Is good economic performance harmful for a country? A perverse model of sovereign debt

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Abstract

This paper presents a model in which the amount of money a creditor is willing to lend depends on the economic condition of a country. A country in crisis can get a lot of money. However an improvement in economic condition can lead to a decline in the amount of debt that can be issued. There are two ways a country can default - forced or strategic. The interaction among these two forces determines the optimal amount of debt. I argue that this can explain the banking behaviour during the debt crisis of the '80s

Introduction

The debt crisis of the 80s arose from a combination of policy action in the debtor countries, macroeconomic shocks in the world economy and a remarkable spurt of unrestrained bank lending during 1979-81. The risk associated with international lending was not understood that well by most people, including the lenders. The banks seemed to believe that "countries never go bankrupt".

[1] I thank Lars Svensson and Olivier Jeanne for helpful comments

In the mid and late 70s, the commercial banks were making enormous profits on their international lendings to developing countries. The banks didn't really care too much about how debtor countries were managing their economies. Few banks, apparently, were concerned with the question of whether the debtor countries would be willing and able to service their debts if debt servicing had to come out of national resources rather than out of new loans (Sachs, 1989).

"*What is truly remarkable about the bank behaviour is not lending during 1973-79, but rather the outpouring of new lending during 1980-81, even after world macroeconomic situation had soured markedly. In a mere two years, 1980-81, net bank exposure to major debtor countries nearly doubled over the 1979 level.....This late burst of lending is all the more remarkable and difficult to justify, in light of the enormous capital flight that was occuring at the same time..... At the end of this period, new market-based lending to these countries virtually disappeared.*"

A standard explanation for this phenomenon is defensive lending. Defensive lending refers to the act whereby creditors give new loans to a country that is having trouble servicing its debt. The idea is that if the creditors try to collect the full interest immediately, then the country will default on its debt for sure and inflict a huge loss on the creditors. But new loans might, by reducing the interest burden, enable the country to pay back in the future and accordingly improve the expected value of the initial debt.

Table 1 : Indicators of Bank Lending to Problem Debtors

	1982	1983	1984	1985	1986
15 debtors					
Private debt	336.9	337.3	347.0	341.8	342.0
(growth rate)	–	0.1	2.8	-1.5	0.1
Current account	-50.6	-15.2	-0.6	-0.1	-11.8
Resource transfer	-12.8	21.0	38.3	37.4	21.1
Debt/GDP	41.7	47.0	46.8	46.3	48.4
Debt/exports	269.8	289.7	272.1	284.2	337.9

Source : IMF(1987) and UNCTAD(1987)

Table 1 presents a picture of bank lending from the opening of the debt strategy at the end of 1982 to the end of 1986. It is quite apparent from the table that the mobilization of private capital flows to debtors, that was a central element of the debt strategy, took place to a very limited extent in 1983 and 1984 and basically not at all since. Of course, this aggregate picture is somewhat misleading since it conceals differences among countries. The banks were simultaneously expanding their exposure in some countries and withdrawing funds from some other countries. But inspite of this, the main point remains that there hasn't been much bank lending to problem debtors especially after 1983-84. So, to use Krugman's words, "the central question is why the seemingly forceful case for defensive lending generated only a brief, modest injection of new money"(Krugman, 1989). The bankers claimed that their unwillingness to lend to debtors countries was due to a lack of progress in the latter's economic policy. However, this doesn't seem very convincing. This is because, the debtor countries achieved trade surpluses greater than anyone believed possible in 1983. It is true that this was probably the consequence of a lack of new funds. But the point is, the debtor countries proved that they are capable and willing

to implement sound economic policies and improve economic performance when needed. Thus, if debtors get new loans when they are in a crisis, it's not clear why they shouldn't get loans when they are not. In other words, if creditors provide loans with the hope that the debtor country will perform well in the future, then it should provide loans when the country *is actually performing well.*

As Krugman (1989) pointed out, the asserted link between debtor performance and the availability of new money confuses defensive lending with free-market transactions. For a country that is borrowing from voluntary lenders, the decision to lend does depend on the country's policies, performance and future prospects. However, once problem debtor status is achieved, the new money provided through concerted action is not guided by the same principles. If they can cooperate, creditors will lend as much as they have to in order to protect their investment, not as much as the country has earned or as much as it can be expected to service. *If anything, good economic policies, by reducing the need for new capital, may weaken a country's bargaining position and lead to a reduction of the supply of new money.*

A perverse relationship between performance and the supply of new money is evident in the case of Mexico. When Mexico was able to run massive trade surpluses while resuming modest growth, it received no new money. When oil prices collapsed, the first new money package in more than two years was negotiated.

