On the optimal design of a Financial Stability Fund

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[1] **Opinions expressed here are those of the discussant. They do not necessarily coincide with the views of the Banco de España or the Eurosystem.**

Motivation: Better risk sharing in Europe?

- *Status quo*: **Defaultable sovereign bonds**
  - Possible improvement: **Complete risk sharing contract**
  - Contract can also be **decentralized** as a market outcome
- **This paper:**
  - Quantitative model of possible gains from better risk sharing in Europe
  - Framework for assessing alternative risk-sharing institutions
  - Comparing "ESM" with "FSF" (??)

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- **This paper:**
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  - Framework for assessing alternative risk-sharing institutions
  - Comparing "ESM" with "FSF" (??)
- **Interesting, timely, policy-relevant** application of recursive contract theory!

STATUS QUO: DEFAULTABLE SOVEREIGN DEBT

Defaultable debt economy

- Borrower's value:

$$V^b(b,s) \;=\; \max\{V_n^b(b,s), V^a(s)\} \quad \text{where } s \equiv (\theta, G)$$

- Value of repaying

$$V_n^b(b,s) \;=\; \max_{c,n,e,b'} \left\{ u(c) + h(1-n) - v(e) + \beta E \left[V^b(b',s') \middle| s, e \right] \right\}$$

$$\text{s.t.} \quad c + G + q(s,b,b')(b' - \delta b) \leq \theta f(n) + (1 - \delta(1-\kappa))b$$

- Value of default/autarky:

$$V^a(s) \;=\; \max_{c,n,e} \left\{ u(c) + h(1-n) - v(e) + \beta E \left[(1-\lambda)V^a(s') + \lambda V^b(0,s') | s, e \right] \right\}$$

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- Market value of defaultable bond:

$$q(s,b,b') \;=\; \frac{E\left[(1-\delta) + \delta(\kappa + q(s',b',b(s',b'))\mathbf{1}(V^a(s') > V_n^b(b',s')) | s, e(s,b) \right]}{1+r}$$

ALTERNATIVE:
"FINANCIAL STABILITY FUND"

Guess/verify approach to a recursive risk-sharing contract

1. Conjecture that the value of the optimal contract can be written with **Pareto weights as state variables** in the value functions:
   - Borrower's value:
     $V^{bf}(s^t) = V^{bf}(\mu_t^b, \mu_t^l, s_t)$
   - Lender's value:
     $V^{lf}(s^t) = V^{lf}(\mu_t^b, \mu_t^l, s_t)$
2. Write the planning problem subject to the appropriate constraints:
   - Participation constraint of borrower
   - Incentive compatibility constraint for borrower's effort
   - Participation constraint of lender
3. Rewrite as a Lagrangian saddle point problem
4. Collect value functions on the right hand side in order to identify the updating equations for the planner's Pareto weights
5. Reduce dimensionality by restating the equation in terms of the relative Pareto weight of the borrower

Constrained-optimal risk sharing: Planner's problem

- Planner's value:

$$\mu_0^b V^{bf}(s_0) + \mu_0^l V^{lf}(s_0) = \max_{c,n,e} \Big\{ \mu_0^b \Big[u(c) + h(1-n) - v(e) + \beta E \Big(V^{bf}(s^1) \Big| s_0, e \Big) \Big]$$
$$+ \ \mu_0^l \Big[\theta f(n) - c - G_0 + \frac{1}{1+r} E \Big(V^{lf}(s^1) \Big| s_0, e \Big) \Big] \Big\}$$
$$\text{s.t.} \quad u(c) + h(1-n) - v(e) + \beta E \Big(V^{bf}(s^1) \Big| s_0, e \Big) \ \geq \ V^a(s_0) \quad (1)$$
$$\text{and} \quad \theta f(n) - c - G_0 + \frac{1}{1+r} E \Big(V^{lf}(s^1) \Big| s_0, e \Big) \ \geq \ Z \quad (2)$$
$$\text{and} \quad \beta E \left(\frac{\partial \pi(s^1 | s_0, e) / \partial e}{\pi(s^1 | s_0, e)} V^{bf}(s^1) \Big| s_0, e \right) \ = \ v'(e) \quad (3)$$

- Multipliers are γ^b, γ^l, ξ on (1)-(3)

