Central Bank Swap Lines as Bilateral Sovereign Debt

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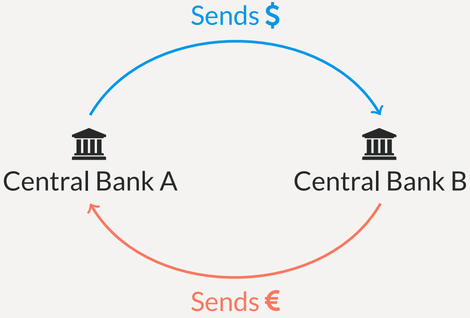
What is a Central Bank swap?

Swaps are symmetric currency exchanges

- A swap line is a contract between two Central Banks
- When activated, each institution provides an amount of its currency to the counterparty
- At maturity, positions are undone



- Symmetric swaps (AE-AE) potentially very different from asymmetric ones (AE-EM)

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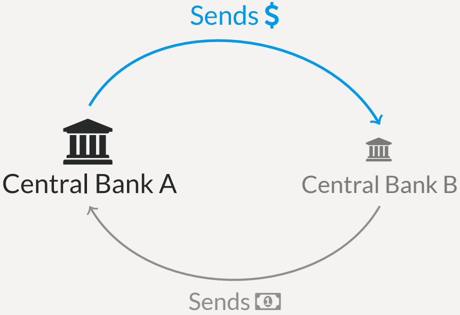

which can be asymmetric in practice

- The Fed doesn't really want Mexico's pesos

  … treats them more like collateral

- Mexican authorities may need dollars for their BoP

  … more similar to borrowed reserves

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How are Central Bank Swap Lines different from Sovereign Debt?

For an EM using the swap line to borrow from an AE

Regular debt (bond markets)	Bilateral loan (swap line)
• Defaultable	• Non-defaulteable (Central Bank)
• Many different lenders	• No coordination issues
• Interest rate (spreads) mainly reflects default risk	• Can be used to curb default risk
	• Interest rate?

How do Central Bank Swap Lines interact with Sovereign Debt?

Main findings

- One type of debt affects borrowing conditions for the other
  - Borrowing from the market serves as explicit threat in swap negotiations
  - Swap can be used when spreads on the market are high
- Lending around or in default maximizes surplus for bilateral loans
- Without restricting swaps in default, welfare losses for government
- Bilateral debt worsens the debt dilution problem

Literature

Roadmap

Model with Swaps only

Model with Swaps and Debt

Concluding remarks

Model with Swaps only

Environment

The government of a small open economy borrows from a monopolist

- Income $y(z_t)$ follows an AR(1) process in logs
- Renegotiate the swap m each period
  ... Involves a transfer x and a new loan size m'
- The swap is non-defaultable
  ... Repaying the whole amount is a natural threat point

- Should expect
  ... Interest rate to vary over time
  ... Interest rate to reflect market power
  ... Interest rate to reflect outside options

$$x = \frac{1}{1+r} m' - m$$

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Bargaining stage with monopolist

- At income state z and loan m, solve

$$\max_{x,m'} \mathcal{L}(x,m,m',z)^{\theta} \times \mathcal{B}(x,m,m',z)^{1-\theta}$$

- Government (borrower) surplus

$$\mathcal{B}(x,m,m',z) = \underbrace{u(y(z)+x) + \beta\mathbb{E}\left[v(m',z') \mid z\right]}_{\text{agreement: receive } x \text{, owe } m'} - \underbrace{\left(u(y(z)-m) + \beta\mathbb{E}\left[v(0,z') \mid z\right]\right)}_{\text{threat point: repay } m \text{, clean slate}}$$

- Lender surplus

$$\mathcal{L}(x,m,m',z) = \underbrace{a - x + \beta_L\mathbb{E}\left[h(m',z') \mid z\right]}_{\text{agreement}} - \underbrace{\left(a + m + \beta_L\mathbb{E}\left[h(0,z') \mid z\right]\right)}_{\text{threat point}}$$

