control over the choice of investment projects.

Debt Forgiveness and the Debt Laffer Curve

A much more attractive and real solution is debt forgiveness. If the debtor nation can convince its creditors that forgiving some of its debt is beneficial not only for itself, but also for the creditors, then it can reduce debt overhang and negate some of its negative effects on the debtor's economy. "Most of the inefficiencies of a debt overhang can be relieved by partial debt forgiveness. Importantly, since debt forgiveness overcomes economic inefficiencies that hamper the growth of the debtor, it is not surprising that debt forgiveness can be designed in such a way as to improve the position of both the creditors and the debtors" (Sachs, 1989). For an economy facing severe debt overhang, partial debt forgiveness can actually lead to an increase in eventual payments to the creditors by facilitating a higher rate of growth. The proposition that collective debt relief can benefit both the debtor economy as well as the creditors, was illustrated through a simple two-period model by Jeffrey Sachs (1989). First, it is assumed that the debtor economy is a two period function:

$$U = (C_1) + bU(C_2)$$

We assume that *n* number of creditors, where *n* is large, are owed a total debt in the amount of T. The debtor can voluntarily make a schedule payment in the amount of *S*, or, if it fails to do so, creditors can force it to pay an amount *P* by seizing its assets,

lawsuits, and other collection activities. Sachs notes that these collection activities are generally inefficient as they impose costs on the debtor that are much greater than what the creditors actually collect. It is assumed that the debtor is willing to pay its debts up to a fraction z of the second-period output Q_2. If the debt payment due is less than zQ_2, then the debtor satisfies its obligation. If the payment due is more than the zQ_2, then the debtor pays up to that amount and partially defaults on the rest. In our notation T = payment due and S = actual amount paid, so:

$$S = T \quad \text{if} \quad T \leq zQ_2$$

$$S = zQ_2 \quad \text{if} \quad T > zQ_2$$

The final assumption of this model is that the repayment S is divided among the creditors in proportion to their individual exposure. To study the behavior in the simplest way, a two-period set up is assumed, where the debtor enters the first period with an amount of debt due in the second period equal to D.

The economy's production technology is given by:

$$Q_1 = F(K_2)$$

$$Q_2 = F(K_2)$$

$$K_2 = K_1 + I_1$$

With the usual assumptions that F' > 0 and F" < 0.

The country may be able to attract new loans in period 1. The principal due on such loans will be denoted as D_1. New creditors will only be willing to lend if they will be repaid fully, with the world interest rate r, or $(1 + r)D_1$, in the second period. Since the total debt T due at the end of the second period will be $D_1 (1 + r) + R$, where R is the

amount due from the original creditors. The lending from new creditors will be limited by:

$$D_1 (1 + r) < zQ_2 - R$$

As long as the above equation holds, the new creditors will be fully repaid. The original creditors, with claim D, may agree to change D to some amount R < D. If they do not do so, then the debt due in period 2 remains D. The goal of the creditors is to maximize their ultimate repayment, which is given by $S - (1 + r) D_1$, where S is the total repayment that the debtor can afford and $(1 + r) D_1$ is the payment to first period lenders that expect full repayment. The creditors problem can be restated as:

$$\max_R S - (1+r)D_1 \qquad \text{subject to R < D}$$

The debtor has the choice of investment, consumption, and perhaps new borrowing, in the first period. The balance of payments constraint is:

$$D_1 = I_1 + C_1 - Q_1$$

Once the level of second-period debt R is decided by the original creditors, the debtor maximizes its utility. Let us now assume that the original debt D is so high that no new loans are forthcoming. If the creditors do not forgive any portion of the debt, part of the debt D will be defaulted in period 2. To choose the optimal level of investment I1 and thereby the amount of debt to be repaid, the debtor solves the following problem:

$$\max U(C_1) + bU(C_2)$$

Such that $C_1 F(K_1) - I_1$

$$C_2 = F(K_1 + I_1) - S$$

Given that S = zQ_2, we can also write $C_2 = (1-z)F(K_1+1)$. The interior solution obtained is:

