AUSTERITY

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In memory of Dave Backus

Austerity

- What is it? How do we measure it?
- What is its main function? Its optimal size?
- What are its consequences for macroeconomic activity and welfare?

This paper provides

- A framework for its study
  - Sovereign debt model augmented to include *incomplete information*. Credit rationing due to adverse selection
  - Credit rationing limits deficit–debt–consumption
- A definition of austerity
  - **The shortfall of consumption from its complete information level**.
  - The shortfall is not "justified" by the debtor's repayment capacity: The borrower would have been willing to obtain and able to repay a larger loan

Key features of the model

Features from standard sovereign debt model

- Non-contingent debt
- Lack of commitment to repay debt
- In case of default, the borrower suffers a type specific cost
- The borrower may or may not be able to commit to doing certain other things (such as the amount of investment to undertake)
- Risk neutral, competitive creditors

Features from standard credit rationing model

- The borrower's type (credit risk, willingness to repay) is private information
- Loan contracts specify price and quantity and may include additional features (such as investment requirements, the undertaking of structural reforms,..)

Preview of main results (two borrower types, high and low crediworthiness)

- **Austerity** is the outcome of incomplete information about credit risks
- High type always suffers austerity (consumes less than what he would have liked and been able to finance)
  - In pooling equilibria, austerity arises from the inability of the creditors to determine the credit risk of the borrower
  - In separating equilibria (where the borrower's type is revealed by his actions) austerity arises in order to prevent the misrepresentation of credit risks

Main results (cont'ed)

- **Investment**: Can investment requirements be included in the loan contracts to improve outcomes for creditworthy borrowers?
- YES. Investment can be a tool for establishing credibility (separating types) and allow more creditworthy countries to borrow more
- But there is over-investment
  1. The borrower must invest more than what he would have liked given the size of the loan
  2. At the margin, the borrower has to invest some own funds (sacrifice consumption))
- This makes austerity more severe. Nonetheless creditworthy borrowers prefer investment requirements

Noteworthy:

- This property of investment is independent of its collateral creation potential
- The amount of new loans procured may not be a reliable measure of austerity suffered due to composition (consumption vs investment) effects
- More severe austerity may lead to higher growth and welfare

The model is used to also study additional related issues

- **Structural reforms** in lieu of investment

  $\Rightarrow$ (sacrifice of current in favor of future consumption)
  Similar results

- **Spending multipliers**
  - Novel perspective: Multipliers matter for optimal size of austerity through credit risk *identification* channels (whether they matter for economic growth and ability to pay or not)
  - Ambiguous relationship between size of spending multipliers and optimal level of austerity

Relevant Literature

- Monetary policy games literature of the 80s-90s (wet vs hard nose central bankers)
  Green and Porter (1984), Backus and Driffill (1985), Canzoneri (1985), Vickers (1986)
- Sovereign debt
  Eaton and Gersovitz (1981), Obstfeld and Rogoff (1996, ch. 6), Atkeson (1991)
- Credit rationing
  Stiglitz and Weiss (1981), Bester (1985), Meza and Webb (1987), Brennan and Kraus (1987), Milde and Riley (1988)

The model

- Two periods
- Two types, λ^h, λ^l,$\lambda^h > \lambda^l$. λ is the cost of default for the borrower (share of income lost)
- Type is private information
- Prior: Prob($\lambda = \lambda^h$)=θ. Posterior depends on actions
- One period, non-contingent debt issued in period 1, b_2. Debt due in period 1, b_1
- Risk neutral, competitive lenders. They break even
- Equilibrium selection: Creditors maximize borrower's ex ante welfare, $W = W^h + \omega W^l, \omega \geq 0$

Timing–Decisions

- Period 1:
  1. Default or not on outstanding debt, b_1
  2. Borrow amount b_2 at price $q = \theta\beta$
- Period 2: Default or not on b_2

A simple example: $\lambda^l = 0, \lambda^h = \infty, \omega = 0$

Complete information

High: $u(Y_1 - b_1 + \beta b_2^h) + \delta(Y_2 - b_2^h), b_2^h = \tilde{b}$

Low: $u(Y_1) + \delta u(Y_2)$, $b_2^l = 0$ (autarky)