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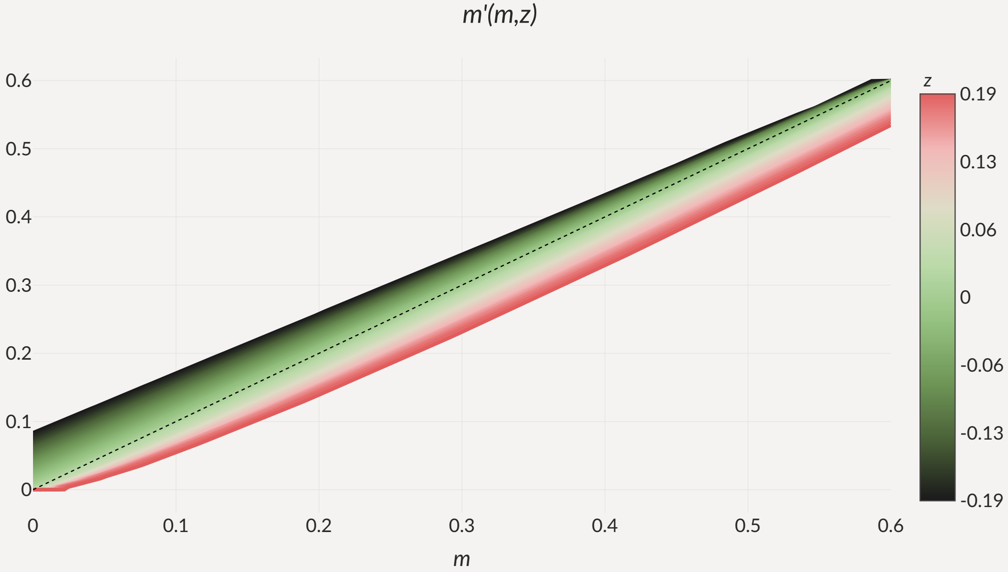
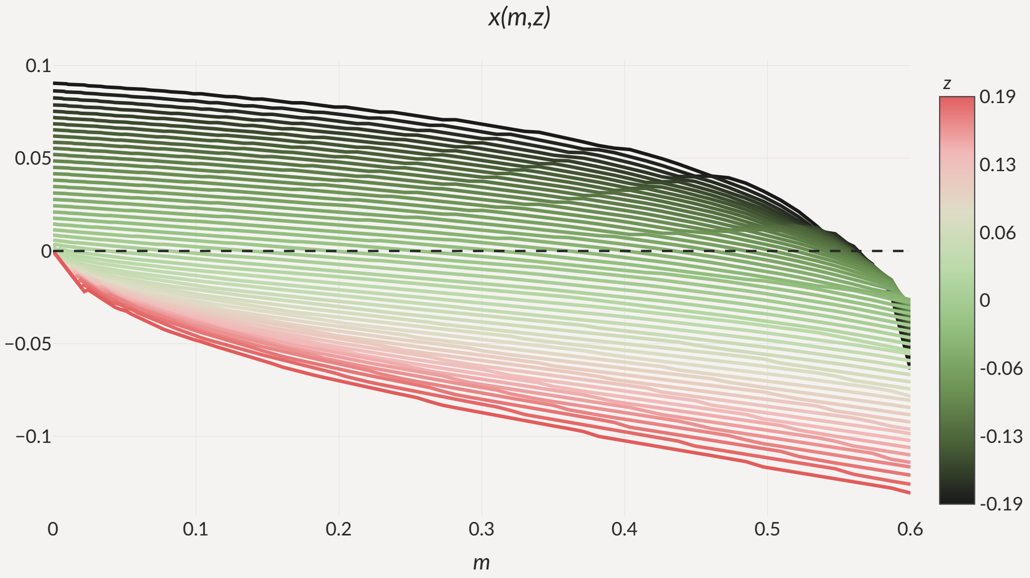
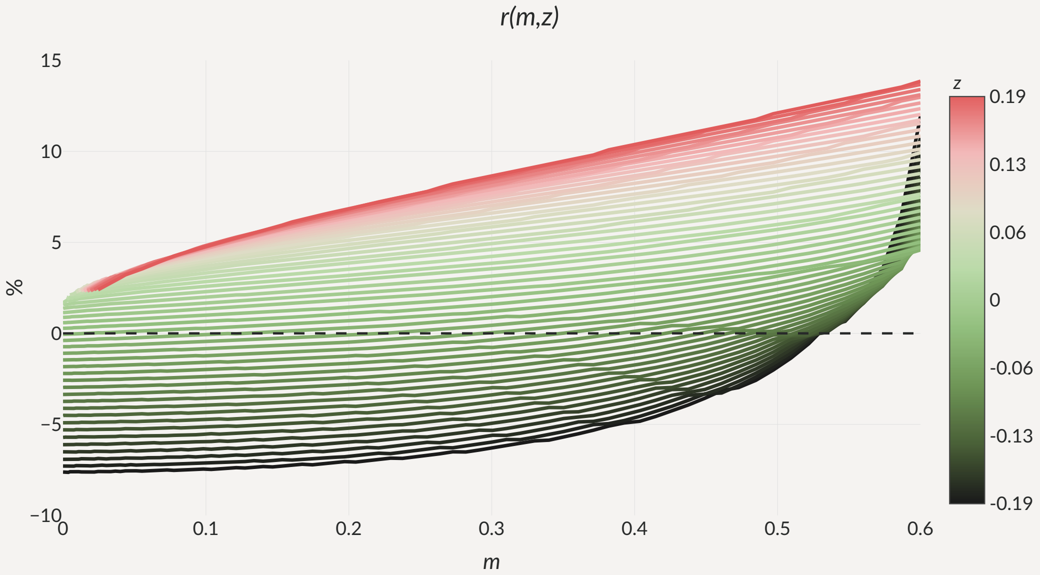
Swap Line Terms: Loan Dynamics