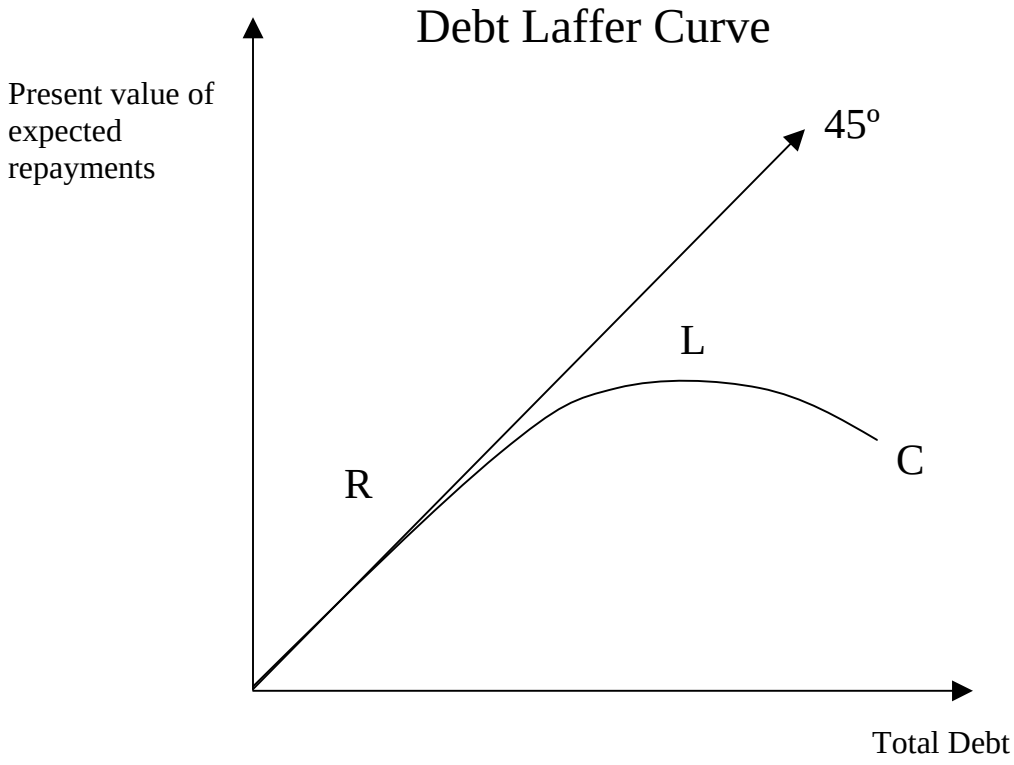
$$U'(C_1) = (1-z)F'(K_1 + I_1)bU'(C_2)$$

And by assumption, debt repayments equal $zF(K_1 + I_1)$ are less than D. The actual debt repayments are denoted as $\hat{S}$. From the above we can see that the creditors can forgive part of the debt and receive the same amount of repayments they would have received in the absence of debt forgiveness. If this is done, however, the debtor is left better off. Alternatively, the creditors can choose to forgive a portion of the debt such that they would receive slightly more then they would have if none was forgiven while the debtor is left indifferent (or better off depending on how much is forgiven). The debtor would face the same maximization problem as above, but with $\hat{S}$ replacing S. It is not hard to show that if this is done, investment will be higher. Since I_1 is higher, Q_2 is higher as well. Writing down the debt to a level slightly above $\hat{S}$ would leave both the creditors and the debtor better off.

What is happening is that with debt overhang, debt acts like a distortionary tax. "Since the debtor pays a fraction of income z to its creditors, any increase in output is taxed at the marginal rate z when viewed from the debtor's perspective" (Sachs, 1989). Given this tax rate, the levels of investment are chosen according to the maximization problem above. By writing down the debt to a level that can actually be repaid, debt is turned into a lump-sum burden rather than a marginal tax. Doing so removes the disincentive placed upon investing when debt acts as the marginal tax. Krugman (1988a, 1988b) also holds that when a country's obligations exceed the amount it is likely to be able to pay, the debt acts like a high marginal tax on the debtor. This is so because if the

debtor does better than expected the main benefits will accrue not to the debtor but to its creditors. This is highly similar to the argument presented by Sachs and discussed above.

Krugman goes on to say that "… the burden of national debt will fall on domestic residents through taxation, and importantly through taxation of capital; so the overhang of debt acts as a deterrent to investment (Krugman, 1988b)." He seconds Sach's opinion that debt collection activities are inefficient in that the creditors receive less than what the debtor ends up losing due to these activities and attributes that to the lack of bankruptcy proceedings for sovereign debt. He summarizes the argument presented by the Debt Laffer Curve very neatly: "The upshot of these negative effects is that the higher is the external debt of a country, the larger the probability of nonpayment; and thus the greater the subjective discount on that debt. If debt is high enough, further increases in the level of debt may actually lead to a smaller expected value of payments (Krugman, 1988b)."



The horizontal axis of the above diagram depicts the level of debt while the vertical axis shows the present market value of debt. This market value tends to be less than the face value because of the risk associated with the default probability of the debtor. For low levels of debt (from origin to R) the probability of default is deemed as low so the market value is equivalent to face value (depending on market circumstances, interest rate r on debt in question and probability of default close to, or at 0, market value can actually exceed face value). As the level of debt grows the probability of default increases and the expected repayment curve (C) falls increasingly below the 45° line that represents complete repayment. Beyond the breakeven point L the negative effects of the debt burden begin to strangle economic growth of the debtor and the market value of all debt falls as new debt is accumulated. This is the debt overhang effect and it is readily visible from the diagram that reducing (forgiving) a country's debt up to the point L would actually increase the market value of creditors' claims on the debtor.

