Domestic Debt and Self-Fulfilling Crises

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Motivation

- Sovereign bonds are held by a mix of domestic and foreign investors
  - * Domestic investors are affected by local policy
  - * Government cares about domestic investors
  - * Composition of bondholders affects bond prices

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- Confidence risk could depend on expectations about domestic demand

> Q Is the share of domestic debt efficient?
> Q Can pessimistic expectations about domestic demand induce confidence-driven
> Q fluctuations in prices?

Today

- The standard Eaton and Gersovitz (1981) with domestic and foreign investors

- Study uniqueness and efficiency properties of the equilibria

- Analyze the implications for the optimal design of financial regulation

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  * High foreign debt
  * Low bond prices
  * Contractionary fiscal policy
  * Low domestic demand for bonds

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- Multiple equilibria, where the "bad" equilibrium is characterized by

    * High foreign debt
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    * Contractionary fiscal policy
    * Low domestic demand for bonds

- Multiplicity provides a theory of financial regulation

    * Optimal regulation should be contingent on all possible domestic demand

Model

Two-period model with domestic and foreign investors

- Domestic investors
  * Constant endowment
  * Get lump-sum taxes/transfers
  * Save only using government bonds

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- Benevolent government
  - * Initial foreign debt B_0
  - * Issues an exogenous amount of debt B_1
  - * Cannot do selective default

Uncertainty

- The exogenous utility cost ν the government would face in case of default, such that $\nu \in [\underline{\nu}, \overline{\nu}]$
- ν is drawn from a distribution independent of debt with p.d.f $f(\nu)$

Domestic investors

- Preferences

$$U = u(c_0) + \beta\mathbb{E}[u(c_1(\nu)) - d(\nu)\nu]$$

- Budget constraint of the first period

$$c_0 + qb_1 + T_1 = y$$
$$b_1 \geq 0$$

- Budget in period two at the state ν

$$c_1(\nu) + T_2(\nu) = y + b_1(1 - d(\nu))$$

B_1^D is the aggregate debt held by domestic investors

Foreign investors

- There is a continuum of identical investors that are risk-neutral

- The asset pricing condition for government bonds is therefore

$$q = \mathbb{E}\Big[1 - d(\nu)\Big]\beta$$

Government

- Issues a fixed B_1. The fiscal budget in the first period

$$B_0 = qB_1 + T_1$$

- In the second period, the fiscal budget at each ν is:

$$(1 - d(\nu))B_1 = T_2(\nu)$$

Resource constraints

- Aggregate Resource Constraint.

$$c_0 + B_0 = y + q(B_1 - B_1^D)$$
$$c_1(\nu) = y - (1 - d(\nu))(B_1 - B_1^D)$$

▸ Competitive Equilibrium

Optimal Policy

Problem of the government

- The value function of the government in the second period

$$V(B_1^D, \nu) = \max_{d \in \{0,1\}} (1-d)u(y - B_1 + B_1^D) + d(u(y) - \nu).$$

- I define:

$$\bar{V}(B_1^D) \equiv u(y) - u(y - B_1 + B_1^D)$$

- The government defaults function is

$$d(B_1^D, \nu) = \begin{cases} 1 & \text{if} \quad \nu < \bar{V}(B_1^D), \\ 0 & \text{otherwise.} \end{cases}$$

Problem of foreign investors

- The probability of default is

$$F(\bar{V}(B_1^D)) = \int_{\underline{\nu}}^{\bar{V}(B_1^D)} f(\nu)d\nu$$

- Then, the break-even condition of foreign investors is

$$q(B_1^D) = \beta[1 - F(\bar{V}(B_1^D))]$$

Problem of the domestic investors

- Value function

$$W(B_1^D) = \max_{b_1} u(c_0) + \beta \mathbb{E}[u(c_1(B_1^D, \nu)) - d(B_1^D, \nu)\nu]$$

subject to

$$c_0 + q(B_1^D)b_1 + T_1(B_1^D) = y$$
$$b_1 \geq 0.$$
$$c_1(B_1^D, \nu) + T_2(B_1^D, \nu) = y + (1 - d(B_1^D, \nu))b_1$$

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- FOC:

$$q(B_1^D)u'(c_0(B_1^D)) = \beta[1 - F(\bar{V}(B_1^D))]u'(c_1^R(B_1^D)) + \mu$$
$$0 = b_1\mu.$$

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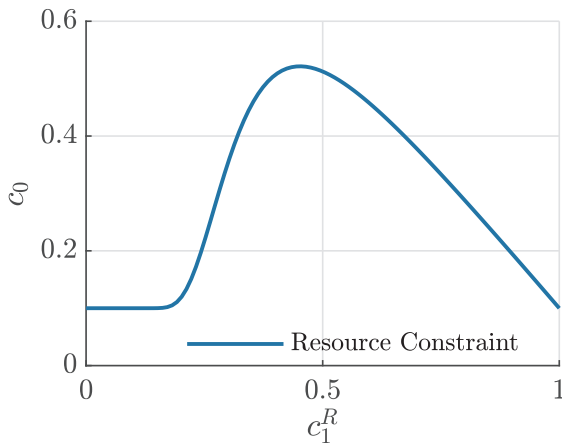$$c_1(B_1^D, \nu) + T_2(B_1^D, \nu) = y + (1 - d(B_1^D, \nu))b_1$$