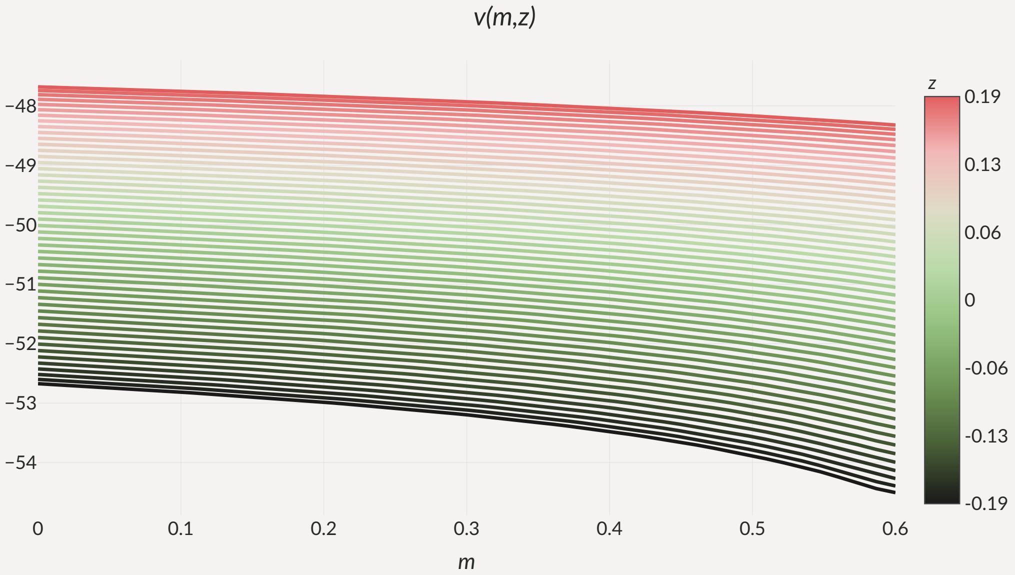
Swap Line Terms: Transfers



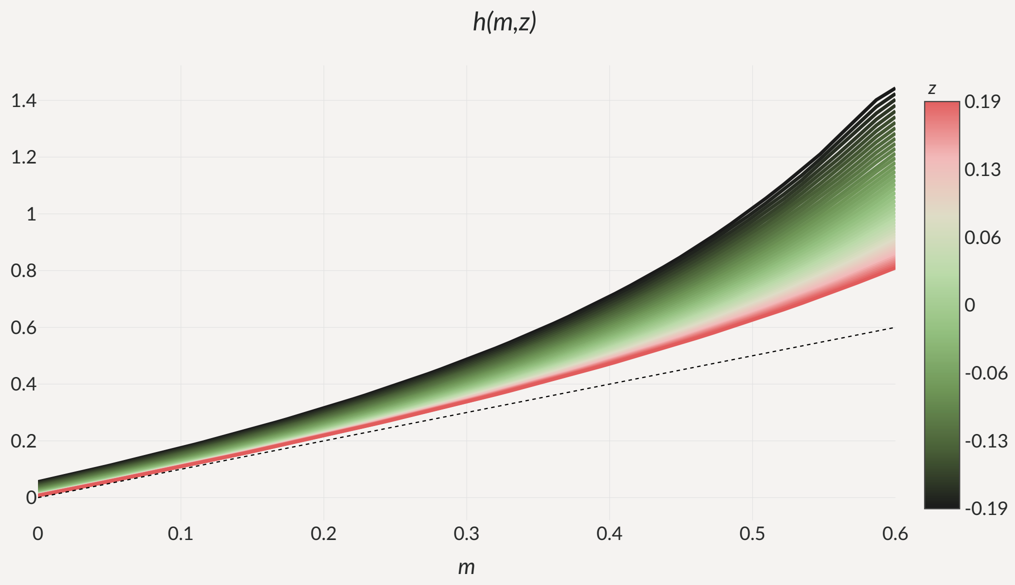
Swap Line Terms: Interest rate



Swap Line Terms: Borrower's value function



Swap Line Terms: Lender's value function



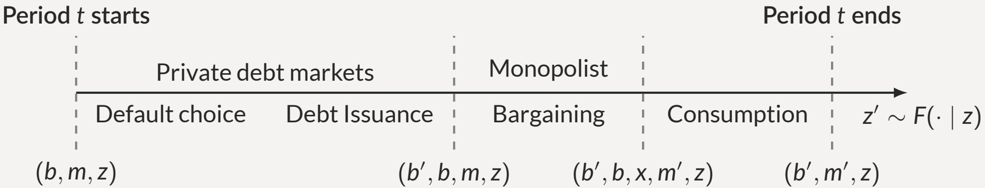
Swap Line Terms: Takeaways

The threat point is less 'credible' when *m* is large

- This creates convexity in the lender's value function
  … making the lender act 'as if' risk-loving
- The lender initially subsidizes the loan to induce indebtedness and high profits
  - Gamble for debt overhang
- Initial subsidy and high rates consistent with B's risk aversion – 'Participation constraint'

Model with Swaps and Debt

Timeline of events



Borrowing from markets

- Debt is a geometrically-decaying coupon

  ... get 1, pay $\kappa, (1-\rho)\kappa, \ldots (1-\rho)^{s-1}\kappa$
- Government enters first stage owing b in debt, m in swaps, income state z

$$v(b,m,z) = \max\left\{v_R(b,m,z) + \epsilon_R, v_D(m,z) + \epsilon_D\right\}$$
$$v_R(b,m,z) = \max_{b'} w_R(b',b,m,z)$$

- Lenders in competitive markets need to anticipate interactions with the monopolist

$$q(b',b,m,z) = \frac{1}{1+r}\mathbb{E}\left[\left(1 - 1_{\mathcal{D}}(b',m',z')\right)\left(\kappa + (1-\rho)q(b'',b',m',z')\right) \mid z\right]$$
$$m' = m'(b',b,m,z)$$
$$b'' = b'(b',m',z')$$

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m' &= m'(b',b,m,z) \\
b'' &= b'(b',m',z')
\end{aligned}
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Bargaining stage

- Similar to the case with swaps only with extra state variables (b, b')

