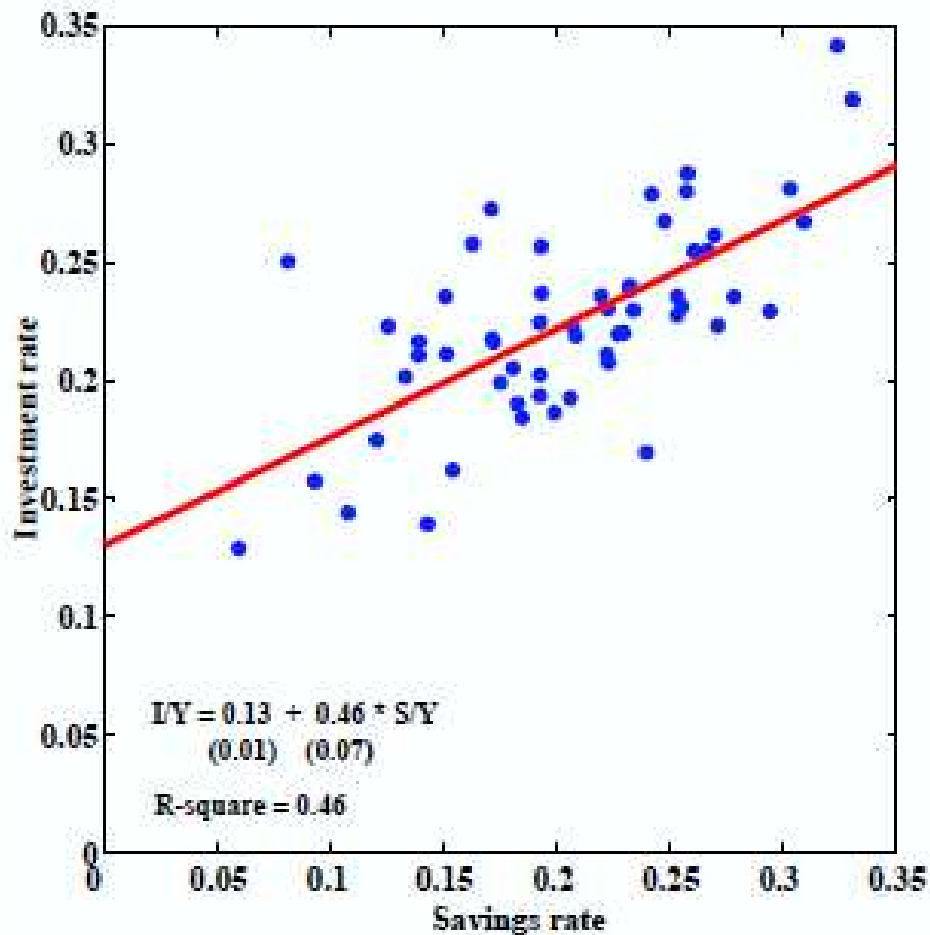


Can Financial Frictions Account for the Cross-Section Feldstein-Horioka Puzzle?

Yan Bai and Jing Zhang, 2005
Discussed by Frederic Lambert

The Feldstein-Horioka regression



Note:

The regression sample: 57 countries over the period from 1960 to 2000.

Objective and result

- Explore the role of financial frictions in accounting for the Feldstein-Horioka puzzle
- Two frictions:
 1. Incomplete markets (Aiyagari-Bewley model)
 2. Limited enforcement

Main result

- Both frictions are needed to account for the Feldstein-Horioka puzzle

Benchmark environment: Complete markets

- Production economy in a continuum of small open economies framework

- **Technology:** $AK^\alpha L^{1-\alpha}$

$A_t = (1 + g_a)^t a_t$ is country-specific and stochastic

No aggregate uncertainty

- **Preferences:** $\sum_{t=0}^{\infty} \sum_{a^t} \beta^t \pi(a^t) u(c^i(a^t))$ with $u(c) = \frac{c^{1-\sigma} - 1}{1-\sigma}$

- **Budget constraint:**

$$\begin{aligned} c^i(a^t) + k^i(a^t) - (1 - \delta)k^i(a^{t-1}) + \sum_{a_{t+1}|a_t} q(a_{t+1}, a_t) b^i(a_{t+1}, a^t) \\ = a_t^i k^i(a^{t-1})^\alpha + b^i(a_t, a^{t-1}) \end{aligned}$$