Incomplete information: Separating equilibrium

- High type repays in first period, low defaults
- Low type defaults on b_1 if:
  $u(Y_1)+\delta u(Y_2) \geq u(Y_1-b_1+qb_2^{ND})+\delta u(Y_2) \Rightarrow b_2^{ND} \leq \frac{b_1}{q}$
- Debt contracts: $b_2^h = b_2^{ND} = \frac{b_1}{\beta}, b^l = b_2^D = 0, q = \beta$
- Implications:
  1. Current account, $b_1 - \beta b_2^h$ cannot be negative
  2. There is austerity for H:
     $\tilde{c}_1 - c_1 = \beta(\tilde{b} - \frac{b_1}{\beta}) > 0$

Incomplete information: Pooling equilibrium

- Debt contracts:
- $q = \theta\beta, b_2^{ND} = b_2^p, b_2^D = 0$
- $b_2^{ND} : u(Y_1) + \delta u(Y_2) \leq u(Y_1 - b_1 + qb_2^{ND}) + \delta u(Y_2)$
  $b_2^p : \theta\beta u'_{1h} - \delta u'_{2h} = 0$
- Implication: There is austerity for H, $\tilde{c}_1 - c_{1h}^p > 0$ because $\beta > \theta\beta$

Selection of optimal equilibrium across pooling and separating equilibria

- Criterion
  $W^p - W^s =$
  $u(Y_1 - b_1 + \theta\beta b_2^p) + \delta u(Y_2 - b_2^p) - [u(Y_1) + \delta u(Y_2 - \frac{b_1}{\beta})$
- At $\theta = 1$ $b_2^p = \tilde{b}$ and W^p coincides with first best
- At $\theta = 0, q = 0$ thus optimal $b_2^p = 0$
  $\Rightarrow W^p = u(Y_1 - b_1) + \delta u(Y_2) < u(Y_1) + \delta u(Y_2 - \frac{b_1}{\beta}) = W^s$
- There exists a $\theta = \theta^\star$: for $\theta > \theta^\star$ pooling is preferred and for $\theta < \theta^\star$ separating is preferred

Costly "signalling" for the high type, $\lambda Y_1 < b_1$

- $\lambda^l = 0, \lambda^h = \lambda, \lambda Y_1 < b_1$
- Have now to worry about H defaulting
- $u(Y_1 - b_1 + \beta b_2^s) + \delta u(Y_2 - b_2^s) > u(Y_1(1-\lambda)) + \delta u(Y_2)$
- $b_2 < \lambda Y_2$ repayment constraint
- $b_2 \leq \frac{b_1}{\beta}$ loan cannot be too high; otherwise L mimics H
- $b_2 \gg 0$ loan cannot be too low; otherwise H defaults

Main result: Optimal austerity can be neither too severe nor too light (the loan supporting separation is bounded from both below and above)

Investment (with commitment to invest)

$$u(Y_1 - b_1 + \beta b_2^h - I_h) + \delta(Y_2 + F(I_h) - b_2^h)$$

- Well known result: Investment increases collateral (cost of default), supports higher consumption and improves welfare for every type
- We suggest a novel role for investment. Investment matters for the agency problem even when it does not contribute to collateral
- It thus matters for austerity

- Proposition 1: For any b_2, optimal I_l less than optimal I_h
- Marginal benefit from a unit of investment lower for L because of L's lower marginal utility in period 2 (due to default)
- Can this fact be exploited in order to alleviate the agency problem?

