An Introduction to Sovereign Debt

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Abstract

14 Nov. 2008 *- Ecuador announced it will use a 30-day 'grace period' to decide whether or not it will repay its sovereign debt.*

Ecuador owes about $10bn in total external debt ($3.8bn sovereign, $4.3bn multilateral and $1.5bn bilateral debt). Its internal audit commission has not made any recommendations, but the commission's reports of 'illegality' in the issuance of some global bonds is broadly interpreted as justification for it to default on its sovereign debt. In the most likely scenario, it will default and there will be a protracted negotiation between creditors and the Ecuadorian government which will result in the return of some fraction of the original investment. Unlike domestic bankruptcy, there is currently no international court in which creditors may sue Ecuador, or force the liquidation of its assets - which in Ecuador's oil-rich economy would certainly allow them to recoup fully their investments. In addition, the value of defaulted bonds is so small that no other state has an incentive to act on behalf of creditors to force, through economic or military means, Ecuador to repay. Supposing that at the time these bonds were bought there was some positive probability that this would occur, why were investors prepared to buy at the time? And why would they be prepared to lend again in the future? Answering these questions is the essence of early work in the sovereign debt literature. This note contains a simple model to summarize this early literature, together with annotated discussion of the intuition in recent work.

*This note was written for an Undergraduate Research Meeting in LSE, to introduce an interesting topic; demonstrate a basic macro model; and discuss macro intuition and research. All the usual caveats apply.

Introduction

Economies are subject to intertemporal fluctuations in income. Standard preferences mean a representative agent wishes to smooth this volatility. One way governments can achieve this is to issue a bond on international/foreign capital markets: promising to pay back the principal, with an amount of interest, sometime in the future[1]. Since this form of debt is owed to an economic agent with complete control over itself, including the legal framework in which it resides, it has been termed "sovereign debt".

Sovereign debt is fundamentally different from private debt for two reasons: (1) missing collateral; (2) missing legal enforcement. These features mean resolving default on the debt is better thought of as a negotiation, not a legal enforcement of contractual penalties[2]. The very existence of sovereign debt is thus an immediate puzzle for standard contract theory and a topic of interest for contract theorists.

Macroeconomists would like also to understand this puzzle, together with how this form of financing is employed, and what effects it has on the country. Development macro would like to know if it can be a source of growth: it is a capital flow that could be used in productive projects throughout the country. However, in contrast to much macro literature that tries to explain stylised facts about variables[3], most of the trees sacrificed in this literature have been used to explain why sovereign debt **even exists**.

Political economists have an interest in sovereign debt because its use (and abuse) depends on the form of political institutions present in different countries. The fundamental assumption here is that creditors are only willing to lend to governments that they think will repay in the future - either by incentives or coercion.

Other questions asked in the literature, that I won't have time for

For more on these issues, read the surveys referenced at the end of this paper:

- Renegotiations and contract details. Defaults are typically partial; terms are renegotiated and depend on contract clauses such as collective action and seniority - how and why is this?

[1] An alternative motivation is that of a government wishing to finance a deficit ($G - T > 0$) which does so by raising capital in international, instead of domestic, capital markets.

[2] Although it is not definitive, Standard & Poor's definition of 'default' is generally accepted: the failure to meet a principal or interest payment on the due date (or within the specified grace period) contained in the original terms of the debt issue. The greyness of this definition arises when applying it to different sovereigns and their instruments.

[3] e.g. Kaldor's stylised facts of growth

- What distortions and inefficiencies does sovereign debt generate in the economy?
- How might debt be restructured to avoid/reduce these problems?

History of sovereign debt and default

For a comprehensive history of debt and especially default since 1300, see Reinhart & Rogoff (2008).

From this paper, the earliest sovereign default in modern history I'm aware of is Edward III's England, which defaulted on Italian lenders in 1340 when its attempt to invade France met with failure[4]. From these earliest times, defaults have been infrequent but typically cyclical, serial, and concurrent. Reinhart & Rogoff (2008) present this evidence as a forewarning against those who argue sovereign debt crises are no longer an issue.

The most influential defaults in recent memory are those of Latin America at the beginning of the 1980s (which gave rise to Brady Bonds); Russia in 1998; and Argentina in 2001 (Beers & Chambers 2004).

