The Economics of Sovereign Debt and Default: An Analysis of Debt Dilution

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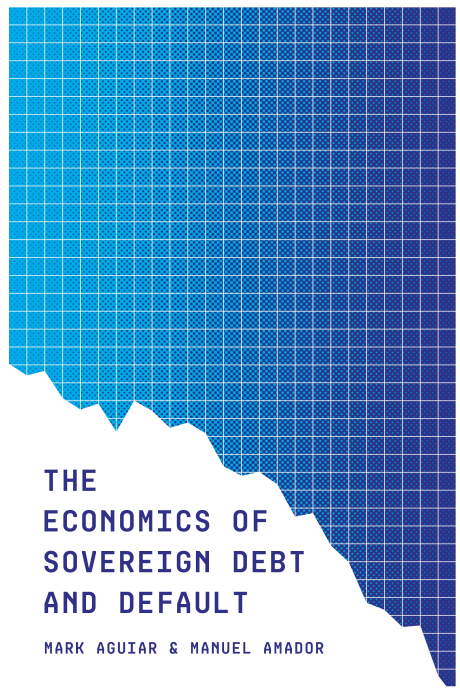

What we do...and why

- Repeated waves of debt build ups and subsequent defaults
- A large literature has developed matching key empirical patterns
- The book attempts to distill key lessons using a simple framework
- ... then revisits larger quantitative models

Spreads

- A key empirical pattern concerns the price of debt
- Large and volatile spread relative to comparable risk free bonds
- Two components
  - (i) Default probability
  - (ii) Risk premia
- We (and much of the literature) focuses on the first

Equilibrium

- How do bond prices influence government decisions
- How does government borrowing influence pricing?
- This fixed point is the crucial object in any sovereign debt equilibrium
- Consider the pricing equation of a long-term bond

$$q = \mathbb{E}\left[M' \mathbb{1}_{\{Repay\}} \times (\kappa + q')\right]$$

- Price depends on probability of repayment *and* future probabilities via q'

Government Actions

- Two key decisions
  - (i) Repay or default
  - (ii) How much to borrow
- Early literature focused on why repay at all (Eaton-Gersovitz and Bulow-Rogoff)
- Conclude that direct costs matter
- How to measure?
  - One valiant and creative attempt for Argentina by Herbert-Schreger
- Raises question: How do these costs influence borrowing
  - Key object in our analysis is the deadweight costs of default
  - How does (or does not) equilibrium behavior minimize on the probability these costs are realized

Some Lessons

- The lender(s)-borrower relationship is not zero sum
  - Government does not "gain" as much in default as lenders lose
  - Deadweight costs reduce total surplus
- Lack of contingency means these costs are realized in equilibrium
- In a competitive equilibrium, only the government can minimize the chance of default
- Outside a competitive equilibrium, there may be Pareto improvements via bargaining or third-party interventions

Some Lessons

- In a competitive equilibrium, only the government can minimize the chance of default
- Security design is critical for aligning incentives
- Government should reap benefit or bear cost of changes in the (marginal) probability of default
- Short-term debt does this
- Long maturity but variable coupon does so as well
- Yield curve not a useful measure of relative marginal cost

IFIs

- Conditionality useful but imperfect proxy for market discipline
- Role for facilitating better security design
- Lender of last resort complicated by use of long-term bonds
- Political economy frictions make access to debt markets potentially welfare reducing
    - Small differences in discount rates get amplified
    - Not an avenue for long-run growth
- Debt sustainability formulas need to incorporate maturity, coupon type, and history

Key Frictions

Partial List

(i) Lack of commitment/enforcement

(ii) Limited state contingency

(iii) An incentive to "dilute" legacy creditors

(iv) Large deadweight costs of default

(v) Vulnerability to self-fulfilling crises

(vi) Currency mismatch

(vii) Political economy distortions

A Simple Framework

- Most of the literature uses medium scale quantitative models
- Black box in terms of analytical tractability
- Introduce a simplified framework that captures much of what's going on
- Allows a focus on core frictions

Small Open Economy

- A SOE faces a large pool of risk-neutral lenders
  - Lenders discount at $r^\star$
  - Government discounts at ρ with $\rho \geq r^\star$
- Government:
  - Constant endowment y
  - Concave felicity function $u(c)$
  - Trades non-contingent bonds with lenders
  - Cannot commit to repayment

Default

- Payoff to default: V^D
- Present value of consuming *fraction* of endowment $(1-\tau)y$
- Deadweight costs due to default
- Key source of risk:
  - V^D varies stochastically
  - "Normal" state is low value (harsh punishment) $V^D = \underline{V}$
  - With probability λ get high value (weak punishment) $V^D = \overline{V}$
- Lenders receive zero in default

Taking Stock

- Framework captures:
  - Lack of commitment
  - Deadweight costs of default: $\overline{V} < u(y)/\rho$
  - Lack of state contingency
  - Political economy frictions if ρ differs from citizens (ignore for now)

Taking Stock

- Framework captures:
  - Lack of commitment
  - Deadweight costs of default: $\overline{V} < u(y)/\rho$
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  - Political economy frictions if ρ differs from citizens (ignore for now)
- Framework misses (among other things):
  - Risk premia
  - Consumption hedging
  - Formal modeling of default/renegotiation/haircuts