Problems with Debt Forgiveness

However, debt forgiveness as a remedy does face some obstacles. First and foremost, it may not be easy to convince creditors to forgive some of their claims on the debtor not because the creditors don't understand the economic logic laid out above, but because forgiving the debt, or a portion of it, would set a precedent and create a moral hazard. The argument that Sachs lays out is purely an ex-post analysis of the "what if" variety. The anticipation of possible forgiveness has the effect of weakening any contract the parties could have made ex-ante. In other words, developing economies may come to expect to have a portion of their debt forgiven if they face a severe debt overhang, and it might induce them to borrow at such levels (or to underinvest if the creditors decide not

to give new loans) that would create the overhang only to have some of the debt forgiven. Another issue facing debt forgiveness as a solution is that no one economic agent or entity is holding the debt. As mentioned above, many creditors numbering *n* hold total debt T. In fact, some of the LDC debt has been reissued and bundled in various forms and is currently traded on secondary markets. Convincing one creditor to forgive some of the debt would be impossible since they would most likely point the finger at the next guy. It would be to the benefit of a creditor, holding a small amount of debt, to wait and see if other creditors, especially those with bigger claims, would forgive some of it. If this happens, the small creditor stands to gain, as the market value of his or her debt would increase. Depending on the level of its exposure, it might be advantageous for a small creditor to hedge his or her bets in such a way and attempt to free-ride.

Debt Buybacks and the Bulow and Rogoff Arguement

In the event that the creditors refuse to be benevolent and do not forgive any of the debt, it maybe to the debtor's advantage to repurchase some of its debts on secondary markets. The discussion of the possibility of debt buybacks assumes that the country has some foreign exchange reserves available. If there are no reserves available then the only mechanism of self-help from debt would be trying to convince creditors to buy into some kind of an exit-bond scheme, promising the new issues seniority. This is not very likely to work as the debtor is likely to be regarded as not very creditworthy and few, if any creditors, would be willing to accept such a scenario. Certain models predict that buying the debt would not be beneficial since most, if not all, of the debtor economy's gains from debt reductions will go to the creditors. Bulow and Rogoff (1988) made use of the

debt Laffer curve to support just such an assertion. Mathematically, their arguement can be represented as follows:

One agent *($\beta = 1$)* and we assume that *$1/(1 + r) = 1$*, therefore *$r = 0$*

Debt level = D, and agent repays *$D_2=(1+ r)D_2$*

Initial level of capital, *$K_1 = 0$*

Agent is risk neutral, therefore *$U = C_1 + E(C_2)$*

Output in the second period $Y_2 = \tilde{A}F(I)$ where $\tilde{A}$ is the productivity factor

Notation:

η - share of output that can be seized (> 0)

Therefore, $\eta(\tilde{A}) \bullet F(I)$ is the amount of goods produced that can be seized.

Consumption = $C_1 = Y_1 - I_1 = Y_1 - K_2$

Consumption in second period = $C_2 = (\tilde{A}F(I) - \textit{payments to abroad})$

Payments to abroad:

- if default, then: $\eta \cdot \tilde{A}F(I)$
- if no default, then: *D*
- Agent will choose to pay

$$\min\{\eta\tilde{A}F(I), D\}$$

- So the borrower's problem is

$$\max_{C,K_2} C_1 + E(C_2)$$

that is:

$$\max_{C,K_2} \bar{Y}_1 - K_2 + E[\tilde{A}F(K_2 - \min\{\eta\tilde{A}F(K_2), D\}]$$

Case 1: Default, end up paying

$$\eta\tilde{A}F(K_2) \text{ if } \tilde{A} < \frac{D}{\eta F(K_2)}$$

Case 2: No Default, end up paying

$$D \text{ if } \tilde{A} \geq \frac{D}{\eta F(K_2)}$$

Rewrite the equation as:

$$E_a[\min\{\bullet\}] = \int_{A=0}^{\frac{D}{\eta F(K_2)}} \eta\tilde{A}F(K_2)d\tilde{A} + D\int_{\frac{D}{\eta F(K_2)}}^{\tilde{A}} d\tilde{A}$$

$$\eta F(K_2)\underbrace{\int_{\tilde{A}}^{\frac{D}{\eta F(K_2)}} \tilde{A}\cdot d\tilde{A}}_{E[\tilde{A}\left|\tilde{A}<\frac{D}{\eta F(K_2)}\right.]} + D\underbrace{\int_{\frac{D}{\eta F(K_2)}}^{\tilde{A}} 1\cdot d\tilde{A}}_{\Pr(\tilde{A}\geq\frac{D}{\eta F(K_2)})}$$