Yet more recently, sovereign debt has emerged as one facet in the 'credit derivatives problem'. Sovereign debt contracts are now frequently combined with credit default swaps - a kind of insurance contract that pays out in the event that the sovereign defaults. For more on how this affects sovereign debt models, and good references, see Goderis & Wagner (2008). In particular, economists are concerned how these contracts effect the impact and resolution of defaults - which brings us to Ecuador's current position on the brink of default.

Why do sovereigns (not) default?

Basically, as for all economic agents, there needs to be an incentive somewhere - either a penalty for failing to repay, or a reward for repayment. Ever since the literature began with Eaton & Gersovitz (1981), most of it tries to establish these incentives by deriving conditions where an economy will choose to repay rather than default.

[4]The Economist refers to Philip II's Spain as the original crisis, but academic authors award Spain only the honour of "Most State Defaults" (Voth 2008).

A model of default costs

Exclusion from capital markets[5]

A basic model, where exclusion from capital markets is sufficient to sustain an equilibrium[6].

Three period model: $t = \{1, 2, 3\}$				
Endowments:	y_t		Discount factor:	$\beta \in (0, 1)$
Consumption:	c_t		Gross interest rate:	$r > 1$

Utility is given by:

$$U = log(c_1) + \beta log(c_2) + \beta^2 log(c_3)$$

The agent seeks to maximise her utility subject to her lifetime resource constraint:

$$c_1 + \frac{c_2}{r} + \frac{c_3}{r^2} = y_1 + \frac{y_2}{r} + \frac{y_3}{r^2}$$

We will assume that $r < \frac{1}{\beta}$ so that the agent wishes to borrow: the rate at which she discounts the future is greater than the rate of interest on borrowing. We will also assume that there is no way to store endowments over time, and no way to borrow except from the rest of the world.

Let's now assume a special endowment path:

$$y_1 = y_3 = y_L < y_H = y_2$$

So that, without access to any borrowing ('autarky' or 'default') the path of endowments and consumption are identical and may be represented in the figure below:

Looking at the right-hand-side (RHS) of the budget constraint, let's define:

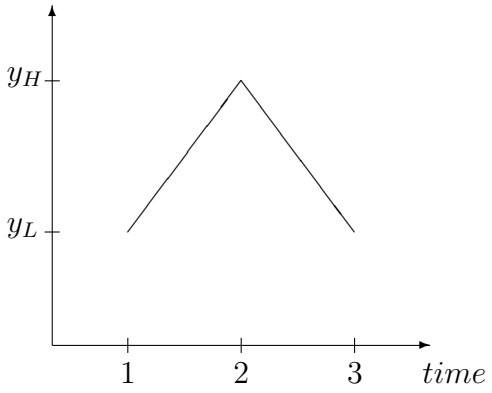
$$Y_0 := y_L + \frac{y_H}{r} + \frac{y_L}{r^2}$$

Solving the model To find the optimal path of consumption, we will assume that the agent can borrow as much as she likes with perfect commitment to repay in

[5]Sometimes interpreted as a loss of 'reputation' in credit markets.

[6]A simplified version of Eaton & Fernandez (1995, section 2.1) and Eaton (1993).

Fig. 1: Endowment path



the future, but she must still satisfy her lifetime constraint. She solves her problem using the Lagrangian method:

$$\frac{1}{c_1^*} = \frac{\beta r}{c_2^*} = \frac{(\beta r)^2}{c_3^*}$$

When we substitute this optima into the budget constraint, we find:

$$\begin{aligned} c_1^* &= \frac{Y_0}{1+\beta+\beta^2} \\ c_2^* &= \frac{\beta r Y_0}{1+\beta+\beta^2} \\ c_3^* &= \frac{(\beta r)^2 Y_0}{1+\beta+\beta^2} < c_2^* < c_1^* \end{aligned}$$

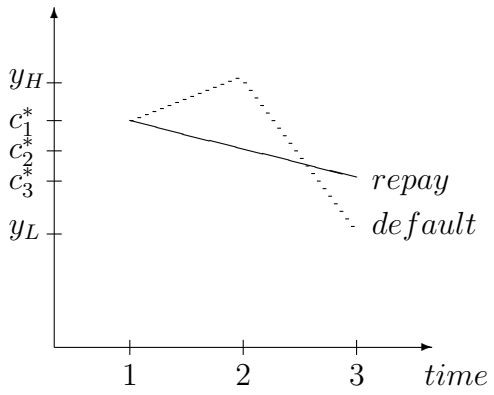
Where the inequalities in the last line follow from the assumption $\beta r < 1$.