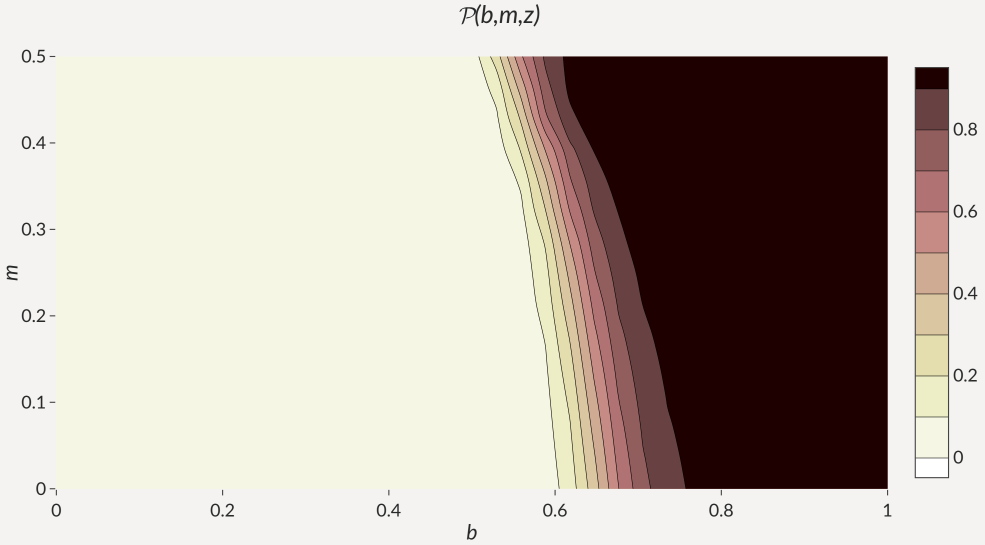
$$\mathcal{L}_R(b', x, m, m', z) = (a - x + \beta_L \mathbb{E}\left[h(b', m', z') \mid z\right]) - (a + m + \beta_L \mathbb{E}\left[h(b', 0, z') \mid z\right])$$

$$\begin{aligned}\mathcal{B}_R(b', b, x, m, m', z) = {} & u\big(y(z) + B(b', b, m, z) + x\big) + \beta \mathbb{E}\left[v(b', m', z') \mid z\right] \\ & - \big(u\big(y(z) + B(b', b, m, z) - m\big) + \beta \mathbb{E}\left[v(b', 0, z') \mid z\right]\big)\end{aligned}$$

$$B(b', b, m, z) = q(b', b, m, z)(b' - (1 - \rho)b) - \kappa b$$

Default probability

Both types of debt are clearly complements



When is the Swap Used?

- In repayment, average swap = 1.2% of GDP with s.d. 2.9%
- In default,

- Also consider Limited version: $m' \leq m$ while in default

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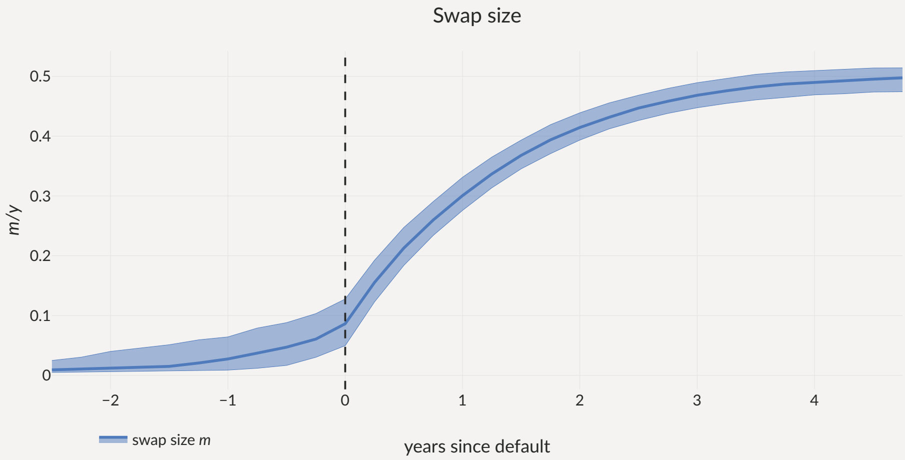