So, again

$$\max_{K_1} \bar{Y}_1 - K_2 + E_a[\tilde{A}]F(K_2) - E_a[\min\{\bullet\}]$$

In first best, where the borrower repays with certainty and no default occurs,

$$F.O.C. = -1 + E_a[\tilde{A}] \cdot F'(K_2) = 0$$

However, when the borrower considers the possibility of default and rationally accounts for the fact that higher investment will mean a higher chance of no default,

$$F.O.C. = -1 + E_a[\tilde{A}] \cdot F'(K_2) - \frac{d}{dK_2} E_a[\min\{\bullet\}]$$

And the market value of debt can be written as:

$$V(D) = E_a[\min\{\eta\tilde{A}F(K^*_2), D\}]$$

where K* is a function of D, and the higher the D, the less is K. According to the logic that this argument dictates, the buybacks are not beneficial. This is because as debt is bought back, the market price and value of debt increases if the debtor is in the overhang part of the Debt Laffer curve.

Rationale for Debt Buybacks

However, such an argument makes several important assumptions that do not necessarily hold up. First and foremost it assumes that secondary markets are efficient and any given economy's debt is priced according to the risk factors associated with that

economy. Such an assumption need not hold up in practice since information available to the debtors about their own economy is not necessarily the same as that available to the creditors or potential buyers of debt on secondary markets (since these are the ones that determine a given economy's debt's market price by either demanding it or not demanding it at the current price level). Creditors have differing preferences when it comes to their exposure to debt of a particular country. Some creditors may opt to liquidate or at least decrease their exposure, even if that means selling off their claims at a substantial discount. Other creditors may be more optimistic in their outlook of the debtor's prospects, or they may chose to improve their chances of repayment by providing liquidity relief instead of debt relief.

Bulow and Rogoff argue that the average cost of debt, which is what they say a debtor must pay to buy back its debt (which would be given by a line from the origin to point L on the DLC graph) exceeds the benefits received by the debtor. The marginal cost of debt, given by the slope of the C curve is the saving of debt service and is equal to zero at point L. This means that all of the benefits of the buyback accrue to the creditor, while the debtor has benefits less than the cost at any point to the right or point R. Mathematically this can be represented as follows:

The market price of debt can be written as:

$$p \equiv \frac{V(D, K_2)}{D},$$

and the borrower's indirect utility is:

$$\max_{Q} U_1 = \max_{Q} Y_1 - pQ - \delta K_2(D-Q) + E[A]F(K_2) - V(D-Q, K_2(D-Q))$$

$$\left.\frac{dU_1}{dQ}\right|_{Q=0} = -\frac{\eta F(K_2)}{D} E[A \mid A < \frac{D}{\eta F(K_2)}] < 0$$

According to this logic the borrower has no gains from the reduction of debt as they go to the creditors. It must be conceded that this is a possible outcome but this analysis abstracts from the incentive effects and the differing views of the many creditors discussed above. Buying the debt back first from pessimistic creditors rather then at random would enable debtors to get a prices somewhere between the average and the marginal price. Bulow and Rogoff point to the Bolivian buybacks as evidence of the correctness of their assertions. In the case of Bolivia, a buyback resulted in the market price of debt rising from 6 cents on the dollar to 11 cents, leaving the total market value of debt outstanding virtually unchanged from before the buyback. However, Williamson (1988) interprets this in a different way, he holds that the buyback resulted in the elimination of the most pessimistic of creditors which in and of itself is advantageous for Bolivia because by advancing the date and reducing the cost of resuming payment, the buyback enabled Bolivia to reduce some of the negative incentive effects already mentioned and invest in a more sensible fashion.

A modified version of an arithmetical example presented in Krugman (1988b) is given by Williamson (1988) to demonstrate the above proposition. Consider a country that has foreign exchange reserve of 10 and debt service of 100 coming due in the following period. Assume that the country can only face two possible outcomes; good and bad. In a good outcome, the debtor will be able to generate a surplus of 80 while in a

bad outcome it will only be able to generate 20. Further suppose that pessimists who attach 2/3 probability to the bad outcome and 1/3 to the good, hold 20% of the claims. The remaining 80% of the claims are held by the optimists who believe that the probability of a good outcome is 2/3, while the bad only 1/3. In case of no debt buyback, 30 will be available to the debtor for debt service in case of a bad outcome, and 90 in case of a good outcome (debtor is assumed to retain its initial foreign reserves). Assuming that investors are risk neutral, the pessimists will value their claims at:

