Domestic, External, and Implicit Debt and Default

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The Issue

Government debt (and its composition)

Interest rates

Demographic change

Data

Non-resident- vs. resident-held sovereign debt

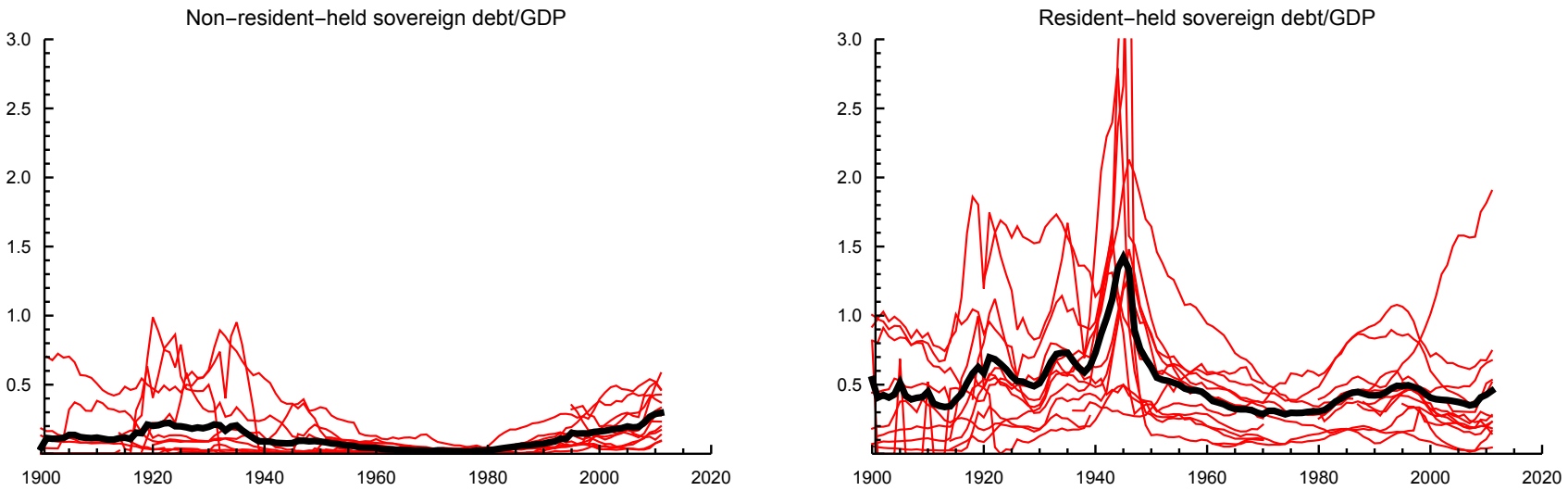

Figure 1: Non-resident- and resident-held sovereign debt, relative to GDP. Data source: Abbas et al. (2014). The black lines indicate the unweighted average.

Government net debt

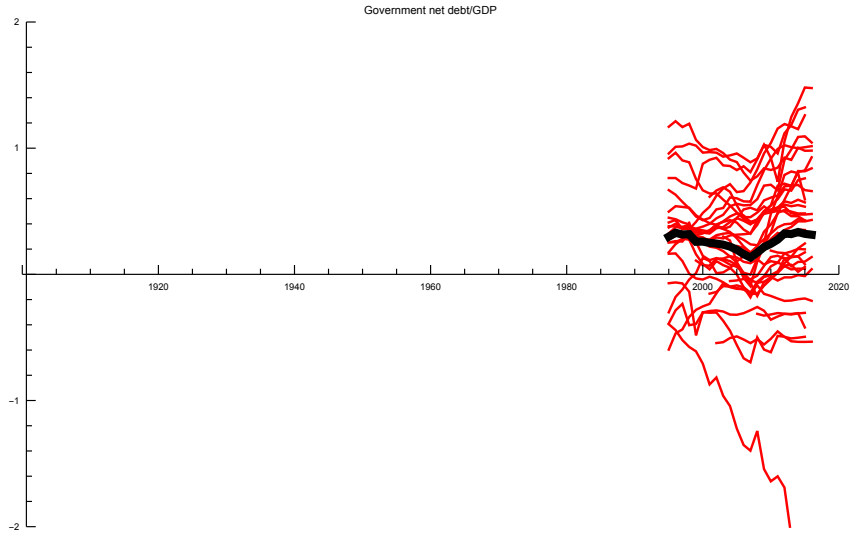

Figure 2: Government net debt, relative to GDP. Data source: OECD. The black line indicates the unweighted average.