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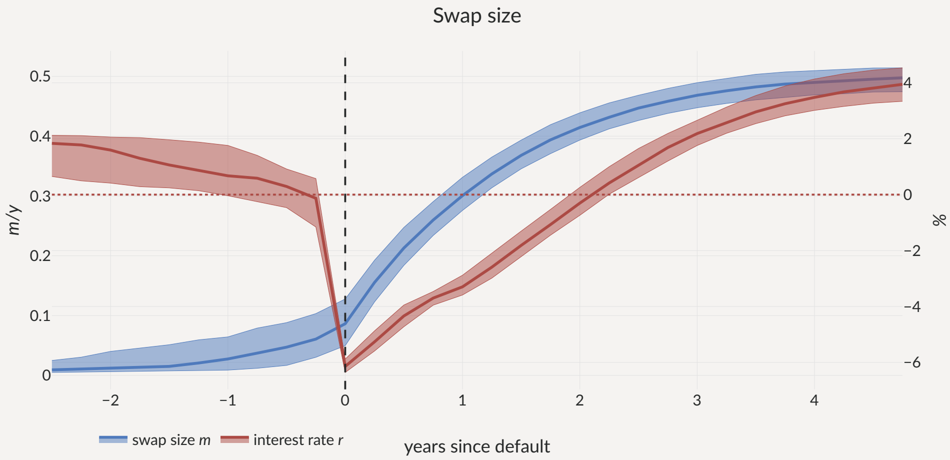

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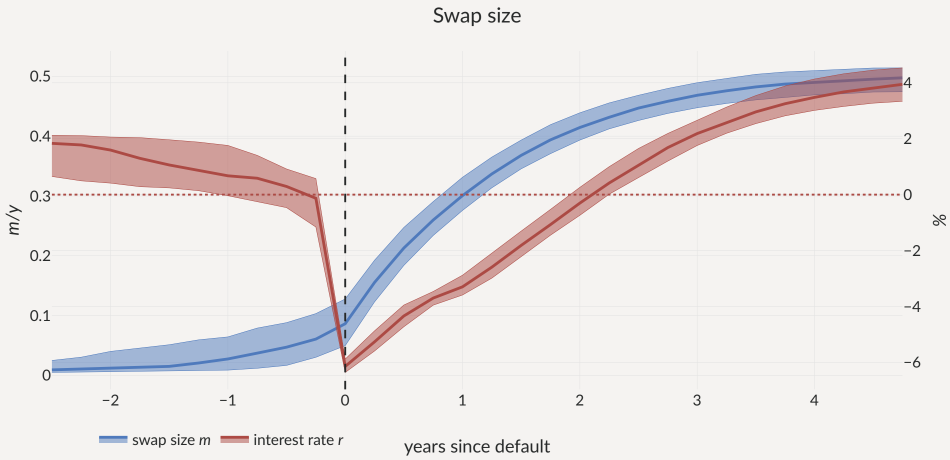

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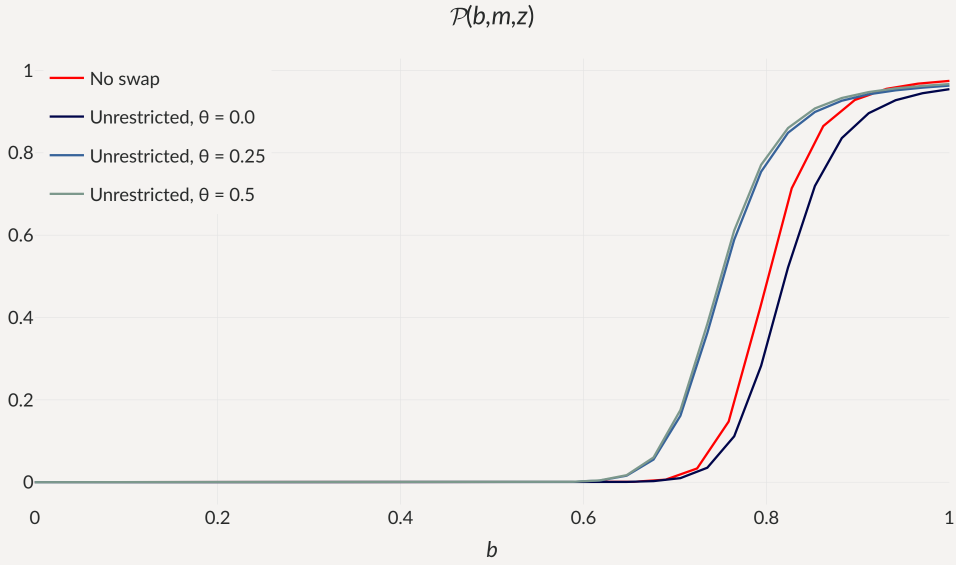
Debt Tolerance with Swaps