$$\frac{2}{3}(30)+\frac{1}{3}(90)=50$$

while the optimists will value their claims at:

$$\frac{1}{3}(30)+(\frac{2}{3})(90)=70$$

Now suppose that the debtor uses its foreign reserves of 10 to buy back 20 of the debt held by the pessimists (plus some incentive amount to persuade the pessimists to sell). If this occurs, then in the bad scenario, the creditors that did not sell out will get 20 while in the good scenario they will get 80 which would be full debt service because 20 of the debt had already been retired with the buyback. So the remaining 80% of the debt will be valued at:

$$[(\frac{1}{3})20+(\frac{2}{3})80]/(0.8)=75$$

Thus the valuation of debt has improved by 5 (minus the incentive that had to be used to persuade the pessimists to sell). What has occurred is the debtor was able to buy out the pessimists at a price that it, as well as the more optimistic creditors, believes to be

unrealistically low. At this point the reader might think that it makes no sense that the price would be different for pessimistic and optimistic creditors as those could trade between themselves and thus bring the price to equilibrium. This could very well happen if the optimistic creditors had unlimited resources and were unconcerned of where they were funneling those resources. However, as discussed below, optimistic creditors are unable to do so because increasing exposure to Latin America would not go over well on Wall Street (at least in the 1980s). Creditors from different nations may also face differing regulations on where and how much they can lend, thus making it impossible for them to increase their exposure even if they saw such a move as desirable given current market prices. If we take into consideration the incentive effects described above, we can see that it is not only the remaining creditors that gain, but also the debtor as it moves to the left on its debt overhang curve (C).

The willingness of some creditors to sell at a certain price does not say much about the valuation of debt by other creditors nor by the debtor itself. Williamson, in presenting an analysis of the Mexican situation discussed further below, writes: “It is difficult to imagine that most banks anticipate receiving on average (after netting out new money) only 50% of the interest owed by Mexico, but that is what is implied by the recent price of Mexican debt.”

If the efficient pricing assumption turns out to be incorrect, then the equation identifying market value of debt as

$$V(D, K_2) = E[\min\{\eta AF(K_2), D\}]$$

Need not hold, and consequently, the equation for market price of debt

$$p = V(D, K_2)/D$$

need not hold either. In fact, various Latin American countries' debt has traded at a deep discount (e.g. Mexican debt at the late 80s traded at a 50% discount despite Mexico having serviced its debt faithfully since 1983 and despite the substantial amount of foreign reserves Mexico had built up leading up to that point (Williamson 1988)). Such heavy discounts on sovereign debt exist because the market judges that the possibility of default warrants deep discounts. However, there is a type of investor called value investor (pioneered by Benjamin Graham and perfected by Warren Buffet) that bets on the market being overly pessimistic and in general not highly efficient. Considering the success of Mr. Buffet in the public equity markets, it would be unreasonable to argue that his view of the markets is completely wrong. If public equity markets can be off target often enough for Berkshire Hathaway (Mr. Buffet's firm) to make hundreds of billions of dollars, it is not hard to imagine that the same could be true of the markets were external debt is traded.