Rewrite as a saddle-point problem

- Planner's value:

$$
\begin{aligned}
&\mu_0^b V^{bf}(s_0) + \mu_0^l V^{lf}(s_0) \\
&\quad = \min_{\gamma^b,\gamma^l,\xi} \max_{c,n,e} \Bigg\{ \mu_0^b \left[u(c) + h(1-n) - v(e) + \beta E\left(V^{bf}(s^1) \middle| s_0, e \right) \right] \\
&\qquad + \mu_0^b \left[\theta f(n) - c - G_0 + \frac{1}{1+r} E\left(V^{lf}(s^1) \middle| s_0, e \right) \right] \\
&\qquad + \gamma^b \left[u(c) + h(1-n) - v(e) + \beta E\left(V^{bf}(s^1) \middle| s_0, e \right) - V^a(s_0) \right] \\
&\qquad + \gamma^l \left[\theta f(n) - c - G_0 + \frac{1}{1+r} E\left(V^{lf}(s^1) \middle| s_0, e \right) - Z \right] \\
&\qquad + \xi \left[\beta E\left(\frac{\partial \pi(s^1|s_0, e)/\partial e}{\pi(s^1|s_0, e)} V^{bf}(s^1) \middle| s_0, e \right) - v'(e) \right] \Bigg\}
\end{aligned}
$$

- Multipliers are γ^b, γ^l, ξ on (1)-(3)

Collect terms on the right

- Planner's value:

$$\mu_0^b V^{bf}(s_0) + \mu_0^l V^{lf}(s_0)$$
$$= \min_{\gamma^b,\gamma^l,\xi} \max_{c,n,e} \Bigg\{ (\mu_0^b + \gamma^b)(u(c) + h(1-n) - v(e)) - \gamma^b V^a(s_0)$$
$$+ (\mu_0^l + \gamma^l)(\theta f(n) - c - G_0) - \gamma^l Z - \xi v'(e)$$
$$+ \beta E\left(\left(\mu_0^b + \gamma^b + \xi \frac{\partial \pi(s^1|s_0,e)/\partial e}{\pi(s^1|s_0,e)}\right) V^{bf}(s^1) \Big| s_0, e\right)$$
$$+ (\mu_0^l + \gamma^l)\frac{1}{1+r} E\left(V^{lf}(s^1) \Big| s_0, e\right) \Bigg\}$$

- Now check our guess:
  - $V^{bf}(s^t) = \tilde{V}^{bf}(\mu_t^b, \mu_t^l, s_t)$?
  - $V^{lf}(s^t) = \tilde{V}^{lf}(\mu_t^b, \mu_t^l, s_t)$?

Evolution of the planner's weights

- Planner's value can be rewritten as:

$$\mu_0^b \tilde{V}^{bf}(\mu_0^b, \mu_0^l, s_0) + \mu_0^l \tilde{V}^{lf}(\mu_0^b, \mu_0^l, s_0)$$
$$= \min_{\gamma^b, \gamma^l, \xi} \max_{c,n,e} \Big\{ (\mu_0^b + \gamma^b)(u(c) + h(1-n) - v(e)) - \gamma^b V^a(s_0)$$
$$+ (\mu_0^l + \gamma^l)(\theta f(n) - c - G_0) - \gamma_l Z - \xi v'(e)$$
$$+ \frac{1}{1+r} E\left(\mu_1^b \tilde{V}^{bf}(\mu_1^b, \mu_1^l, s_1) + \mu_1^l \tilde{V}^{lf}(\mu_1^b, \mu_1^l, s_1) \Big| s_0, e \right) \Big\} ,$$

- ... if the weights evolve as follows:
  - $\mu_{t+1}^l = \mu_t^l + \gamma_t^l$
  - $\mu_{t+1}^b = \beta(1+r)\left(\mu_t^b + \gamma_t^b + \xi \frac{\partial \pi(s^1|s_0,e)/\partial e}{\pi(s^1|s_0,e)} \right)$