In this paper, I try to model this situation. That is, I try to show how improving economic condition of the debtor country might induce the creditor to decrease the loan amount. Worsening conditions, on the other hand, can actually increase the amount of optimal debt.

The Model

The debtor country is assumed to have a certain steady-state level of income. This income level can be influenced either through an exogeneous shock or through policies of the government. From the creditors' point of view, *this shock is known just one period in advance.*

We consider the following game -

∘ Period 0 - Creditor gives D to sovereign after observing a signal about the shock to country's income in period 1. Sovereign uses the loans for consumption purposes

∘ Period 1 - The shock is realised. The sovereign chooses whether to pay back D(1+r) or not, where r is the rate of interest on loans

∘ Period 2 - If the sovereign pays back, it can get new loans if required. If it defaults, a re-negotiation process is started which lasts for one period. In the meantime, the sovereign's access to the credit market is cut off

∘ Period 3 onwards - Everything is back to normal

In the models of sovereign debt, one of the central questions is why do sovereigns repay their debt, or, to put it in another way, what happens if sovereigns do not repay. The question is important, because unlike in the corporate world, where debt contracts are enforced by courts, sovereigns are protected by "sovereign immunity". According to Eaton and Gersovitz (1981) the threat of permanent inclusion from the credit market is a sufficient reason to repay. Thus, if a country is worried that a default might tarnish its reputation and prevent it from accessing the credit market, then it will never default. Bulow

and Rogoff (1989b), on the other hand, focused on direct punishment as a reason for repayment. These would include disruption of the defaulting country's trade with other countries or denial of trade credit. There is however scant evidence that defaulting debtors were differentially affected (Eichengreen and Portes,1988). Among Third World borrowers, creditors have taken little note of history in their lending in the 1970s (Lindert and Morton, 1989). Given that default history raised the probability of re-scheduling both in 1980-86 and earlier, one would expect major banks to charge higher premia, or lend at shorter term or lend less, to governments with default history. They did slightly the opposite in 76-79. Even trade policy, which had the chance to discriminate in the bilateralism of the 1930s, wasn't used to discriminate against defaulters or in favour of faithful repayers.

Thus, surprisingly few debtors have been punished since the 1920s, either wtih direct discriminatory sanctions or with denial of future credit. The cost of default is more likely to be the temporary loss of access to the credit market during the negotiations following the default. That is what we assume here.

Assumption : The shocks to income are correlated

Thus a positive shock is likely to be followed by a positive shock while a negative shock is likely to be followed by a negative shock. The creditor is trying to maximize expected returns. He would like to make D as large as possible, since the return will be proportionately larger. However the creditor also has to take into account the probability of default. In this model, there can be two types of defaults - strategic defaults and forced defaults. Strategic default occurs when the sovereign is solvent but chooses to default because it is profitable. The sovereign's decision to default will depend on how much it can

gain in period 1 by defaulting compared to how much it can potentially lose in period 2 due to a loss of access to the credit market. On the other hand, when the sovereign is insolvent, it is forced to default. Obviously these probabilities depend on the state of the economy in period 1, i.e. on the shock. But they also depend on the amount of the loan D. The creditor chooses D in such a way so that this probability doesn't become too large. Consider the following situations :

◦ There's a large positive shock in period 1. The sovereign is solvent. Given that shocks are correlated, this implies that even in period 2, the country will receive a positive shock. As a result, the country will feel tempted to default in period 1 since the loss of access to the credit market in period 2 will, most likely, not cause any damage. Now, higher is D, greater will be the incentive for the sovereign to default. Hence, the optimum D in this case will be small.

◦ There's a small negative shock in period 1 but the sovereign is still solvent. The sovereign may not default because a default could be damaging due to the high probability of receiving an adverse shock in period 2. Since the probability of default is low, the creditor would want to give more loans. Optimum D will be higher.

◦ There's a large negative shock in period 1. In this case, the sovereign will be forced to default because it will not have enough resources to pay back. A large D will only make things worse and increase the default probability. Hence, in this case the optimum D will be small.

Therefore it seems that the amount of loans which the creditor is willing to give rises as the shock becomes more adverse but then falls. Let us try to

formalize this.

