Austerity and Bailouts in a Model of Sovereign Default

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Motivation

1. In sovereign debt renegotiations, official lenders have provided new loans (bailouts) that are conditional on gov't spending and revenue meeting certain targets (austerity)

2. Official debt has different properties than private debt (particularly priority) and international lenders have a first mover advantage

3. Before 1980's IMF had strict policy of **not lending to countries in default**

Our Questions

1. How does the availability of official debt affect private lending?

2. What is the effect of official lending on bargaining outcomes and on lending and default decisions?

3. How does austerity offset the effects of new lending on bargaining outcomes?

4. From a policy perspective, is there a case for bailouts? How about austerity?

Our Results

1. Even without austerity, some countries will choose not to borrow from official lenders

2. The presence of bailouts shortens defaults, lowers haircuts

3. Austerity works primarily by reserves bailouts to countries who really need them.

4. Welfare maximized by offering limited bailout with austerity

Data

1. Data on government accounts comes from IMF's *World Economic Outlook Database*

2. Data on external sovereign debt from World Bank's *Global Development Finance* and Dias, Richmond and Wright (2013)

3. Data on national accounts aggregates from World Bank's *World Development Indicators*

4. Trend GDP calculated on annual data using Hodrick-Prescott filter with smoothing parameter 6.25 (results robust to using 100 or 400)

Data Preview

- Total Debt increases prior to and at start of default

- The Share of debt that is official rises after default

- Government spending has bigger cycles than income.

Data Observations

Data Observation 1: At onset of default, total debt grows and official debt steadily grows as a share of overall debt

	Debt	Off. Share	Off. Share Upper Middle Income
in default	110%	76%	54%
not in default	55%	71%	62%
year before default	93%	60%	50%
year default starts	97%	61%	51%
year default ends	80%	76%	68%
year after default	67%	75%	69%

Data Observation 2: Government spending cycles are larger than
income cycles (which are somewhat modest)

	Income	Gov.t
In Default	−0.3%	−0.5%
Not In Default	0.2%	0.3%
Year Before	1.5%	2.8%
Year of Default	−1.2%	−0.2%
Year Default Ends	0.4%	−1.9%
Year After	0.5%	0.6%

1. Model Basics:

   1. Agreements occur stochastically
   2. Agreements limited by default risk
   3. Agreements occur when current resources are scare or future resources are predictable

Public Debt and Austerity

1. Public Debt
   1. Public Debt is available as part of an agreement
   2. Issued by international institution (potentially altruistic)
   3. Very similar to public debt, except it can't be discounted in a settlement
   4. Priced actuarially fair, dependent on individual country's circumstances

Government Spending and Austerity

1. Country divides resources (from income and various lending) into consumption and government spending

2. A bailout consists of a maximum allowable amount of institutional debt plus a maximum amount of government spending

3. Debtors and creditors can reach agreements which involve private debt in addition to or instead of the official amount

4. Refusal of bailout leads to freedom in choice of government spending

Borrowing Model

Debtor

- Debtor enters period with b private debt, d official debt, and observes new state s

- Debtor decides whether to default or repay:

$$V(b, d, s) = \max \left\{ V^D(b, d, s), V^R(b, d, s) \right\},$$

- After default, debtor enters bargaining game which has value $V^D(b, d, s')$

Borrowing Model

Debtor

- If debtor repays debt, retains access to credit markets

- Value to repaying debts b and d, $V^R(a, b, s)$, satisfies

$$V^R(b, d, s) = \max_{b', g} u(c, g) + \beta E \left[V(b', d', s') \,|\, s \right]$$

subject to

$$c + g - q(b', d', s) \, b' - b - d \leq e(s)$$

Borrowing Model

Private Creditors

- Make zero expected profits

- Price of bond that pays 1 unit tomorrow given state s today
  private debt b' and official debt d', $q\left(b', d', s\right)$, satisfies:

$$q\left(b', d', s\right) = \left(1 - \pi\left(b', d', s\right)\right) q^0 + q^0 \pi(b', d', s) EW^D(b', d', s')/b'$$

where the probability of default next period is

$$\pi(b', d', s) = \sum_{s'} \Gamma(s, s') D(b', d', s').$$

- $EW^D\left(b', d', s'\right)$ is the expected discounted value of any future
  debt settlement and q^0 is risk free bond price

Default Values

- Given an idiosyncratic shock σ_{DvsR} to welfare we have default probability:

$$D(b, d, s) = CDF \left(\frac{V^D(b, d, s) - V^R(b, d, s)}{\sigma_{DvsR}} \right)$$