Creditors' Perspective

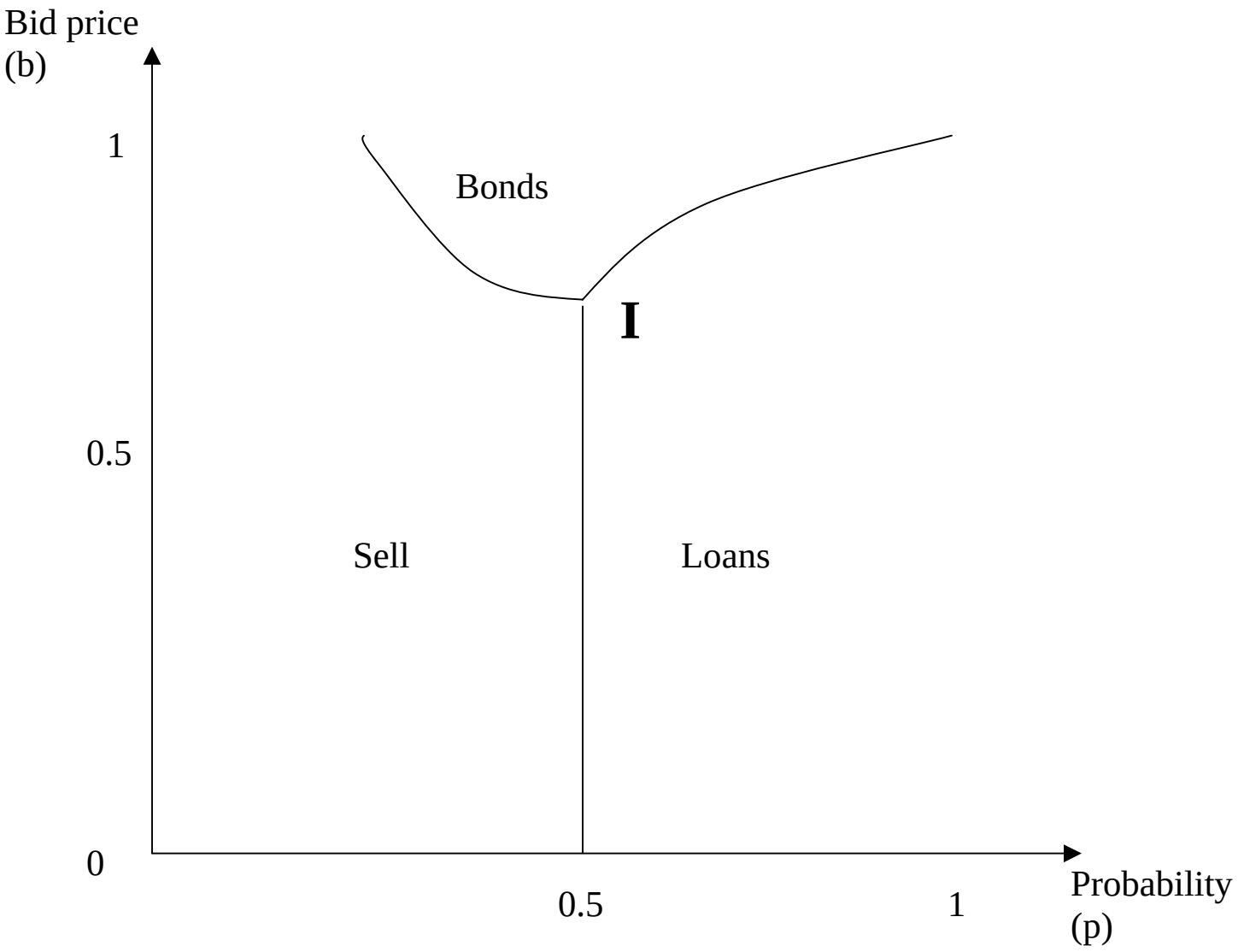
How could it be that secondary market prices for LDC debt are below their real worth? According to Williamson (1988) there are several reasons. This is so because some banks value their positions more so then others for a variety of reasons. One arises from the fact that managerial costs associated with lending can be quite hefty. The cost of reviewing and processing legal documentation associated with lending to sovereigns is much the same regardless of the level of exposure. Thus creditors with small exposure might have a strong incentive to sell off even if doing so would mean selling at a discount even if these discounts are very steep. Debtor relations are also an important factor. Some creditors may be heavily committed to maintaining relationships with certain debtors.

Such creditors may be more reluctant to liquidate their exposure as doing so might harm the relationship they have with the debtor government (and negatively affect seniority for any future repayments). Seniority is a very good bargaining chip for the debtor. A debtor may be able to be able to lower the price of the debt he wishes to buy back by threatening an optimistic creditor that currently is in a position of high seniority with low seniorit in case of a default. Such a threat may very well turn such a creditor into a pessimistic one, willing to sell his debt at a discount. Another important factor is the country in which any given creditor bank is domiciled. Individual country provisions for tax deductions as well as reserve requirements differ widely and the differences in these provisions could give some banks stronger incentives to sell off or limit their exposure then to other banks. Individual creditor positions may also be important. Some may have adequate reserves while others may be constrained from action that would weaken their balance sheets, regardless of how rational such an action may appear to be.

If this were the case then economists would argue that those banks that value LDC debt more then others would simply buy it up on the secondary market. The reason this has not happened is because even though some banks see the value of their claims as being worth more then the secondary market price would imply, their exposure to LDC debt is such that they are unable or unwilling to increase it beyond what it already is. Another reason could be a fear that claims bought on the secondary market would appear less important than the original loans, possibly undermining the willingness of the debtor to make the sacrifices necessary to maintain debt servicing (Rotberg, 1988).

The creditors face a number of choices when it comes to dealing with their exposure. Their choices are between holding on to swap into principal-collaterized bonds

(assuming those are offered), holding onto to their claims or selling their claims on the secondary market at whatever is the going rate at that time. Their choices are represented by the following graph:



The vertical axis represents the bid price for a loan/bond swap or the cents on the dollar at which a creditor would offer to swap its existing claims for some new issue involving collateral and higher seniority. The horizontal axis is the probability that the creditor attaches to the loan ever being repaid, in other words, this is the inverse of the probability of default. According to Williamson, the choice between holding on to claims versus selling them on the secondary market, does not depend on *b*, and that is why the boundary between the two alternatives is a vertical line at the probability *p* equal to the price on the secondary market. This assumption may be too simplistic, however, as when the secondary market price of Mexican debt was 50 cents on the dollar, many of the creditors held onto their claims instead of selling them, indicating that many thought their claims worth more then the market price indicated.