- **Borrowing constraint:** $b^i(a^t) \geq B$

Complete markets: Results

- Consumption in each country is constant over time and across states
- Capital flows across countries equalize return to capital
- Average cross-section correlation coefficient between savings and investment rates = 0.001 (standard deviation = 0.02)

⇒ **Feldstein-Horioka puzzle**

Bond economy with natural borrowing constraints

- Restrict assets traded to risk-free bonds
- The problem becomes:

$$V(a, k, b) = \max \left\{ \frac{c^{1-\sigma} - 1}{1-\sigma} + \beta \sum_{a'|a} \pi(a'|a) V(a', k', b') \right\},$$

$$\text{subject to } c + k' - (1 - \delta)k + b' \leq ak^\alpha + Rb,$$

$$b' \geq \hat{B}(a, k')$$

Bond economy with natural borrowing constraints

Algorithm

1. Guess a world interest rate R
2. Compute the decision rules c, k', b' for each state (a, k, b)
3. Compute the invariant distribution $\lambda^*(a, k, b)$
4. Check whether the excess demand of bonds clears. If not, update R until the bond market clears.

Results

Average cross-section correlation coefficient between savings and investment rates = 0.06 (standard deviation = 0.02)

⇒ **still not Feldstein-Horioka result**

Bond economy with enforcement constraints

- Assets traded still limited to risk-free bonds
- Add enforcement constraints: Let $x \equiv \{c(a^t), k(a^t), b(a^t)\}$

$$U(a^{t+1}, x) \geq V^{aut}(a_{t+1}, k(a^t)), \quad \forall a^{t+1} | a^t$$

where

$$U(a^{t+1}, x) \equiv \sum_{\tau \geq t+1} \sum_{a^\tau | a^t} \beta^{\tau-(t+1)} \pi(a^\tau | a^t) u(c(a^\tau))$$

$$V^{aut}(a_{t+1}, k(a^t)) \equiv \max \sum_{\tau \geq t+1} \sum_{a^\tau | a^t} \beta^{\tau-(t+1)} \pi(a^\tau | a^t) u(c(a^\tau))$$

$$\text{subject to } c(a^\tau) + k(a^\tau) - (1 - \delta)k(a^{\tau-1}) \leq a_\tau k(a^{\tau-1})^\alpha$$

Bond economy with enforcement constraints: Computational method

- The original problem:

$$\begin{aligned} & \max_x \sum_{t=0}^{\infty} \sum_{a^t} \beta^t \pi(a^t) u(c(a^t)), \\ & \text{s.t. } c(a^t) + k(a^t) - (1 - \delta)k(a^{t-1}) + b(a^t) \leq ak(a^{t-1})^\alpha + Rb(a^{t-1}), \\ & \quad U(a^{t+1}, x) \geq V^{aut}(a_{t+1}, k(a^t)), \quad \forall a^{t+1} | a^t \\ & \quad b(a^t) \geq D \end{aligned}$$

- The transformed problem:

$$\begin{aligned} W(a_0, k_0, b_0; B^*) &= \max_{c(a^t), k(a^t), b(a^t)} \sum_{t=0}^{\infty} \sum_{a^t} \beta^t \pi(a^t) u(c(a^t)) \\ & \text{s.t. } c(a^t) + k(a^t) - (1 - \delta)k(a^{t-1}) + b(a^t) \leq ak(a^{t-1})^\alpha + Rb(a^{t-1}), \\ & \quad b(a^t) \geq B^*(a_t, k(a^t)) \end{aligned}$$

- Any allocation is optimal in the transformed problem if and only if it is optimal in the original problem.