- and ex-ante value:

$$V(b, ds) = (1 - D(b, d, s))V^R(b, d, s) + D(b, d, s)V^D(b, d, s)$$

Bargaining Model: Preliminaries

- Bargaining follows a repeated offer model of bargaining, offer made by creditor

- Value to accessing capital markets $V(b, d, s)$ with new assets b, debt d in state s is taken as exogenous

- Settlements cannot yield creditors more than full repayment

- Settlements may involve official lending, subject to announced limit on official lending and limit for gov't spending

Bargaining Model

Settlements

- Debtor cannot commit to make future transfers, but can issue (defaultable) debt as part of settlement

- A settlement consists of a transfer of current resources T and a swap of new debt securities b' and required use of official debt d'

- Creditors value this debt at the market price $q(b', d', s)$ and hence receive

$$T + b'q(b', d', s)$$

Bargaining Model: Accepted Offers

- Debtor's payoff

  Let an offer be a binding recommendation of new debt, assets, and a transfer $T(b, d, s)$

  The value to an accepted offer (with bailout limits $\bar{d}$, $\bar{g}$) is:

  $$V_{ac}^{B}(b, d, s) = \max_{g, d'}[u(c, g) + \delta EV(b', d', s')],$$

  subject to the budget constraint

  $$c + q^{d}(b', d', s)d' = e^{def}(s) - T(b, d, s) - g - d$$

  and the bailout limits $d' \leq \bar{d}$ and $g \leq \bar{g}$

- Without a bailout

$$V_{ac}^{NB}(b, d, s) = \max_g [u(c, g) + \delta EV(b', 0, s')],$$

subject to the budget constraint $c = e^{def}(s) - T(b, d, s) - g - d$

Recursive Formulation, Unaccepted Offers

- The value to an unaccepted offer is:

$$V_{noac}(b, d, s) = \max_{g}\{u(c, g) + \delta E[V^D(b, d, s')]\},$$

subject to the budget constraint $c + g = e^{def}(s)$

Creditor's payoffs

- The value to not accepting:

$$W_{noac}(b, d, s) = q^0 E[W^D(b, d, s')|s]$$

- The value to offering an acceptable offer:

$$W_{ac}(b, d, s) = T(b, d, s) + bq(b, d, s)$$

Equilibrium Payoffs, Creditor Offers

- A creditor will drive the debtor to his reservation value so that

$$V^D(b, d, s) = V_{noac}(b, d, s)$$

Creditor's Value

- We can define the transfer to the creditor as:

$$T(b, d, s, b', d', g) = q^d(b', d', s)d' + e^{def(s)} - d - g$$
$$- \left((1 - \sigma) \left[V_{noac}(b, d, s) - \theta_g \frac{1}{1 - \sigma} (g)^{(1-\sigma)} - \beta EV(b', d', s') \right] \right)^{1/(1-\sigma)}$$

- Creditors values solve:

$$W_{ac}(b, d, s) = \max_{b', d', g} T(b, d, s, b', d', g) + b'q(b', d', s),$$

subject to full repayment limit:

$$W_{ac}(b, d, s) \leq b$$

And if $d' > 0$; $d' \leq \bar{d}$, and $g < \bar{g}$

- Creditors maximize when they offer

$$W^D(b, d, s) = \max\left(W_{ac}(b, d, s), W_{noac}(b, d, s)\right)$$

Official Price Determination

1. Define the official lender's payoff expected payoff in default as $X(s, d, b)$ and

$$X(s, d, b) = (1 - delay(s, b, d))d + \delta EX(s, d, b)$$

2. The price for official debt satisfies:

$$q^d(b, d, s)d = q^0 \left((1 - D(s, b, d))d + q^0 EX(s, b, d) \right)$$

Numerical Analysis

1. Parameters chosen from (Benjamin, Wright 2013) to match data on default with no possible bailouts + share of gov't=0.2;

2. Statistics come from quarterly simulations which are annualized in such a way that data and model match

Results

1. Composition of Agreements
2. Bailouts and the Performance of Output and Government Spending in Default
3. Effects of Austerity
4. Welfare Analysis

