Sovereign Cocos

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The contribution

- Present a model to quantitatively assess contingent convertible bonds (cocos)

+ Reduces frequency of defaults triggered by liquidity shocks

– Increases debt, default, and borrowing costs

Outline of discussion

- Simple model to build intuition
- Overview of model and main results
- Optimal cocos?

A simple model

- Three periods $t = 0, 1, 2$
- Lender (risk-averse, patient) has constant endowments
- Borrower (risk-averse, impatient) faces liquidity shocks in $t = 1$
- "Long term" debt b at price q pays $b/2$ in $t = 1, 2$
- Coco: suspend debt payment (and roll over) if liquidity shock

First, a simple model without cocos

- Lender solves

$$\max_b u(1 - qb) + u\left(1 + \frac{b}{2}\right) + u\left(1 + \frac{b}{2}\right)$$

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- Let $u(c) = Ac - \frac{\phi}{2}c^2$, with $A > \phi$
- Debt supply is given by

$$b_\ell(q) = \frac{2(1-q)}{2q^2+1}\left[\frac{A}{\phi} - 1\right] \tag{1}$$

- Notice that $b_\ell(0) = 2\left[\frac{A}{\phi} - 1\right]$ and $b_\ell(1) = 0$

Simple model without cocos

- Borrower faces a liquidity crisis in $t = 1$ with probability π
- Borrower solves

$$\max_b u(1+qb) + \beta(1-\pi)\left[u\left(1-\frac{b}{2}\right) + u\left(1-\frac{b}{2}\right)\right] \\ + \beta\pi\left[u\left(1-\ell-\frac{b}{2}\right) + u\left(1+\ell-\frac{b}{2}\right)\right]$$

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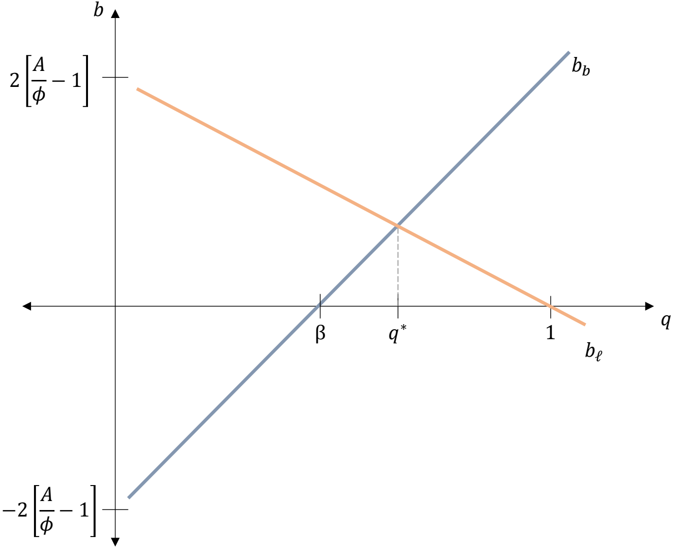
$$+ \beta\pi\left[u\left(1-\ell-\frac{b}{2}\right) + u\left(1+\ell-\frac{b}{2}\right)\right]$$

- Debt demand is given by

$$b_b(q) = \frac{2\left[q-\beta\right]\left[\frac{A}{\phi}-1\right]}{2q^2+\beta} \tag{2}$$

- Notice that $b_b(0) = -2\left[\frac{A}{\phi}-1\right]$ and $b_b(\beta) = 0$

Debt market equilibrium



Now, a simple model with cocos

- Coco: suspend debt payment (and roll over) if liquidity shock
- Lender solves

$$\max_b u(1 - qb) + (1 - \pi)\left[u\left(1 + \frac{b}{2}\right) + u\left(1 + \frac{b}{2}\right)\right] + \pi\left[u(1) + u(1 + b)\right]$$

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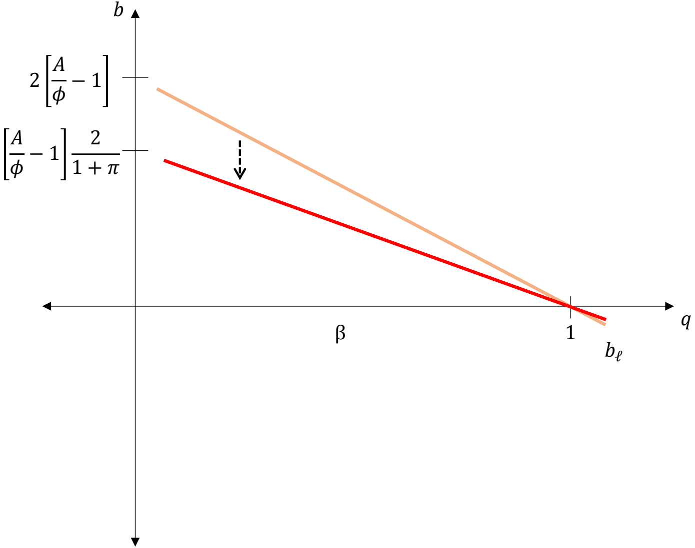
- Debt supply is given by

$$b_\ell^c(q) = \frac{2(1-q)}{2q^2+1+\pi}\left[\frac{A}{\phi}-1\right] > b_\ell(q) \qquad (3)$$

- For the same q, the lender is willing to lend *less*

Debt supply with cocos



Simple model with cocos

- Borrower solves

$$\max_b u(1+qb) + \beta(1-\pi)\left[u\left(1-\frac{b}{2}\right) + u\left(1-\frac{b}{2}\right)\right] + \beta\pi\left[u\left(1-\ell\right) + u\left(1+\ell-b\right)\right]$$

