The economics of sovereign debt restructuring: Swaps and buybacks

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Main ideas
The objective of these notes is to present a number of issues related to sovereign debt restructuring. The presentation will be based on two very simple models that highlight a number of important points.\textsuperscript{1} We will not try to provide any concrete suggestions but the issues we raise will hopefully help inform the discussion.

There are two types of possible effects associated with debt restructuring. Debt restructuring can have an effect on inefficiencies and thereby generate value, and it can imply transfers between countries and creditors.

Why might restructuring generate value?

- Too much debt can lead to insufficient incentives to invest or carry out economic reforms (debt overhang). Debt reduction provides better incentives and reduces inefficiencies but is likely to make creditors worse off (unless the country is on the downward sloping side of the debt Laffer curve).

- Too much short-term debt can give rise to multiple equilibria. In this case, coordination failure (the bad equilibrium) leads to inefficient liquidation. Solve short-term liquidity problems by securing short-term financing (get funds from official lenders such as IMF) or by reducing short-term obligations (restructure to lengthen debt maturity as in Megacanje).

\textsuperscript{1}Some of these ideas appeared in Krugman (1989) “Reducing development country debt.”
• If the private sector cannot borrow cheaper than the government, solving sovereign debt problems can help direct funds to private sector (where marginal benefit of funds is likely higher). Fiscal discipline would be very important in this case.

Why might restructuring induce transfers between countries and creditors?

• Whenever a country buys its debt back (repurchase or swap), it pays the ex-post value for this debt. If the ex-post price of the bonds repurchased is higher than the ex-ante price, bond holders might appropriate a large part (possibly more than 100%) of the value generated. (For example, the price of short-term bonds tends to increase when retiring short term debt to avoid a liquidity crisis). If the country offered the ex-ante price, there would be a free rider in that no creditor would want to sell.

• Introduce senior debt, thereby reducing the value of existing debt. Senior debt can be from official lenders, new bonds with low coupons and high face value, debt backed by tax revenues. Country benefits, old creditors lose.

• When introducing a new creditor to finance a buyback or swap, the cost of not repaying might increase if the new creditor adds “threats.” For example, the IMF might have additional ways of making countries pay, or induce additional costs of default. Country loses, old creditors benefit.

Debt restructuring options include:

• Use loans from official lenders to repurchase debt.

• Use guarantees from official lenders or future tax revenues to partially back new bonds swapped for old debt.

• “Debt management” swaps (long-term for short-term, domestic currency denominated for foreign currency denominated).

In what follows, we will mostly focus on voluntary restructuring, where voluntary means that creditors who do not wish to participate are not punished in any way.
Simple models

The conclusions we derive on the effects of debt restructuring will depend on the assumptions we make in our models. We will consider two cases, one in which the country pays as much of its debts as it can, and another in which the country pays only if the cost of default is larger than its debt.

Capacity to pay

In this model, the country pays its debts whenever feasible. We assume that restructuring does not generate value, but it can lead to transfers. The country carries an initial debt $d$, which is repaid in period 2 whenever the country has enough resources (no strategic defaults). However there is uncertainty about output in period 2.

$$y = \begin{cases} y_0 & \text{with probability } 1/2 \\ y_1 & \text{with probability } 1/2 \end{cases}$$

We assume that the debt can only be fully repaid if output is high, namely

$$y_0 < d < y_1.$$ 

No restructuring

Payments to creditors equal the minimum of $d$ and $y$, namely

country pays $\begin{cases} y_0 & \text{with probability } 1/2 \\ d & \text{with probability } 1/2 \end{cases}$

so payments to creditors per bond are

creditors get $\begin{cases} y_0/d & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases}$

and the ex-ante bond price is thus

$$p_0 = \frac{y_0 + d}{2d}.$$
**Self-financed debt buyback**

We now assume that the country uses its own resources to buyback part of its debt. The effects of this purchase depend on whether the resources the country spends diminish its ability to pay in the future (high appropriability) or not (low appropriability).

**Low appropriability:**

Let $x$ be the amount spent in the buyback. The face value of retired bonds equals $x/p_1$, where $p_1$ is the *post-buyback* price of the bonds.