Let the income process be -

$$\begin{aligned} Y_t &= \overline{Y} + \epsilon_t \\ \epsilon_t &= \rho\epsilon_{t-1} + \eta_t \end{aligned}$$

where η_t is a white-noise process.

Hence we can re-write this as -

$$Y_t = (1-\rho)\overline{Y} + \rho Y_{t-1} + \eta_t \tag{1}$$

There's a period aggregate utility function u(c_t) (increasing and concave).The sovereign is trying to maximize the present discounted value of this function. However there's election at the beginning of every period and the incumbent party has a probability π of staying in power in the next period. If it loses the election, it doesn't get any utility. The sovereign's objective function is

$$U = \max_{c_1}\{u(c_1) + \pi\beta u(c_2)\}$$

where β is the discount factor.

We ignore consumption from period 3 onwards because whether a country defaults or not doesn't affect its consumption stream after period 2.

Let's consider what happens for different values of Y_1.

Case 1 *Y_1>D(1+r) : The country is solvent. If the sovereign defaults, it's*

expected utility is

$$U = u(Y_1 + D(1+r)) + \pi\beta E_1[u(Y_2)] \tag{2}$$

If, on the other hand, the country honours its debt, it's expected utility is

$$U = u(Y_1) + \pi\beta E_1[\max\{u(Y_2), u(\overline{Y})\}] \tag{3}$$

The second term on the R.H.S. follows from the fact that if income falls below the mean, the country can always consume $\overline{Y}$, by borrowing fom abroad. This requires some explanation. A default implies a temporary loss of access to the credit market. This can hurt the sovereign in two ways - (1) It can't raise loans to finance investment which raises the steady-state level of income in the future, and (2) It fails to check a drop in consumption in the event of an adverse shock to income. Since the sanction lasts for one period only, I assume that the sovereign is more concerned about (2), that is, it views the ability to prevent a decline in consumption as the main benefit of not defaulting.

The sovereign is going to default (strategically) if

$$u(Y_1 + D(1+r)) + \pi\beta E_1[u(Y_2)] > U = u(Y_1) + \pi\beta E_1[\max\{u(Y_2), u(\overline{Y})\}]$$

Case 2 *Y_1<D(1+r) : The country is insolvent. Hence the sovereign is forced to default.*

Given this, we can try to understand the intuition. But first note that,

$$E_1[u(Y_2)] = E_1[u(Y_2)|Y_2 > \overline{Y}].\Pr ob(Y_2 > \overline{Y}) + E_1[u(Y_2)|Y_2 \leqq \overline{Y}].\Pr ob(Y_2 \leqq \overline{Y}) \tag{4}$$

and

$$E_1[\max\{u(Y_2), u(\overline{Y})\}] = E_1[u(Y_2)|Y_2 > \overline{Y}].\Pr ob(Y_2 > \overline{Y}) + u(\overline{Y})\Pr ob(Y_2 \leqq \overline{Y}) \tag{5}$$

Now, suppose ϵ_1 is very large. Then ϵ_2 is large too with very high probability (because the shocks are correlated). So $\text{Prob}(Y_2 > \overline{Y}) \approx 1$.

Let's consider the limiting case when $\text{Prob}(Y_2 > \overline{Y}) \longrightarrow 1$.

If the sovereign defaults, using equations 2 and 4, we have

$$U = u(Y_1 + D(1+r)) + \pi\beta E_1[u(Y_2)|Y_2 > \overline{Y}]$$

If it chooses to repay instead, using equations 3 and 5, we have

$$U = u(Y_1) + \pi\beta E_1[u(Y_2)|Y_2 > \overline{Y}]$$

It is quite obvious that as long as D>0, the sovereign is going to default. So, if the creditor could observe ϵ_1, the optimal D would be 0.

Now, suppose ϵ_1 is negative but Y_1>D(1+r). Then ϵ_2 is negative too with a high probability.

Consider the limiting case when Prob$((Y_2 \leqq \overline{Y}) \longrightarrow 1$

If the sovereign defaults,

$$U = u(Y_1 + D(1+r)) + \pi\beta E_1[u(Y_2)|Y_2 \leqq \overline{Y}]$$

If it doesn't,

$$U = u(Y_1) + \pi\beta u(\overline{Y})$$

Since $u(\overline{Y}) > E_1[u(Y_2)|Y_2 \leqq \overline{Y}]$, it's clear that for D=0, the sovereign will never default. Since the utility from not defaulting (when D=0) is strictly greater, the creditor can give a loan of D=ε, $\varepsilon > 0$ and still preserve the direction of inequality. But then the creditor can start earning a positive return on the loan. Hence the optimal D is strictly positive.