If the debtor offers a swap into collaterized bonds at a sufficiently good rate then creditors may very well prefer such a deal to either selling or holding on to their claims. Further more, if the debtor promises to make the new issues senior to that of existing debt, this will expand the area where bonds dominate in our graph by lowering the intersection point *I*. Williamson explains the implications of the model in the following way: “If the interest rate were identical on the defeased bonds and on the old loans, the vertical coordinate (b) would be identical to the horizontal coordinate (p). When, as in the Mexican scheme, the interest rate on bonds is higher than that on loans, it would actually pay a bank to bid a price (b) *lower* than that at which it could sell on the secondary market in order to switch into bonds.

How good of a benefit a debtor can obtain depends on how low a bid price it can get from the creditors who are wishing to get rid of their claim. The interest spread of the

new issue as opposed to the old debt also determines how much the debtor gains. In contrast, the option of the buyback tends to appear more attractive to the debtor the lower the market price of its debt on the secondary market.

Mexico, defeasance versus Buybacks

In analyzing the Mexican defeasance scheme of the late 1980's, Williamson argues that the funds used for the purposes of the scheme would have given greater returns to Mexico had Mexico used them for a buyback at the market price of 50 cents on the dollar. He argues that using the $0.2 billion of reserves to buy back the debt would have led to cash flow savings C_s equivalent to:

$$Cs = \$(0.2i / s - 0.2u)billion$$

where *u* is the US interest rate, *I* is the interest rate Mexico paid on the existing debt, and *s* being the current price (at the time of the scheme) of Mexican debt on the secondary market. Given the value of these variable at the time, Mexico would have realized $19 million per year savings from interest had it used its funds for a buyback as opposed to $13 million it obtained from the defeasance scheme.

However, it is important to point out that the defeasance scheme involves a substantial reduction in principal due at the time of maturity, this particular scheme would have brought $1 billion in principal reduction versus the $0.4 billion that could have been achieved with a buyback. An analysis of what would have resulted in the greatest savings for Mexico would have to compare the relative benefits of greater interest savings under buybacks and the greater principal reduction under swaps. In order to perform such a comparison, Williamson introduces a rate *d* at which Mexico discounts future foreign exchange reserves. The discount rate that would equate the two alternatives

is 14 percent per year. For anything lower then this, defeasance would be preferable, for anything higher, buybacks. Even though a figure of 10 percent is often used as a social-discount rate, Williamson argues that such a figure is too low for a country like Mexico that is undertaking a program to improve its balance of payments and expects foreign exchange to become less of a constraint over time. He argues that 15 percent is more likely the correct discount rate *d* applicable to this case. In addition to the discount rate *d*, a buyback would also be attractive from the standpoint of incentives, as discussed above. However, if it turns out the social discount rate is indeed lower then the 14 percent break even point, it is necessary to point out that the defeasance scheme is itself a "buyback in disguise" (Rotemberg, 1991) as it involves the use of a debtor's foreign exchange reserves for a reduction of that debtor's obligations.

Accounting for Default Costs

Another problem with the Bulow and Rogoff model discussed above is that costs of default are not assessed properly since the model assumes that the world ends at the end of period two. In practice, however, life will continue beyond the second period and the costs of default will be higher then the $\eta AF(K_2)$, resulting higher borrowing rates as well as complete lack of credit in the short-term are just a few of the additional costs that must be considered in a world with a future beyond tomorrow. Stiglitz and Weiss (1983) assert that creditors can observe a debtor's past investment choices and default history in deciding whether to lend in the second period and at what rate. Thus, since a creditor cannot, necessarily, observe or may choose not to give full credence to the debtor's current investments, he or she is able to base its decisions on the debtor's history. The debtor, knowing that its current investment choices will become a factor when its default

history is analyzed in the future when it might like to take out new loans, will take this into consideration. Thus, the fact that the creditor has an ability to analyze the debtor's default history adds a new cost to defaulting, over and above the $\eta AF(K_2)$ considered in the Bulow and Rogoff argument.

Default costs, including difficulty in achieving future finance, trade sanctions, conditionality for aid packages, etc. are, in general, hard to quantify. Thomas (2000) argues that this may be one reason why formal treatments of the buyback issue usually suppress them. He attempts to include a specification of such costs in his "willingness to pay" model where a default decision is a voluntary one. Thomas argues that including the default costs in the calculus of buybacks reverses the conclusion arrived at by Bulow and Rogoff. He presents a variety of scenarios where buybacks are beneficial to the debtor (buy not necessarily to the creditor).