The time path of optimal consumption is declining, though its exact path depends on the parameters and endowments. To make this discussion interesting, let's consider the case in the figure below:

Suppose the agent can choose to default in any period but, as punishment, will subsequently be in international financial capital autarky forever. Beginning in period 3 there are clearly no gains from defaulting. Looking then at period 2, irrespective of the gains from borrowing in the first period[7], there is an incentive for the agent

[7]Think of this either as a backward induction solution to a sequential game, or alternatively the gains in period 1 as a "sunk benefit".

Fig. 2: Consumption paths under capital market exclusion



to default in period 2 - she will gain from higher consumption in that period too!! However, this has to be balanced by the cost of permanent exclusion - in particular, lower consumption in the third period.

For simplicity, let's consider a contract that specifies repayment rx in period 2 in exchange for $(r^2-1)x/r^2$ in period 1 and x in period 3, so that risk-neutral creditors will be happy[8]:

$$(r^2-1)x/r^2 + x/r^2 = rx/r$$

To be willing to lend to this agent so as to ensure repayment, the creditors need to ensure an "Incentive Compatible Condition" holds for the agent, which ensures that in all periods she prefers to repay the amount specified in the contract, rather than default and consume her autarkic endowment forever[9]:

$$\beta log(y_H - rx) + \beta^2 log(y_L + x) > \beta log(y_H) + \beta^2 log(y_L)$$

Since LHS = RHS when $x = 0$, and LHS has a unique maximum, we need only ensure that it is increasing when $x = 0$ to establish that some $x > 0$ will be the solution[10]. Expressing the condition mathematically:

$$\begin{aligned} \frac{\partial LHS}{\partial x}|_{x=0} = \beta\frac{1}{y_H}(-r) + \beta^2\frac{1}{y_L} &> 0 \\ \iff \beta y_H &> r y_L \end{aligned}$$

[8] I have here assumed perfect commitment on the part of creditors to pay in the third period, and to carry out any punishment they threaten.

[9] Note that, in our model, period 2 is the only one where the agent might consider defaulting.

[10] Actually, $x^* \in (0, y_H/r)$ since $y_H - rx > 0$.

Intuitively, the agent must be prepared to give up rx units in period 2 in exchange for x units in period 3 - and the marginal utility benefit of the gain must strictly exceed the marginal utility cost of the loss. Provided this condition is satisfied, the equilibrium can be derived...

Conclusion: even without commitment from the debtor, under certain conditions, the threat of exclusion from capital markets can be enough to ensure that she repays.

Direct output costs[11]

A basic model, where a fall in output caused by default is sufficient to sustain an equilibrium[12].

Real economic costs due to, for example, collapse of trade credit (Kohlscheen & O'Connell 2008) that shrinks the trade sector, or perhaps more directly (though less likely in current times): 'gunboat' diplomacy (Mitchener & Weidenmier 2005). We summarise these effects in the model as an exogenous decline by $\gamma \in (0, 1)$ in the economy's endowment when it defaults, but no explicit loss of access to credit markets.

	Endowment
No default:	y_t
Default in t:	$(1-\gamma)y_s \ \forall s \geq t$

The rest of the model is identical to that discussed in the previous section, so the optimal path under perfect commitment is unchanged. As before, the agent only has incentive to default in the second period, but now the agent retains the freedom to access capital markets for an amount z in exchange for rz units next period. Then utility under default is given by:

$$\beta log(y_H(1-\gamma)+z) + \beta^2 log(y_L(1-\gamma)-rz)$$

So, analogous to the previous section, the Incentive Compatibility Condition required by the creditors is:

$$\beta log(y_H - rx) + \beta^2 log(y_L + x) > \beta log(y_H(1-\gamma)+z) + \beta^2 log(y_L(1-\gamma)-rz)$$

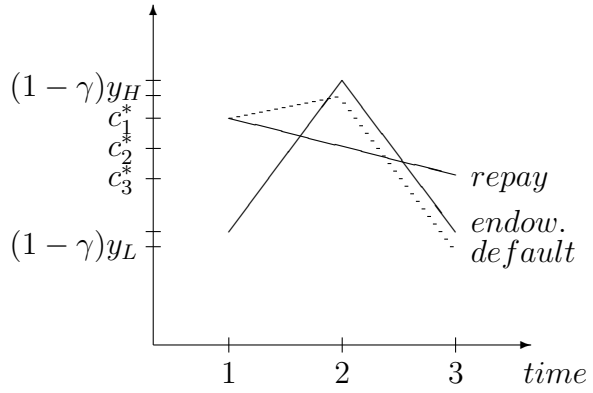
Since the agent could also default in the final period, no-one will ever be prepared to lend: $z \not> 0$. A sufficient, but not necessary, condition that guarantees the ICC

[11] Sometimes called 'sanctions' motive for repayment.