Results About Bailouts

1. Most Bailouts do not involve private borrowing

2. However some bailouts (4%) involve both private and public private borrowing

3. Some bailouts involve private asset accumulation
   (Such defaults are low income, low debt defaults)

Bailouts

Simulated Bailouts by Composition

Bailouts, Low Income
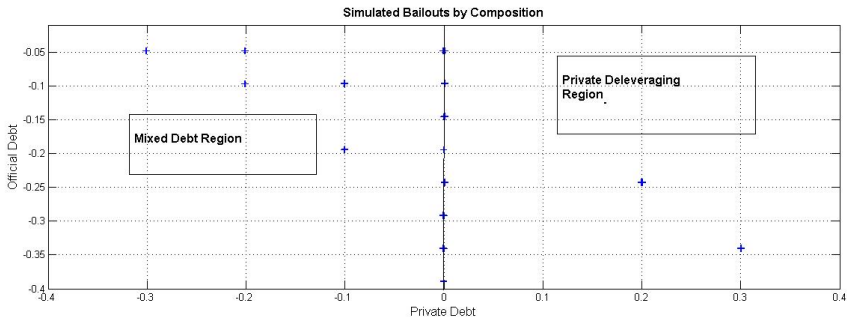
Simulated Bailouts by Composition, Low Income

Bailouts, High Income
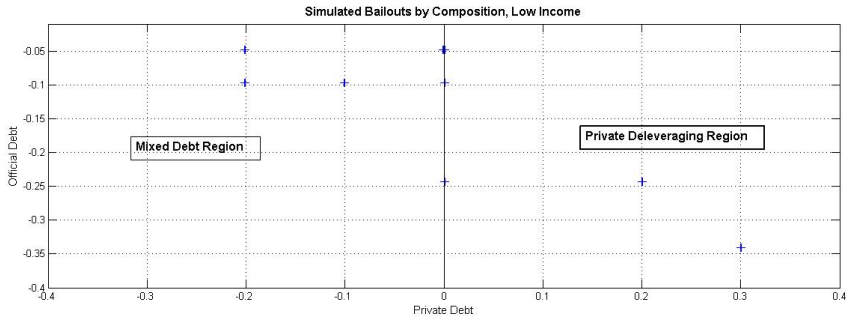
Simulated Bailouts by Composition, High Income

Bailouts, High Debt
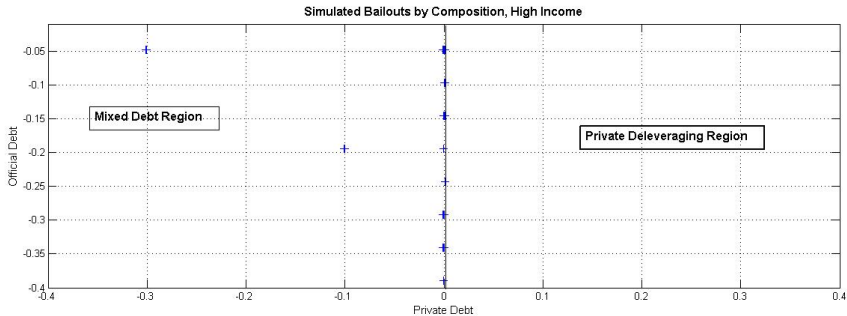
Simulated Bailout Composition, High Debt

Bailouts, Low Debt
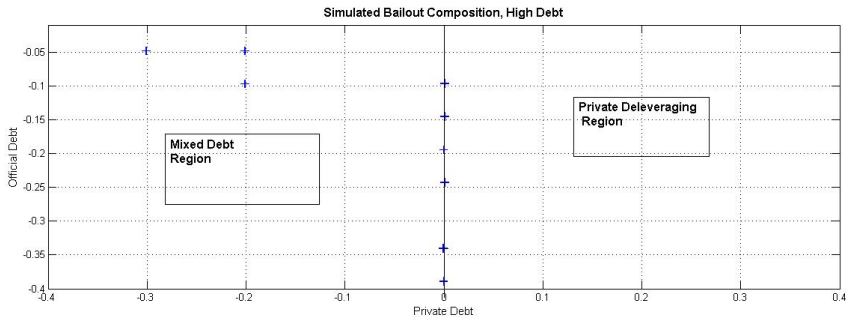
Simulated Bailout Composition, Low Debt
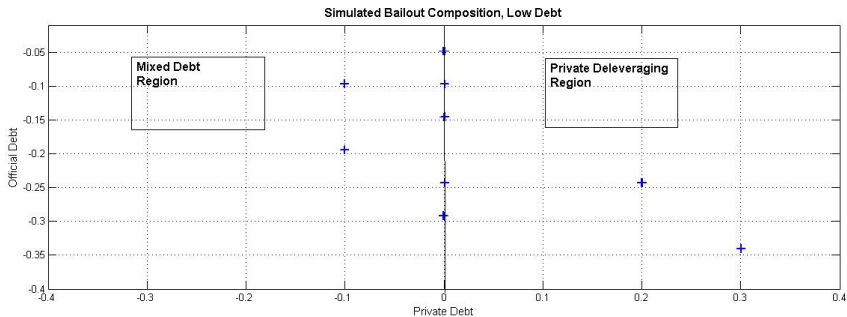
Facts about Bailouts