Reducing the dimension of the recursive problem

- Substitutions:
  - $x_t \equiv \mu_t^b / \mu_t^l$
  - $\nu_t^l \equiv \gamma_t^l / \mu_t^l$
  - $\nu_t^b \equiv \gamma_t^b / \mu_t^b$
  - $\tilde{\xi}_t \equiv \xi_t / \mu_t^b$
- Now the planner's problem is:

$$x_0 \tilde{V}^{bf}(x_0, s_0) + \tilde{V}^{lf}(x_0, s_0)$$

$$= \min_{\nu^b, \nu^l, \tilde{\xi}} \max_{c,n,e} \Big\{ x_0(1+\nu^b)(u(c) + h(1-n) - v(e)) - \nu^b V^a(s_0)$$

$$+ \ (1+\nu^l)(\theta f(n) - c - G_0) - \nu^l Z - \tilde{\xi} v'(e)$$

$$+ \ \frac{1}{1+r} E\left(x_1 \tilde{V}^{bf}(x_1, s_1) + \tilde{V}^{lf}(x_1, s_1) \Big| \, s_0, e \right) \Big\} \ ,$$

- Evolution of the relative Pareto weight:
  - $x_{t+1} = \frac{\mu_{t+1}^b}{\mu_{t+1}^l} = \frac{\beta(1+r)\left(x_t + \nu_t^b + \tilde{\xi}_t \frac{\partial \pi(s^1|s_0,e)/\partial e}{\pi(s^1|s_0,e)} \right)}{1+\nu_t^l}$

Comment: try to lighten the notation!

- **This is an applied paper.**
  - For the theory, see Marcet/Marimon.
  - This paper should simplify presentation as much as possible.

- No need to start from the sequence problem.
- Just **conjecture that value can be written as a function of Pareto weights**, jump directly to recursive description.

Main comments: What's the goal of the paper?

- **We already know** risk sharing is beneficial in theory.
    - What's new here? What do we learn about Europe?

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- **We already know** risk sharing is beneficial in theory.
  - What's new here? What do we learn about Europe?
- Is this a **quantitative evaluation of potential gains** from European risk sharing?
  - Consider partial default
  - Consider contagion
  - How important is default penalty θ^p?
- Is this a **recommendation about the optimal institutional framework** for European governance?
  - What institutions might implement this solution?
  - Can this solution be summarized by a simple rule?
  - What markets/assets might decentralize this?
  - Be much, much more specific!
- **What else is missing here?**

Quantitative issues (1)

- What's the *status quo*?
  - **Several peripheral countries have already restructured/defaulted** on sovereign debt
  - None have permanently left the Eurozone or entered "autarky"
- Model partial default and restructuring as a bargaining game?
  - Value of default is restructuring, not autarky
  - Borrower and lender must propose a haircut for $t+1$
  - Must agree that **haircut will be implemented if** G_{t+1} **is low enough**
  - This agreement must elicit sufficient (unobservable) effort
  - If realized G_{t+1} is too high, renegotiation continues
  - Hence duration of renegotiation is endogenous
- Can restructuring game be written as a recursive contract?
  - **If renegotiation game is the status quo, how large are the gains from establishing the FSF?**

Quantitative issues (2)

- Default has **productivity penalty**: $\theta^p(\theta)$
  - **Why?**
  - Disruption of private financial markets?
- By assumption, no outcome in the FSF environment has a productivity penalty
  - **Why?**
- **Is the penalty important** for your quantitative results?

Quantitative issues (2)

- Default has **productivity penalty**: $\theta^p(\theta)$
  - **Why?**
  - Disruption of private financial markets?
- By assumption, no outcome in the FSF environment has a productivity penalty
  - **Why?**
- **Is the penalty important** for your quantitative results?
- **Default affects productivity of defaulter only**
- Higher debt of country i affects premium of country i only
- What about **contagion**?
  - With contagion, lender's threat point may decrease: $Z < 0$
  - And Z might be endogenous

Institutional issues

- **What does this look like in practice?**
- Is this a proposal about **how the ESM should operate**?
  - What sort of agreement is the ESM offering to member governments?
  - **Which observable events** do you think the ESM can condition on?
    - GDP growth?
    - Government spending?
  - Can you summarize this as a simple rule?
    - Is the rule history dependent?
- **Is this really market based?**
  - Arrow-Debreu assets: bonds linked to quantiles of GDP performance?
  - Would Arrow-Debreu markets be less liquid?
  - Are you just advocating **simple GDP-linked bonds?**
  - If so, why isn't the market doing this already?
- **Be much, much more specific!**

What else is missing here?

- What does this have to do with **"financial stability"**?
- Are "financial" shocks exogenous?
- ECB has played a role of **providing liquidity**, but there is no concept of liquidity in your model
- **Would be nice to use recursive contracting techniques in a model with more financial details**

THANKS FOR YOUR ATTENTION!