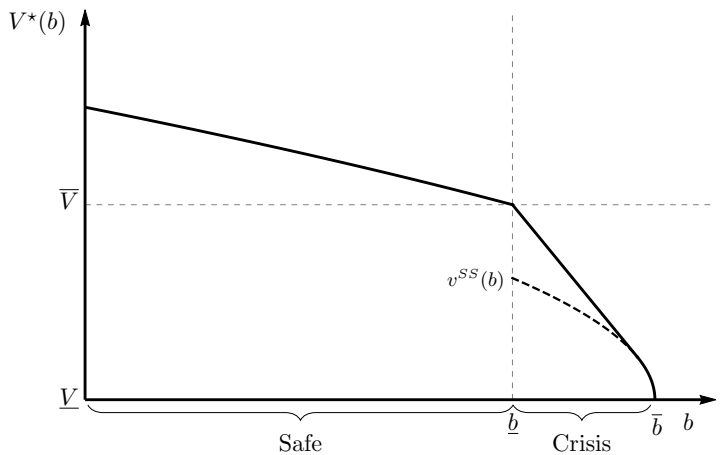
Constrained Efficiency

- First-best:
  - Keep consumption constant until first arrival of $\overline{V}$
  - Adjust to ensure no default
  - Makes consumption contingent
- Constrained efficient with non-contingent lending:
  - "Back load" consumption
  - Government saves to avoid default
  - Race between saving and arrival of $\overline{V}$

Decentralization

- Constrained efficient allocation can be implemented with short-term bonds
- Why does government save?
  - At arrival of $\overline{V}$, government value jumps with default
  - Why not just wait?
- Key is prices

Equilibrium



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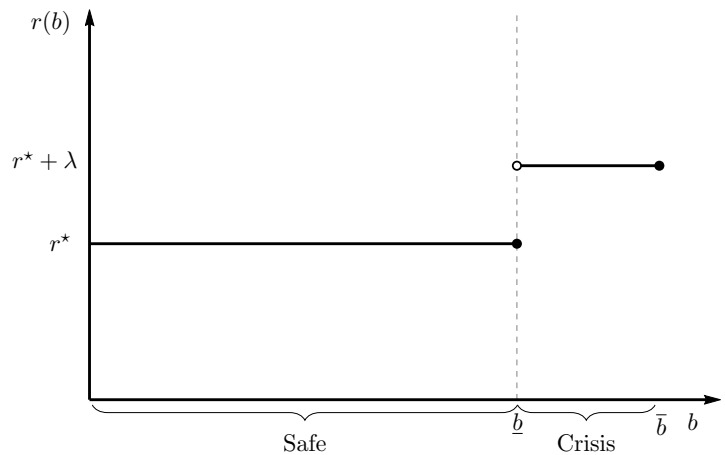

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Incentive to Save

- Consider b just above $\underline{b}$
- $V(b) < \overline{V} = V(\underline{b})$: Jump in value at default
- Why not just wait for $\overline{V}$ and default?
  - Rolling over debt at $r(b) = r^\star + \lambda$
  - If save to $\underline{b}$, roll over at $r(b) = r^\star$
  - Reduce borrowing costs: $\lambda \underline{b}$
- Government *fully* internalizes deadweight cost of default
- Captures *all* the benefits of reducing probability of default
- Prices correctly align incentives between lender and government

Long-maturity Debt

- How does longer maturity affect the alignment between lender and borrower?
- Consider a modify planning problem:
  - Government has legacy long-term bonds b_ℓ
  - Perpetuity that pays coupon $r^\star$
  - Look at a planning problem that maximizes payments to "new" lender subject to government value
- Key difference: For any consumption c, new lender gets $y - c - r^\star b_\ell$

Long-maturity Debt

- Planner has less of an incentive to avoid defaults:
  - Smaller surplus to be split between government and new planner
  - As if $\widehat{y} = y - r^\star b_\ell$ *but only during repayment*
  - Government has same payoff in default regardless of legacy debt
  - Smaller deadweight cost (*ignoring* legacy lender)

Decentralization

- Can decentralize planning problem with legacy bondholders using short-term bonds
- Government only issues or repays ST debt
- Does not trade LT bonds
- Services coupon on long-term debt (and pays principal if maturing)
- Weaker incentive to save: Saves λb_S not $\lambda(b_S + b_\ell)$ by entering Safe Zone

Decentralization

- Government avoids issuing long-term bonds
    - Consistent with data (see Sergio's work with Broner and Lorenzoni)
- Secondary-market yield curve irrelevant for government decisions
- What matters is *marginal* impact of borrowing on prices
- What about debt buybacks to remove legacy debt?

Debt Buybacks

- What if government could exchange b_ℓ for ST bonds?
- After exchange: Implement constrained efficient outcome
- But at what terms?
  - Market exchanges "price in" new efficient allocation
  - b_ℓ worth more at new allocation
  - Make repurchasing bonds expensive
  - Can show never profitable for government
  - Echoes but different from Bulow-Rogoff
- Pareto improving swap at non-market prices possible
  - Requires bargaining or collective exchange

Alternative Mechanisms toward Efficiency

- Fiscal rules: Hard to enforce (see euro zone)
- Conditionality in bond contracts
  - US Liberty bonds – promised to repurchase/exchange if issued new bonds
  - Limits on future fiscal policy hard to enforce
- Floating-rate debt
  - Perpetuity with coupon tied to market rates (default probability)
  - Implements constrained efficient outcome
  - Provides safety from rollover crises

Additional Frictions

- Political economy frictions
- Short-cut to political turnover: Higher discount factor
- With large deadweight costs of default and longer maturity, small differences in discount rates lead to large welfare costs
  - Borrowing satisfies present bias
  - Brings potential default
  - Government strikes balance between two given its own rate of time preference
- With investment: Debt overhang crowds out foreign investment
- Political economy frictions lead to slower growth and "allocation puzzle"