Payments to creditors in the second period equal the minimum of $d - x/p_1$ and $y$, namely

$$\text{country pays in period 2} = \begin{cases} y_0 & \text{with probability } 1/2 \\ d - \frac{x}{p_1} & \text{with probability } 1/2 \end{cases}$$

where we assumed that second period resources do not depend on $x$ (low appropriability) and that $x$ is small enough such that $y_0 < d - \frac{x}{p_1}$ (if $x$ were larger, the qualitative results would be the same). Payments to creditors per bond are

$$\text{creditors get in period 2} = \begin{cases} \frac{y_0}{d - x/p_1} & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases}$$

and the post-buyback bond price is thus

$$p_1 = \frac{1}{2} \frac{y_0}{d - x/p_1} + \frac{1}{2}.$$

It is clear $p_1 > p_0$ and, as a result, creditors benefit with the buyback. The country, on the other hand, is worse off because its savings in the good state in period 2 ($x/p_1$) are more than compensated by the payment it makes in period 1 ($x$).\(^2\)

**High appropriability:**

As before, let $x$ be the amount spent in the buyback. The face value of retired bonds equals $x/p_1$, where $p_1$ is the *post-buyback* price of the bonds.

\(^2\)This is the case because the savings take place with probability 1/2 and $p_1 > 1/2$. Also, this is a zero-sum game, so if creditors gain the country must lose.
Payments to creditors in the second period equal the minimum of \(d - x/p_1\) and \(y\), namely
\[
\text{country pays in period 2} \begin{cases} y_0 - x & \text{with probability } 1/2 \\ \frac{y_0 - x}{d - x/p_1} & \text{with probability } 1/2 \end{cases}
\]
where we assumed that second period resources decrease by \(x\) (high appropriability) and that \(x\) is small enough such that \(y_0 - x < d - \frac{x}{p_1}\) (if \(x\) were larger, the qualitative results would be the same). Payments to creditors per bond are
\[
\text{creditors get in period 2} \begin{cases} \frac{y_0 - x}{d - x/p_1} & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases}
\]
and the post-buyback bond price is thus
\[
p_1 = \frac{1}{2} \frac{y_0 - x}{d - x/p_1} + \frac{1}{2}.
\]
It is easy to show that \(p_1\) satisfies
\[
\frac{1}{2} < p_1 < p_0 < 1
\]
and, as a result, creditors lose with the buyback. The country, on the other hand, benefits because its savings in the good state in period 2 (\(x/p_1\)) are larger than the loss in output (\(x\)).

**Buyback with official loans**

The previous examples illustrate an important point: countries gain with a buyback as long as the resources used for the buyback diminish future available resources. However, apart from the issue of appropriability, countries considering debt restructuring usually do not have resources to buyback their debts (almost by definition). An alternative option is to use loans from official lenders for the buyback, which will diminish future available resources because these debts are *senior*.

Let \(x\) be the amount borrowed from official lenders, which the country uses to buyback bonds. The face value of retired bonds equals \(x/p_1\), where \(p_1\) is the post-buyback price of the bonds.

Total payments to creditors (including official lenders) equal the minimum of \(d - x/p_1 + x\) and \(y\), namely
country pays \( \begin{cases} y_0 & \text{with probability } 1/2 \\ d - \frac{x}{p_1} + x & \text{with probability } 1/2 \end{cases} \)

Payments to bond-holders per bond are

creditors get \( \begin{cases} \frac{y_0 - x}{d - x/p_1} & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases} \)

and the post-buyback bond price is thus

\[ p_1 = \frac{1}{2} \frac{y_0 - x}{d - x/p_1} + \frac{1}{2}. \]

Notice that \( p_1 \) is the same as the one we obtained for the case of the buyback with own resources and high appropriability! As a result, the country can replicate that case by borrowing from official lenders. As before, the country gains with the buyback while bondholders loose.