	Unconditional Bailout	Conditional Bailout
Bailout prob	52%	49%
Share of off. debt	36%	15%
Output before def	-0.007	-0.007
Output before bail	-0.014	-0.0157
Output before def with bailout	-0.010	-0.012
Output after bail	.001	.003
Debt before def	88%	80%
Debt before def with bailout	170%	173%
Debt after bail	12 %	22 %

Effects of Bailouts on Bargaining Outcomes

	No Bailout	Bailout
Lengths	24	22
Haircuts	26%	24%
Corr(Bailouts,Haircuts)	-	44%
Corr(Bailouts, Lengths)	-	29 %
Inc in Off Debt, Rich	-	1.2 %
Inc in Private Debt, Rich	- 1.3%	-0.7 %
Inc in Off Debt, Poor	-	14 %
Inc in Private Debt, Poor	-11 %	-17%

Effects of Austerity

	No Bailout	Uncond.	Optimal
Govt Before Def	$+0.005$	-0.006	0.002
Start of Def	-0.0370	-0.0264	-0.0301
End of Def	-0.0112	-0.0054	-0.0085
After Def	0.0131	0.009	0.0130
Start of Bail	-	-0.037	-0.039
Income Fall at Bail	-	0.0142	0.0156
Income Fall at Def	0.02	0.004	0.007

Welfare

- Adding unconditional bailouts, helps those in default, hurts virtually everyone else, Net welfare falls

- Adding a conditional bailout helps poor, defaulted with moderate debts

- From no bailout baseline, optimal austerity plan puts austerity recommendation below the mean for countries entering default.

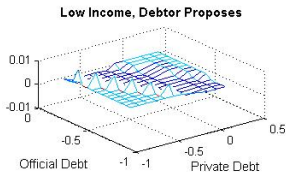- Too much of bailout encourages default; optimal policy limits bailouts
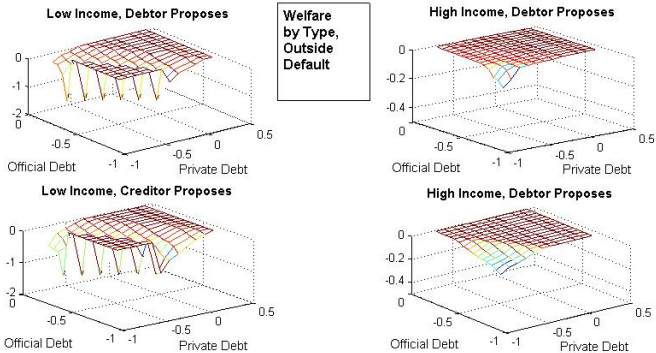
Unconditional Bailouts, Welfare
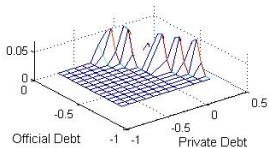

Welfare by Type, Outside Default
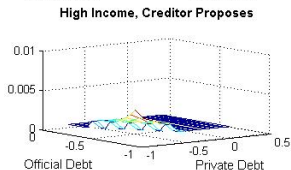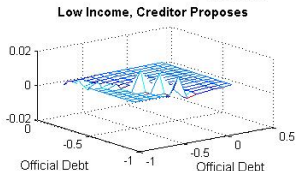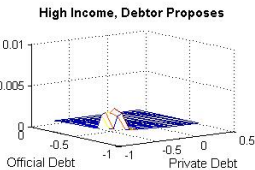
Low Income, Debtor Proposes

Low Income, Creditor Proposes

High Income, Debtor Proposes

High Income, Debtor Proposes

Unconditional Bailouts, Welfare

Low Income, Debtor Proposes

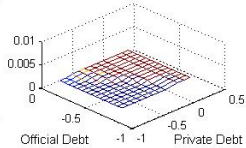High Income, Debtor Proposes

Welfare by Type, Inside Default

Low Income, Creditor Proposes

High Income, Creditor Proposes

Optimal Bailouts, Welfare

Low Income, Debtor Proposes

High Income, Debtor Proposes

Welfare
by Type,
Inside
Default

Low Income, Creditor Proposes

High Income, Creditor Proposes

Official Debt   Private Debt

Conclusions

- Bailout policy can qualitatively match sharp falls in government spending around bailouts and defaults

- Bailout policy can qualitatively match behavior of official vs. private lending around default

- Optimal policy involves both limited bailouts and austerity

Further Work

- Richer analysis of gov't behavior during negotiations (Gov't spending as leverage?)
- Richer set of policies, allowing official lenders to make offers
- Potential for bailouts at discounts