More repayment with Limited and with bargaining power



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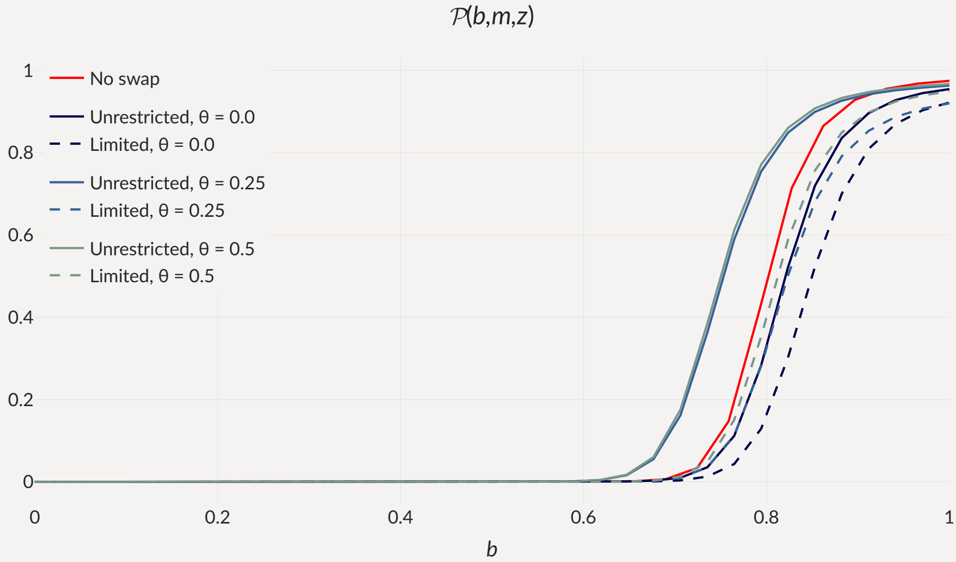
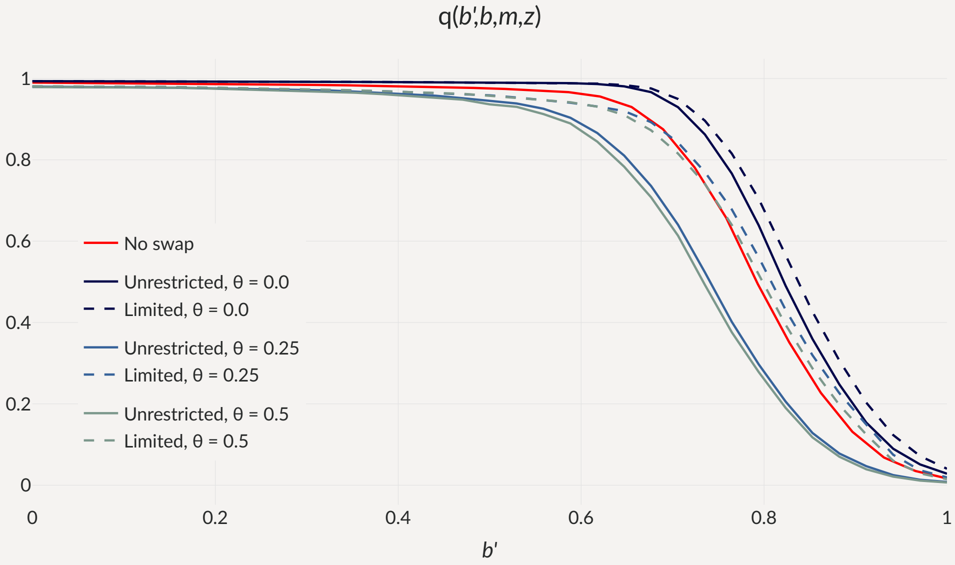