In order to proceed any further and actually quantify the relationship between the shock and the optimal level of debt, we need to impose some structure on the problem. Let's make the following assumptions -

1. U(c_t)=log(c_t)

2. $\eta_t \sim uniform[-\overline{\eta}, \overline{\eta}]$

3. In period 0, the creditor perfectly observes the shock in period 1 i.e. η_1. This is, of course, a very simplistic assumption. But since the shocks are correlated, by observing period 0 shock, the creditor can infer something about next period's shock. I just assume that his inference is accurate. I believe

that relaxing this assumption will just make the algebra more tedious without significantly changing the result.

The creditor chooses D by maximising his expected return. The implicit assumption is that the creditor has some market power. This is consistent with a situation where the creditors consist of big foreign banks. Define two events, A and B such that -

A : the event that there's strategic default

B : the event that the sovereign is solvent, i.e. Y_1<D(1+r)

The creditor's expected return is

$$\Pr ob(A^c \cap B).D(1+r)$$

$A^c \cap B$ refers to the event that the sovereign is solvent and it doesn't default strategically. Only in this case, the creditor gets D(1+r) back. In all other cases, his return is 0.

Since we have assumed that the creditor's information set in period 0 is the same as in period 1, hence the creditor knows for sure whether event B has occured or not. Let's assume that B has occured, i.e. Prob(B)=1. Hence we need to find Prob($A^c|B$).

$$\begin{aligned} \Pr ob(A^c|B) &= \Pr ob(u(Y_1 + D(1+r)) + \pi\beta E_0[u(Y_2)|Y_2 \leqq \overline{Y}].\Pr ob(Y_2 \leqq \overline{Y} \quad (6) \\ &< u(Y_1) + \pi\beta u(\overline{Y}).\Pr ob(Y_2 \leqq \overline{Y})|Y_1 > D(1+r)) \end{aligned}$$

Let the income in period 0 be Y_0. Assume $Y_0 < \overline{Y}$. Therefore,

$$\begin{aligned} Y_1 &= (1-\rho)\overline{Y} + \rho Y_0 + \eta_1 \\ and\ Y_2 &= (1-\rho)^2\overline{Y} + \rho^2 Y_0 + \rho\eta_1 + \eta_2 \end{aligned}$$

We can use the probability distribution of η_2 to compute the probabilites and the expectations in (6).

$$\Pr ob(Y_2 \leqq \overline{Y}) = \Pr ob(\eta_2 \leqq \overline{Y} - (1-\rho)^2\overline{Y} - \rho^2 Y_0 - \rho\eta_1)$$

where we have replaced Y_2 with more fundamental terms. Simplifying,

$$\Pr ob(Y_2 \leqq \overline{Y}) = \frac{\rho^2(\overline{Y} - Y_0) - \rho Y_0 + \overline{\eta}}{2\overline{\eta}} \tag{7}$$

Let $\frac{\rho^2(\overline{Y}-Y_0)-\rho Y_0+\overline{\eta}}{2\overline{\eta}} = \theta$.

Also,

$$E_0[u(Y_2)|Y_2 \leqq \overline{Y}] = E_0[u((1-\rho)^2\overline{Y}+\rho^2 Y_0+\rho\eta_1+\eta_2)|\eta_2 \leqq \overline{Y}-(1-\rho)^2\overline{Y}-\rho^2 Y_0-\rho\eta_1]$$