Costs of the default to the debtor are notated as S (sanctions) and Thomas argues that these are not in the form of a discontinuous loss that is fully imposed as soon as the default occurs but rather that the disutility associated with sanctions takes on an increasing continuous function. Assume that the default costs are represented by:

$$S(D-R)$$

where R is repayments. Further assume that $S(0) = 0$, $S'(D-R) > 0$ and S(…) is continuous and differentiable. R(y,x) denotes the optimal repayment schedule when a buyback of amount x is undertaken at price p(x). Then,

$$\max_R \{u(y-x-R) - S(D - \frac{x}{p(x)} - R)\}$$

Assume that R(y,x) is positive and increasing and continuous in y upt to a level y*(x) where R(y*(x),x) = D-x/p(x) and above y*(x) results in a fully repayment of debt

owed. The price of a unit of debt, as a function of the amount spent on buybacks, x, can be given by:

$$p(x) = \frac{1}{D(x)} \left\{ \int_{y}^{y^*(x)} R(y,x) f(y) dy + \int_{y^*(x)}^{y} D(x) f(y) dy \right\},$$

where D(x) = D – x/p(x) is the post-buyback face value of debt. Thus the utility of the debtor is given by:

$$E[u] = \int_{y}^{y^*(x)} [u(y - x - R(y,x)) - S(D(x) - R(y,x))] f(y) dy + \int_{y^*(x)}^{y} u(y - x - D(x)) f(y) dy.$$

We differentiate the above expression with respect to x (holding the repayment decision rule fixed at R(y,0) for y < y*(0)) to find the effect of a small buyback on the debtor's utility.

$$\left. \frac{dE[u]}{dx} \right|_{x=0} = -\int_{y}^{y^*(0)} \{u'(y - R(y,0)) - \frac{1}{p(0)} [S'(D - R(y,0))]\} f(y) dy + \int_{y^*(0)}^{y} (\frac{1}{p(0)} - 1) u'(y - D) f(t) dy$$

and thus

$$\left. \frac{dE[u]}{dx} \right|_{x=0} = (\frac{1}{p(0)} - 1) E[u']$$

which, according to Thomas, is unambiguously positive since 1/p(0) > 1, assuming there is some initial risk of default. He summarizes this model by writing "Since there is always some repayment, one dollar spent on a buyback allows the country to keep the size of the default constant in each state by reducing repayments by 1/p(0), and so increase consumption by (1/p(0)-1). Hence, there would be a gain in each state of this amount multiplied by marginal utility…. In the model with a continuous strictly positive repayment function, small buybacks are beneficial to the sovereign but not to the creditor (Thomas, 2000)."

Importance of Access To Credit

Why is access to international credit markets so important? It is important because credit markets can provide liquidity injections. If a country is generally solvent but has a temporary problem (resulting from a bad crop due to a drought or a market shock resulting in a drop of its major export, for example) with payments, it can obtain credit to pay off its current obligations as well as to finance ongoing projects that cannot, or should not, be halted (e.g. education reform) (Williamson, 1988). Inability to access international credit markets and forgo important investment projects needs to be included in the costs of default. When determining whether debt buybacks are the best use of available resources, the debtor in question needs to consider the secondary market price at which it can buy some of the debt back, as well as what alternatives it has for the use of the reserves.

Invest or Buy Back the Debt?

A country's consumption tomorrow depends on its level of investment today. Specifically,

$$Y_1 = F(I_0)$$

However, if the country has debt to repay, it will have to allocate some of the Y_1 towards the servicing of the debt. Therefore, the economy will consume

$$C_1 = Y_1 - I_1 - D$$

where D represents the interest and principle payments to the creditors. An economy with severe debt overhang is likely to face high interest rates and reducing D in the current period may increase the utility of the economy more then by investing those same funds by yielding a smaller D in the next period since

$$U = C_1 + E[C_2] + E[C_3] \ldots.$$

and

$$D_2 = (1 + r)D_1$$

Reducing D_1 may have a greater impact on C_2 then using those same funds for investment projects in that same period (I_1). In such a case, a decision as to whether engage in a debt buyback or not will depend on what gives the economy a greater marginal benefit, investing an additional dollar today for an increase F(1) tomorrow, or buying back one dollar of debt today, thereby reducing the D in the subsequent period by 1(1 + r).

Conclusion

Buybacks of sovereign debt maybe an efficient solution to the problem of external debt for debtors that have foreign exchange reserves that could be allocated for this purpose. Of course, it is not always an optimal solution and every debtor's situation must be analyzed on a case-by-case basis to see if buybacks could be a utility maximizing option. However, under certain conditions debtors can gain most from buybacks and this option should be one of those considered.

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