- FOC:

$$c_0(B_1^D) = c_1^R(B_1^D) \qquad \text{for } \mu = 0$$

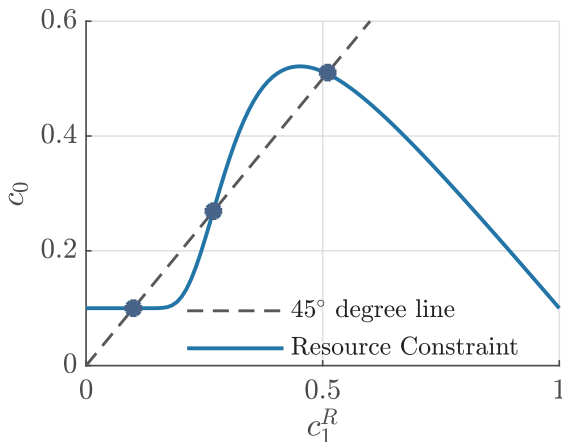▸ Competitive Equilibrium

Multiplicity

Graphical illustration

$$c_0(B_1^D) = y + \beta[1 - F(\bar{V}(B_1^D))](B_1 - B_1^D) - B_0 \qquad c_1^R(B_1^D) = y - B_1 - B_1^D$$

Graphical illustration

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Formalizing the result

Proposition 1. Assume for some level of external debt $B_1 - B_1^D = z \geq 0$

$$u'(y - z)f(u(y) - u(y - z))z - \frac{1 - F(u(y) - u(y - z))}{R} > 1$$

Then, there exists a debt policy $\{B_0, B_1\}$, such that there are multiple Markov equilibria.

Normative Analysis

Constrained efficiency

- Value function

$$V = \max_{B_1^D} u(c_0) + \beta \mathbb{E}[u(c_1(\nu, B_1^D)) - d(\nu, B_1^D)\nu]$$

subject to

$$c_0 + q(B_1^D)(B_1 - B_1^D) = y - B_0$$
$$c_1(\nu, B_1^D) + (1 - d(\nu, B_1^D))(B_1 - B_1^D) = y$$
$$B_1^D > 0$$

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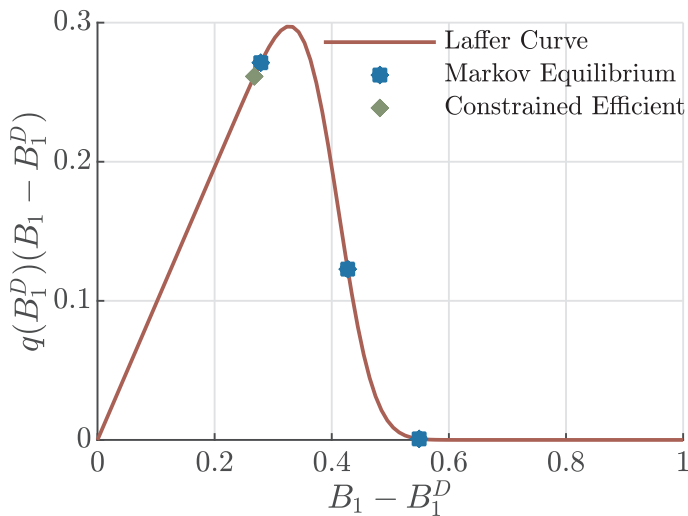$$c_1(\nu, B_1^D) + (1 - d(\nu, B_1^D))(B_1 - B_1^D) = y$$
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- FOC

$$\left[\frac{\partial q(B_1^D)}{\partial B_1^D}B_1^D + q(B_1^D)\right] u'(c_0(B_1^D)) = \beta[1 - F(\bar{V}(B_1^D))]u'(c_1^R(B_1^D)) + \mu^{SP}$$
$$0 = B_1^D \mu^{SP}.$$

Proposition 2. The decentralized Markov Equilibrium is not constrained efficient.

Policy Implications

Financial repression

The budget constraint of the government in the first period would be

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The problem of the domestic investor

$$W = \max_{b_1} u(c_0) + \beta \mathbb{E}[u(c_1(\nu)) - d(\nu)\nu],$$

subject to

$$c_0 + (1 - \tau(B_1^D))qb_1 + T_1(B_1^D) = y \qquad (\lambda_1)$$

$$c_1(\nu) + T_2(\nu) = y + (1 - d(\nu))b_1 \qquad (\lambda_2)$$

$$b_1 \geq 0. \qquad (\mu)$$

Efficiency of financial regulation

- State-contingent subsidy on debt

  Proposition 3. *The Markov equilibrium of a regulated economy with a state-contingent subsidy on government bonds is not, in general, constrained efficient.*

- Subsidy contingent on all possible domestic demand

  Proposition 4. *The constrained efficient allocations can be implemented with an appropriate subsidy on debt contingent on the domestic demand for government bonds, with revenue collected with lump-sum taxes.*

Conclusions

- Domestic debt is inefficiently low

- The model supports multiple equilibria

- Multiplicity comes from the reinforcement loop between bond prices and the composition of bondholders

- The existence of multiple equilibria provides a theory of financial regulation

- The government requires a complex set of policy tools to select the best outcome

Competitive Equilibrium

Definition 1. Given a debt policy $\{B_0, B_1\}$, an equilibrium consists of a price, government policies, and household policies such that

  i households solve their problem at every state, and $\{W\}$ attains the maximum;

 ii q satisfies the break-even condition of international investors;

iii the government budget is balanced;

 iv market clears: $B_1^D = b_1$.

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Markov equilibrium

Given a debt policy $\{B_0, B_1\}$, a Markov perfect equilibrium is defined by a set of strategies, value functions, and a price such that

  i domestic investors solve their problem at every state;

 ii q satisfies the break-even condition of international investors;

iii the government solves problem at every state;

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Eaton, J. and Gersovitz, M. (1981). Debt with Potential Repudiation: Theoretical and Empirical Analysis. *Review of Economic Studies*, 48(2):289–309.