Simplifying,

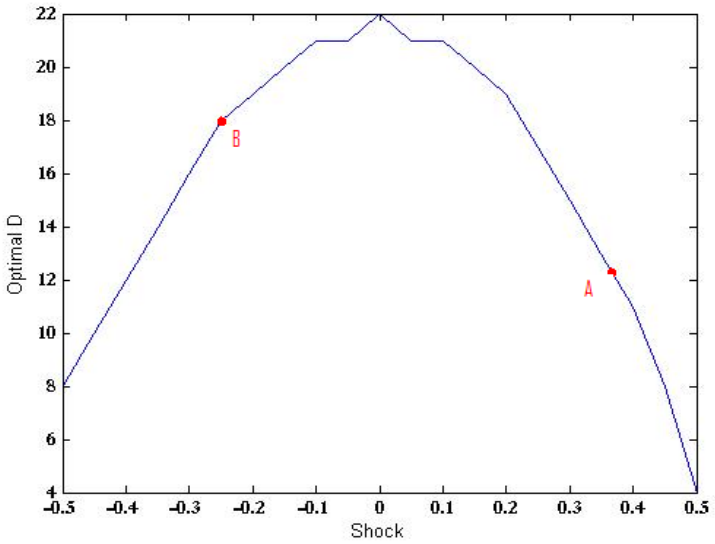
$$E_0[u(Y_2)|Y_2 \leqq \overline{Y}] = \overline{Y}(\log\overline{Y}-1)-[(1-\rho)^2\overline{Y}+\rho^2 Y_0+\rho\eta_1-\overline{\eta}].[\log((1-\rho)^2\overline{Y}+\rho^2 Y_0+\rho\eta_1-\overline{\eta})-1]$$

Let $(1-\rho)^2\overline{Y} + \rho^2 Y_0 + \rho\eta_1 - \overline{\eta} = \Omega$ and $(1-\rho)\overline{Y} + \rho Y_0 + D(1+r) = \Phi$

We replace everything in (6) to obtain

$$\begin{aligned}\Pr ob(A^c|B) &= \Pr ob(\log(\Phi+\eta_1)+\pi\beta\{\overline{Y}(\log\overline{Y}-1)\\ &\quad -\Omega.[\log(\Omega)-1]\}.\theta < \log(Y_1)+\pi\beta\log\overline{Y}.\theta|\eta_1>\Phi)\end{aligned}$$

As stated earlier, for every level of η_1, the creditor chooses D to maximize his expected return. Deriving a relation between the shock and the optimal level of D analytically is difficult. That is why, we simulate the model using reasonable parameter values. The result is shown below.



This graph corresponds to a value of $\pi = 0.5$. For high values of the shock, the creditor refuses to lend because the sovereign will default for sure. As the magnitude of the shock declines and eventually turns negative, the sovereign is able to get more and more loans. This is because, the probability of receiving an

adverse shock in period 2 discourages the sovereign from defaulting in period 1. The creditor knows this and as a result, is willing to lend. However if the shock is too bad, the creditor reduces the loan amount since otherwise the sovereign will be forced to default. As can be seen, when the country receives a bad shock, the amount of loans can actually go up as shown by a movement from point A to point B in the above figure.

Interestingly, the above graph changes drastically as π is changed. For low values of π, there's almost no lending for any value of the shock. This is intuitive - a lower π implies that the incumbent government doesn't care too much about the future since it doesn't have much chance of winning the elections in the next period. Consequently, the prospect of being hit by a negative shock in period 2 may not be enough to deter it from defaulting in period 1 and raising short-term utility. Similarly, for high values of π, the incumbent cares a lot about the future. As a result, the loss from defaulting is too high. The creditor, in this case, lends even when the country receives a favourable shock.

Conclusion

Once a sovereign is tagged as a problem debtor, the amount of debt it can raise doesn't necessarily increase with its ability to repay. Rather, by increasing its outside options, an improvement in economic performance can actually be dis-advantageous for the sovereign in the sense that it can reduce its bargaining power. Lenders, wary of the country's default history, might lend only as much as the sovereign is willing to repay and not as much as it can repay. This is probably what explains bank behaviour in the aftermath of the debt crisis of the 80s.

References

Bulow, Jeremy and Rogoff, Kenneth, 1989b, "Sovereign Debt: Is to Forgive to Forget?", American Economic Review 39, 43-50

Eaton, Jonathan and Gersowitz, Mark, 1981, "Debt with Potential Repudiation: Theoritical and Emperical Analysis", Review of Economic Studies 48, 289-309

Eichengreen, Barry and Portes, Richard, 1988, "Settling Defaults in the Era of Bond Finance", CEPR Discussion Paper 272

Lindert, Peter and Morton, Peter, 1989, "How Sovereign Debt has worked" in *Developing Country Debt and the World Economy* edited by Jeffrey D. Sachs, The University of Chicago Press

Krugman, Paul, 1989, "Private Capital Flow to Problem Debtors" in *Developing Country Debt and the World Economy* edited by Jeffrey D. Sachs, The University of Chicago Press

Sachs, Jeffrey D., 1989, "Introduction" in *Developing Country Debt and the World Economy* edited by Jeffrey D. Sachs, The University of Chicago Press