[12] A simplified version of Eaton & Fernandez (1995, section 2.1) and Eaton (1993).

holds is that of the previous section: $\beta y_H > r y_L$. This implies that the agent is not interested in saving, which ensures that even though the agent has access to capital markets in the model, she does not use them. Then the time paths of endowment, consumption with commitment to repay, and default are shown in the figure below:

Fig. 3: Consumption and endowment paths under output costs



Problem I: Empirical evidence

Unfortunately, empirical evidence (Levy-Yeyati & Panizza 2006, Sturzenegger & Zettelmeyer 2007) tends to find that the direct costs of default are small, and the length of time that countries in default are excluded from capital markets is short. Some weak evidence exists that countries that default trade less with others (Rose & Spiegel 2002, Rose 2005), and that export-oriented industries suffer more from default, though it is short-lived (Borensztein & Panizza 2006).

Problem II: Bulow & Rogoff (1989b) critique

If the economy is not also excluded from saving in capital markets when it defaults, then it is possible for it to take the resources gained from defaulting and invest them at a rate that replicates the consumption path they would have had if they'd repaid - in other words, exclusion from borrowing in capital markets is not sufficient, by itself, to sustain an equilibrium without default. We can see this in the above model with default penalties as a situation where the agent wished to save in capital markets in the second period (and willing agents in the international credit markets could be found), though the existence of this possibility is dependent on γ and other key variables.

Alternative stories

These fall into two categories: explanations for the absence of empirical evidence that sustain the default costs stories, and other incentives for repayment that do not rely on direct punitive costs.

Sovereign debt is typically without contingencies for bad states of the world - default may be costless for an economy in a bad state as an implicit contingency (Grossman & Van Huyck 1988).

If the government is unable to determine who holds its debt because it is traded on secondary markets, it may not wish to default for fear of hurting domestic agents holding its own debt, or reducing available liquidity, or not being reelected. Broner et al. (2007), Brutti (2008), Guembel & Sussman (2006)

Signalling stories. Governments that repay signal to foreign investors that their economy is performing well (Sandleris 2006). Governments repay to signal they are a 'good' or 'honest' type that will continue to repay in the future - a 'bad' type may mimic a 'good' type for a short period of time to attract capital flows (Cole et al. 1995). Governments repay sovereign debt as a credible, costly signal to domestic agents that they are a particular type in negotiations, for example labour union wage bargains (**?**).

When a creditor lends to a government, it is typically unable to perfectly observe whether the government productively invests or consumes the resources. This moral hazard problem combined with the legal difficulties of enforcing sovereign repayment necessitates a capital outflow, and collapse in borrowing and lending for incentive reasons (Atkeson 1991).

More political economy

Myopic governments are unwilling to save for fear of losing saved resources to future governments, this means they are willing to repay today so that they can continue to borrow while they remain in power (Amador 2003).

Economies tend to default 'cyclically' - those that have defaulted in the past are much more likely to default in the future (Reinhart et al. 2003).

Governments in parliamentary processes with strong representation of asset holders are less willing to default and devalue asset holdings for fear of not being reelected; presidential systems are less answerable to such interest groups (Kohlscheen 2008).

Alternative lines of thought

General equilibrium model to explain empirical data ("Minnesota School") approach: Arellano (forthcoming), Yue (2006)

Derive the 'optimal' contract to evaluate the appropriateness of debt forgiveness: Guimaraes (2008), Foley-Fisher (2008)

What levels of debt are 'appropriate'? Aiyagari & McGratten (1998) find the US level is close enough to optimal not to worry about changing it. Pattillo et al. (2002) find that beyond 35-40% of GDP in developing countries leads to a decline in growth.

Final references

Survey articles:

- Eaton & Fernandez (1995)
- Sturzenegger & Zettelmeyer (2007)
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Other papers of interest:

- Cohen & Sachs (1986)
- Fernandez & Rosenthal (1990)
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