**Swap with official guarantees**

We now assume that instead of providing funds for a buyback, official lenders provide \( x \) to guarantee (partially or in full) the issuance of new bonds that are swapped for old bonds. Namely, official lenders pay \( x \) to holders of new bonds in case of default, in which case the country then owes \( x \) to official lenders. This debt is senior to the defaulted bonds, both new and old.\(^3\)

Let the country issue \( L \) bonds guaranteed in proportion \( x/L \equiv \alpha \). Let \( p_1 \) and \( p_2 \) be the post-swap price of the old and new bonds respectively. Payments to creditors equal the minimum of \( d - L \frac{p_2}{p_1} + L \) and \( y \), namely

\[ \text{country pays} \quad \begin{cases} y_0 & \text{with probability } 1/2 \\ d - L \frac{p_2}{p_1} + L & \text{with probability } 1/2 \end{cases} \]

and expected repayments by the country are lower with the swap as long as \( p_1 < p_2 \). Payments to creditors per bond are

\[ \text{old bonds} \quad \begin{cases} \frac{y_0 - x}{d - L \frac{p_2}{p_1} + (L - x)} & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases} \]

\(^3\)We assume that there are cross-default clauses, such that the country cannot make the new bonds effectively senior to the old ones.
new bonds \[ \begin{cases} \alpha + (1 - \alpha) \frac{y_0 - x}{d - L \frac{p_2}{p_1} + (L - x)} & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases} \]

and the post-swap bond prices are thus

\[ p_1 = \frac{1}{2} + \frac{1}{2} \left( \frac{y_0 - x}{d - L \frac{p_2}{p_1} + (L - x)} \right) \]

\[ p_2 = \frac{1}{2} + \frac{1}{2} \left( \alpha + (1 - \alpha) \frac{y_0 - x}{d - L \frac{p_2}{p_1} + (L - x)} \right) \]

It is easy to show that the price of the new bonds are a weighted average of the price of a risk-less bond and the price of the old bonds, where the weight on the risk-less bond equals the proportion of the bond which is guaranteed. Namely,

\[ p_2 = \alpha + (1 - \alpha) p_1. \]

It is also easy to show that both the price \( p_1 \) and the expected payments for the country are the same as in the buyback case.

As a result, the country gains with the swap while bondholders loose. In addition, the result does not depend on \( \alpha \) and we obtain the same results for the swap as for the buyback.

**Caveats**

In models with high appropriability, restructuring benefits the country as long as it acquires new obligations which are senior. The reason is that these obligations take away resources available to repay the old bonds. Similar results would be obtained even without official lenders, as long as the country issues new bonds which could be made senior in some other way, for example by guaranteeing them with tax revenues.

In addition, buybacks and swaps are equivalent only if the new bonds are in no way senior to the old bonds. If the new bonds could be made senior, then \( p_2/p_1 \) would be higher and the country would gain more under the swap.
Cost of default

In this model, we assume that the country pays back its debt only because there is a cost associated with default. Restructuring can lead to efficiency gains, but it also leads to significant transfers. The country carries an initial debt $d$, which is repaid in period 2 whenever it is smaller than the cost of default $c$. However there is uncertainty about the cost of default in period 2.\(^4\)

\[
c = \begin{cases} 
c_0 & \text{with probability 1/2} \\
c_1 & \text{with probability 1/2} 
\end{cases}
\]

We assume that the debt is repaid only if the cost of default is high, namely

\[c_0 < d < c_1.\]

No restructuring

Payments to creditors are given by

\[
\text{country pays } \begin{cases} 
0 & \text{with probability 1/2} \\
d & \text{with probability 1/2}
\end{cases}
\]

and the country’s “utility” is given by

\[
\text{country’s utility } \begin{cases} 
y - c_0 & \text{with probability 1/2} \\
y - d & \text{with probability 1/2}
\end{cases}
\]

Payments to creditors per bond are

\[
\text{creditors get } \begin{cases} 
0 & \text{with probability 1/2} \\
1 & \text{with probability 1/2}
\end{cases}
\]

and the ex-ante bond price is thus

\[p_0 = \frac{1}{2}.\]

\(^4\)In Bulow and Rogoff, the cost of default is increasing in the country’s available resources, so the incentives to default are higher when output is low.
Buyback with official loans

The country gets loans from official lenders in the amount $x$. The country uses these loans to buyback bonds. We assume that the cost of defaulting on official lenders is very large, while the cost of defaulting on bond holders does not depend on the amount of bonds defaulted on.\(^5\) The face value of retired bonds equals $x/p_1$, where $p_1$ is the post-buyback price of the bonds.

If $x$ is very small, the post-buyback price remains at $1/2$ and neither the country nor creditors benefit. We will assume that $x$ is large

$$x \geq d - c_0.$$ 

The country will be able to buy at least $d - c_0$ bonds (even if the post-buyback price is 1). As a result, the cost of default will be larger than the amount of bonds left (i.e. $c_0 \leq d - x$) and the country will always repay.