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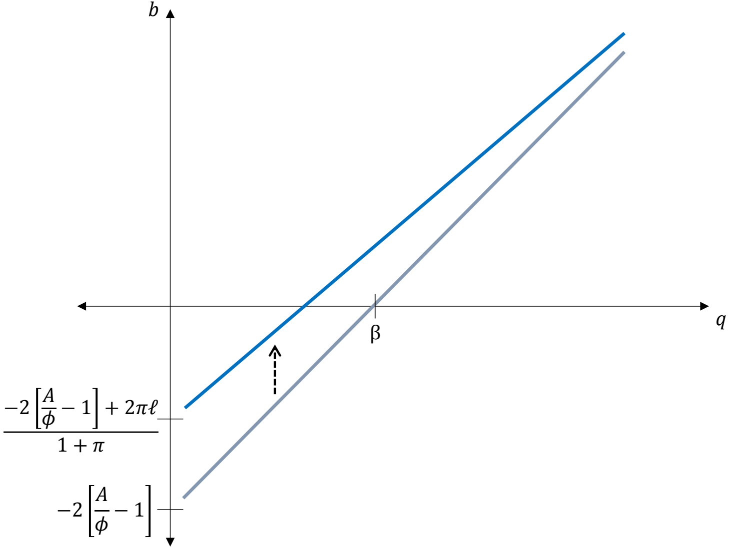
- Debt demand is given by

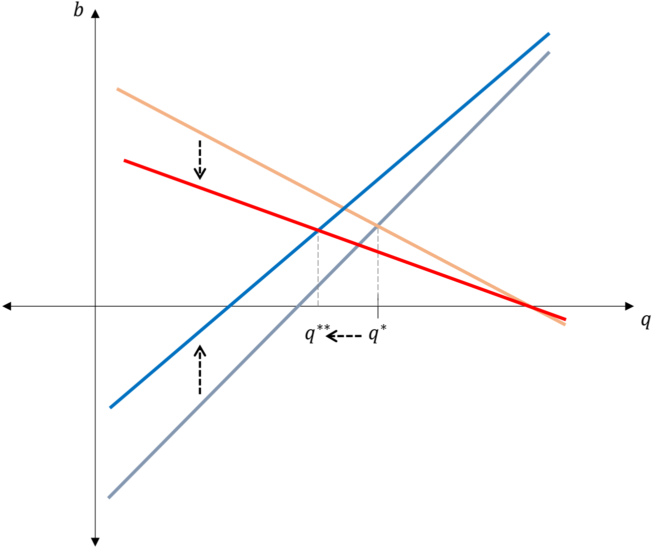
$$b_b^c(q) = \frac{2\left(q-\beta\right)\left[\frac{A}{\phi}-1\right] + 2\beta\pi\ell}{2q^2 + \beta(1+\pi)} \tag{4}$$

- Notice that $b_b^c(\beta) > b_b(\beta)$ and $b_b^c(0) > b_b(0)$

Debt demand with cocos



Borrowing costs rise with cocos



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  - debt certainly goes up
- In general, need quantitative model
  - how do cocos interact with default!

The quantitative model

- Hatchondo and Martinez (2009): long term debt and default
- \+ Global and local liquidity shocks
- \+ Cocos
  - suspend current debt payments
  - roll over existing debt at fixed rate r
  - can still issue new debt

Cocos

- Automatically triggered by local and global shocks
- Should debt suspension be a choice?
- Another form of default
- Does it entail costs: loss in confidence, reputation, etc.

Global shocks

- Global risk premium shock $p = 0 \to 1$
- Stochastic discount factor

$$M(\varepsilon, p) = e^{-r-p\left(\alpha\varepsilon' + \frac{\alpha^2\sigma_\varepsilon^2}{2}\right)}$$

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- Equivalent to shock to lender risk aversion $\alpha = 0 \to 23$
- What are these shocks to lender risk aversion?
  - might they be correlated with other shocks?
- Risk premia moves endogenously, even without these shocks
- Condition cocos on endogenous movements

Local shocks

- Normal times budget constraint $(p = 0, \ell = 0)$

$$c = y - b\delta + q(b', y, p, \ell)(b' - (1 - \delta)b)$$

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- Liquidity shock (with cocos)

$$c = y + q(b', y, p, \ell)(b' - b(1+r)) - \ell$$

Local shocks (2)

- Are some local liquidity shocks a choice? (financial bailouts)
- Difficult to define contingency
- Obviously natural disasters are easier to define, but rare
- Reinforces idea that trigger should be a choice, with associated costs that may differ from outright default

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- Comment 2: why not partial default
  - recovery rates are 50 percent (Benjamin and Wright 2009)
  - Hur, Kondo, Perri (2017) use very tractable way of modeling partial default

Main results

- Simulation with cocos
  - debt higher
  - spreads higher
  - defaults slightly higher
  - small change in welfare

Optimal cocos?

- Can we use model to optimally design cocos?
  - debt suspension choice and cost
  - rollover interest rate r^c
- Which type of shocks should activate cocos?
  - global risk premia shocks not ideal: lenders are "hungry"
  - local shocks are more ideal, but more difficult to verify

Summary

- Useful paper to think about contingent instruments missing in sovereign debt literature
- Beyond cocos: optimal contingent debt contracts