Bond economy with enforcement constraints

Algorithm

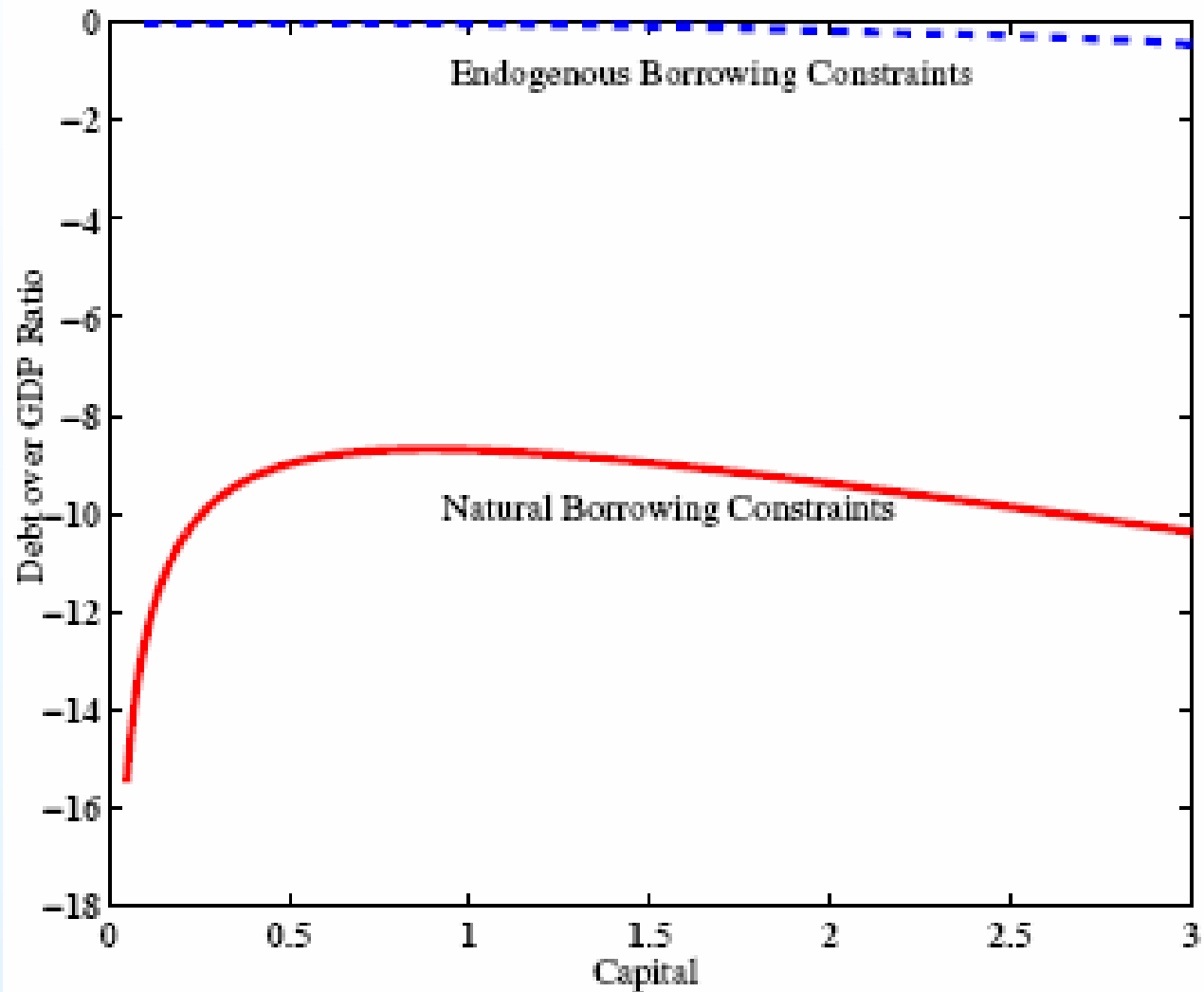
1. Guess a world interest rate R and an initial debt limit function B_0
2. Solve for the value function $W(a, k, b; B_j)$ and policy functions $\{c, k', b'\}$
3. The new debt limit is given by
$$B_{j+1}(a, k') = \max_{a'} \{\hat{b} : W(a', k', \hat{b}; B_j) = V^{aut}(a', k')\}$$
4. Repeat until the debt limit converges
5. Compute the invariant distribution
6. Check that the bond market clears. If not, update R until the market clears.

Results

Average cross-section correlation coefficient between savings and investment rates = 0.51 (standard deviation = 0.05)

⇒ **Feldstein-Horioka puzzle is solved!**

Endogenous and natural borrowing constraints



Outstanding questions

- Other ways to tighten borrowing constraints?
 - renegotiation proof
 - finite punishment
- Do frictions vary with stage of development?
Are rich and poor countries different?