The country’s utility is then given by

$$\text{country’s utility} = y - d$$

and the post-buyback bond price is

$$p_1 = 1$$

As a result, the country looses with the buyback while bondholders benefit.\(^6\)

It is important to note that the buyback generates value, namely creditors gain more than what the country looses. This is true because the cost of default is incurred with probability $1/2$ without the buyback but with probability 0 with the buyback. However bond holders benefit so much that the country ends up loosing. This is mainly due to the fact that bonds are bought at the post-buyback price. If the bonds could be bought at the pre-buyback price of $1/2$, a sufficiently large buyback would benefit the country while leaving creditors indifferent.

\(^5\)This assumption could be justified if the punishments take the form of trade disruption, seizing of foreign assets, etc. If they come from some type of lawsuit brought about by the creditors, then it is likely that the cost depend on the amount of bonds.

\(^6\)For $x \in (\frac{d - c_0}{2}, d - c_0)$, there is no equilibrium. If $p_1 = 1$ the country could not buy enough bonds to change its decision at time 2 and default would take place with probability $1/2$. If $p_1 = 1/2$ the country could buy enough bonds and then the probability of default would be 0. This is a technicality due to the binomial distribution of $c$. 

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Swap with official guarantees

This case is the same as the buyback.

Final comments

• Legal issues. It is not clear for some of the discussed proposals whether they are implementable given legal constraints and available commitment devices. For example, would the debt backed by tax revenues be really senior ex-post, or would the government be forced (or tempted) to use tax revenues for other purposes in case of imminent default? In addition, are there no legal restrictions on the issuance of senior debt?

• It is crucial to understand what the costs of default are and what they depend on. To what extent can the country’s foreign assets be appropriated? Can foreign creditors disrupt international trade? What effects would default have on future capital inflows? Are costs of default increasing in the size of the default? How do these “punishments” differ across creditors? Are they additive, so that, for example, a country defaulting on both bond-holders and official lenders would be punished more than if it had defaulted on either one of them on a similar level of total debt?

• We have not discussed much the case of a swap of long-term bonds for short-term bonds. It is possible to think of short-term debt as senior to long-term debt if countries try to postpone an inevitable default by meeting their obligations as long as they can. In that case, such a swap would be the opposite of what our models would suggest, since the country would be issuing junior debt instead of senior debt. The swap could still be advantageous if the reduction in inefficiencies due to the possibility of a liquidity crisis is large enough. However, it is likely that a large proportion of those gains (hopefully less than 100%) would go to creditors.

• How does restructuring affect new lending? If the objective of restructuring is to allow the domestic private sector to return to credit markets, is it not more effective to help the private sector directly by subsidizing private lending, tax breaks for investment, etc? Sovereign restructuring
is to some extent an attempt to act on the margin by dealing with the stock. On the other hand, if the sovereign ceiling is binding there might be no other way but to attack the stock. However, proposals such as issuing senior debt might be effective at lowering costs of existing debt but might increase the costs of new debt.

• We have taken creditors as risk-neutral, financially unconstrained, agents. This might be far from the truth, in which case a whole new set of issues arise about which we know very little. For example, the argument has been made that even a small buyback might be helpful if it retires the so called “loose” bonds, implying a very inelastic demand for bonds at the margin. In addition, is creditors’ risk aversion volatile and does it increase substantially during crises? In that case an influx of official money in the form of an IMF financed buyback might be very helpful if it stabilizes the price of bonds.

• Finally, in these notes we have only considered voluntary operations. If restructuring resulted in the creation of value (no zero-sum), and a concerted restructuring were feasible, then a large part of the benefits could go to the country instead of the creditors. However, it would be difficult to convince a sufficiently high proportion of creditors to go along with such arrangements, as incentives exist for creditors to let other creditors take part in the deal and then attempt to be repaid in full (moral hazard). Concerted restructuring would be more difficult now than at the time of the Brady plans, since bonds are held by a large number of creditors and coordination would likely be very difficult. Of course, creditors could be forced to take part in the restructuring (in which case they could even be made worse off) in a form of partial default. Clearly, the desirability of such option of last resort would depend heavily on the costs of default and the other options available.