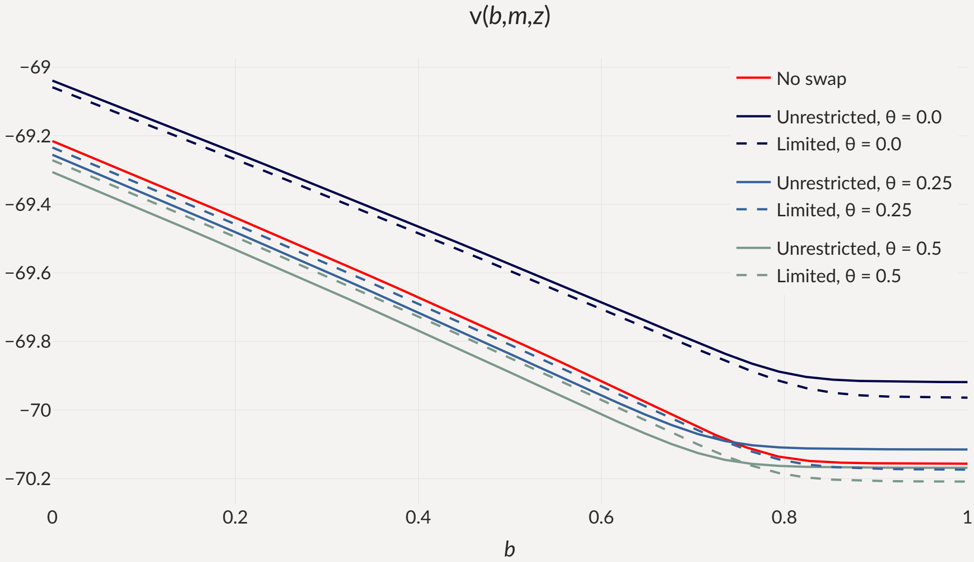
Debt Prices with Swaps

More repayment with Limited but still lower prices — **Tell-tale sign of debt dilution**



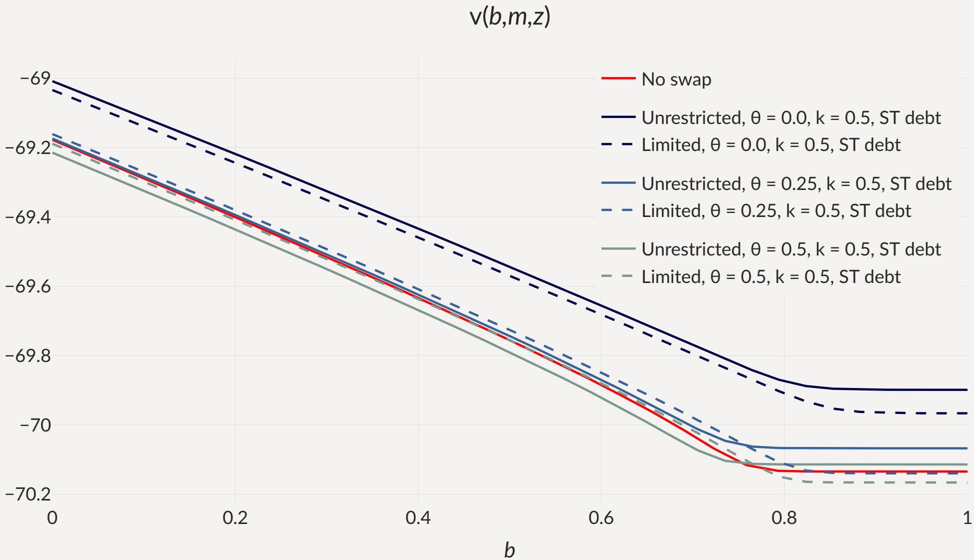
Welfare effects of swap lines

with interior bargaining power, Limited $\succcurlyeq$ Unrestricted, but...



Welfare effects of swap lines — Debt dilution

Solving model with short-term debt: gains of swaps (but not for all θ)



Concluding remarks

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- Simple model with monopolist/fringe structure
- Strong interaction between two markets for sovereign debt

  … even if swaps are not used intensely on the equilibrium path
- Market power crucial in model

  … how to discipline in model?

  … how to affect in reality?
- Large welfare effects, policy challenges
  - How to limit their use during defaults?
  - Strengthen debt dilution – more gains from fiscal rules, state-contingent debt?