YES

Results

- The investment requirement involves "over-investment"
  1. High type has to invest more that what he would have liked
  2. At the margin, the borrower has to invest some own funds (skin in the game)
- $\rightarrow$ Over-investment is so severe as to make the high type's consumption lower than it would have been were it not possible to use investment as a device for that purpose. *It makes austerity –consumption gap– worse*
- In the optimal equilibrium, more severe austerity is associated withe higher welfare for the high type as well as higher growth

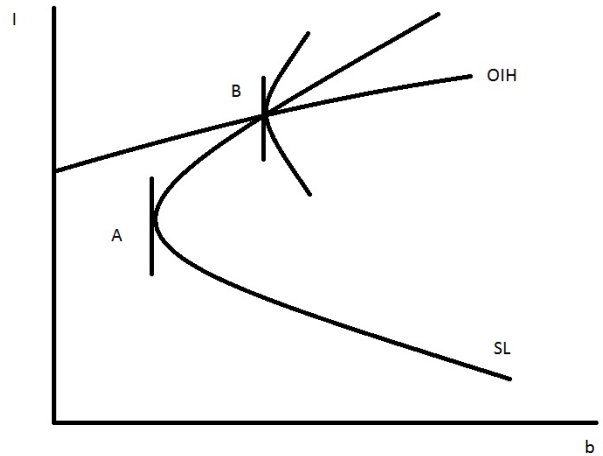

FIGURE: Indifference curves of high type and selection constraint of low type in (b_2, I_1)-space

Richer dynamics: A three period model

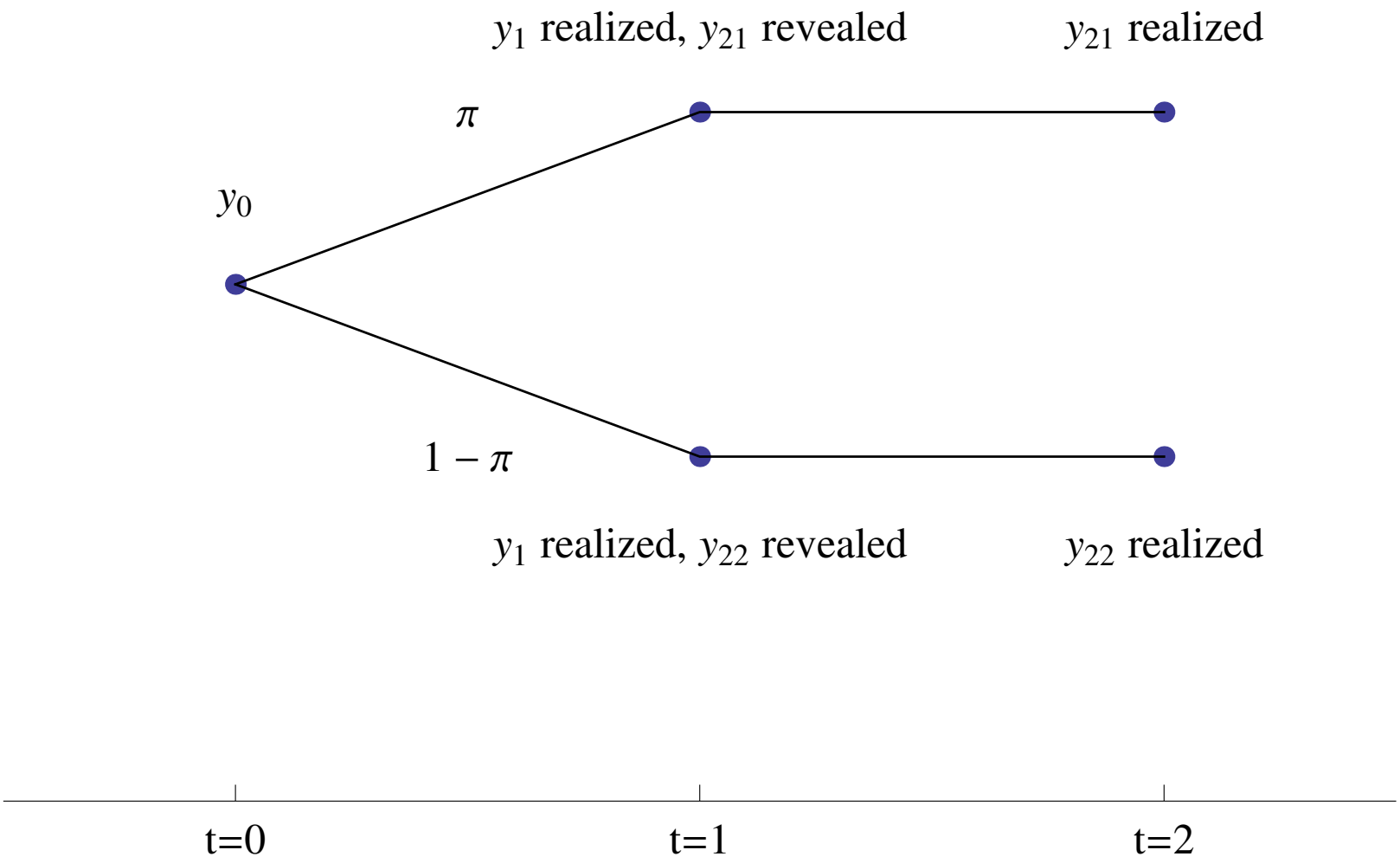

FIGURE: Event tree

Best equilibrium

- In period $t = 0$, high and low types pool—they repay debt due, b_0, and issue new debt, b_1, at price q_0.
- In period $t = 1$, both repay outstanding and issue new debt if the prospects for output growth remain good (which happens with probability π).
- If growth prospects are poor then only the high type repays and issues new debt.
  Interesting property: Outstanding debt increases over time as long as "prospects" remain good

TABLE: Three period model: Debt dynamics

b_0	b_1	q_0	b_{21}	q_{21}	b_{22}	q_{22}
0.10	0.73	0.81	1.01	0.72	0.30	0.90

A model with several periods can capture the debt dynamics observed in a country like Greece whose indebtedness kept growing for some time, but new issuance collapsed (and default occurred) when economic conditions worsened.

TABLE: Three-period model with pooling and separation (government type distribution risk): Parameter values

β	δ	θ	θ_{22}	b_0	y_0	y_1	y_2	π
0.8	0.6	0.95	0.9	0.1	1.0	0.75	1.0	0.5

TABLE: Three-period model with pooling and separation (government type distribution risk): Debt dynamics

b_0	b_1	q_0	b_{21}	q_{21}	b_{22}	q_{22}
0.10	0.25	0.78	0.38	0.76	0.32	0.80

Reforms and austerity

- Reform measures are completely analogous to investment (financially costly in the short run, bring output rewards in the medium-long run $u(Y_1 - b_1 + \beta b_2^h - R_h) + \delta(Y_2 + F(R_h) - b_2^h)$
- The extension of more financing in combination with stricter requirements for structural reform (as currently being discussed for Greece) should not be misinterpreted as leniency
- In the optimal equilibrium it represents more severe –nonetheless growth and welfare improving– austerity

Multipliers and austerity

- The discussion of the role of multipliers and credibility in the austerity debate often confuses ability with willingness to repay. Ability may not be relevant for austerity
- Is there a role for multipliers in a model of austerity?
- Yes, through their influence on the agency problem
- A novel argument: The multiplier matters for the degree of austerity suffered by influencing the tightness of the selection constraint of the low type. If it loosens the constraint then it decreases optimal austerity, if it tightens it then it increases it.

- Multiplier: The effect of an autonomous change in spending in the private or public sector on spending and income in the economy at large
  $c_1 = y_1(1 - \lambda^h(1 - r_1)) + m(q_1 b_2 - b_1 r_1)$ with $m \geq 1$
- Selection constraint of L
  $b_2(1) \leq b_2(0) + \frac{b_1 - y_1 \lambda^l / m}{\beta}$
- The required amount of austerity is decreasing in the size of the multiplier
- Robustness: Suppose, multiplier applies also to default loss, $y_1(1 - m_1 \lambda^i(1 - r_1)) + m_2(q_1 b_2 - b_1 r_1)$
- $m_1 = m_2 \Rightarrow$ the optimal level of austerity is invariant to the size of the multiplier

Conclusions

- Fusion of sovereign debt with credit rationing literatures to create a model for the study of austerity
- Austerity: consumption excessively low (relative to capacity –willingness + ability– to repay
- Austerity necessary because either the borrower's credit risk cannot be identified; or, as a means of deterring the misrepresentation of credit risks
- Investment requirements can help. Make austerity *harsher* but lead to *higher* growth and welfare
- Implications for multipliers and reforms
- Multiperiod extension can account for increasing indebteness and abrupt collapse of funding