Implicit government debt

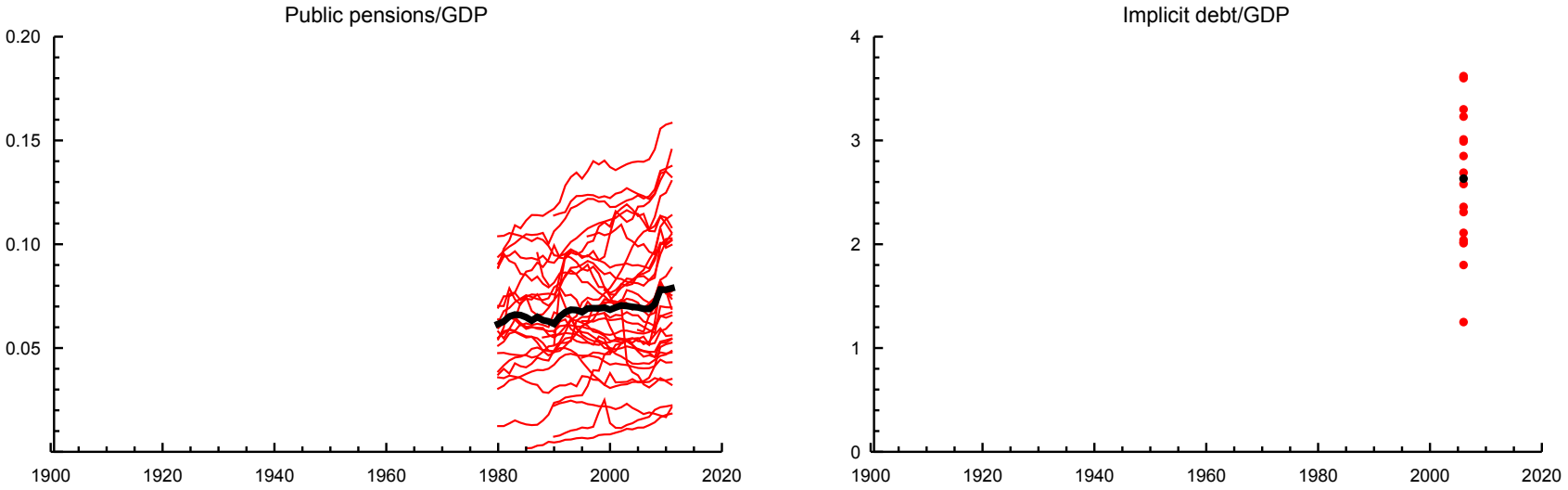

Figure 3: Public pensions and accrued-to-date implicit pension liabilities, both as a share of GDP. Data sources: OECD and Kaier and Müller (2015). The black line and dot indicate the unweighted average.

Summary

- Domestic dominates external explicit debt
- Stable explicit net debt/GDP
- Implicit dominates explicit debt, increasingly so

Overview of the Model

Neoclassical growth model plus defaultable domestic, external, implicit public debt

- Overlapping generations

  Savings and portfolio choice: capital vs. domestic debt

- External lenders

- Government

  Sequential policy choice: debt issuance and repayment, taxes, public goods provision

Two default margins

- Implicit debt service (retirement age, wage vs. price indexation, . . .)
- Explicit domestic and external debt service; secondary markets prevent discrimination (Broner, Martin and Ventura, 2010)

Politics

- Probabilistic voting by old and young
- Markov perfect equilibrium

Closed form solutions except for one margin

Themes

Ageing drives debt dynamics

- Domestic debt service accommodates changed factor incomes

  Falling real returns, rising indebtedness, as in data

- Implicit crowds out explicit debt because foreigners also hold explicit debt

  Secondary markets prevent discrimination

- GE effects shape debt returns

Domestic conflict both imperils and promotes debt service

- Inequality is “bad” (old vs. young)

  Constraints on redistribution increase shadow value of public funds, render debt service more costly

- Conflict is “good” (voters vs. unborn generations)

  GE effects of taxation shift cost of taxation to unborn, render taxation, debt service less costly

Related Literature

Macro/public finance

- Diamond (1965)

  Barro (1979), Lucas and Stokey (1983), Angeletos (2002), Aiyagari, Marcet, Sargent and Seppälä (2002), Farhi (2010)

  Diamond (1965), Niepelt (2004), Werning (2007)

- This paper: Positive; domestic conflict; international linkages; no commitment

Political economics

- Persson and Svensson (1989), Alesina and Tabellini (1990), Alesina and Perotti (1995), Song, Storesletten and Zilibotti (2012)
- This paper: No commitment to debt service; production; international linkages

  Gonzalez-Eiras and Niepelt (2008), (2015)

International finance

- Eaton and Gersovitz (1981), Eaton and Fernandez (1995)

  Kremer and Mehta (2000), Broner, Erce, Martin and Ventura (2013), Broner and Ventura (2016)

  Di Casola and Sichlimiris (2015), D'Erasmo and Mendoza (2016), Azzimonti and Quadrini (2016), Dovis, Golosov and Shourideh (2016)

  Aguiar and Amador (2011)

- This paper: Also domestic, implicit debt; domestic conflict; production

The Model

Households

$$\max u(c_t^y) + v_t(g_t) + \delta \mathbb{E}_t[u(c_{t+1}^o) + v_{t+1}(g_{t+1})]$$

$$c_t^y = w_t(1 - \tau_t) - k_{t+1} - q_t^d d_{t+1}$$

$$c_{t+1}^o = (k_{t+1} R_{t+1} + d_{t+1} r_{t+1} + b_{t+1})(1 - \tau_{t+1})$$

(Can introduce labor-supply margin)

Neoclassical production, competitive factor markets

v_t young per old

External lenders price external debt, e_{t+1}, with kernel m_{t+1}

Government

- Budget constraint

$$g_t + (d_t + e_t)r_t + b_t = \tau_t(y_t + d_t r_t + b_t) + \nu_t q_t^d d_{t+1} + \nu_t q_t^e e_{t+1}$$

- Instruments $r_t, b_t, g_t, \tau_t, d_{t+1}, e_{t+1}$
- External "default cost" $\varphi_t(y_t, d_t, e_t, r_t)$

Politics

- Probabilistic voting

$$\begin{aligned}
&\omega_t \{u(c_t^o) + v_t(g_t)\} \\
&\quad + \nu_t\{u(c_t^y) + v_t(g_t) + \delta\mathbb{E}_t[u(c_{t+1}^o) + v_{t+1}(g_{t+1})]\} \\
&\quad\quad + \varphi_t(y_t, d_t, e_t, r_t)
\end{aligned}$$

Timing within a period

- Exogenous state realized, $\hat{z}_t \equiv (\nu_t, v_t(\cdot), y_t(\cdot), \varphi_t(\cdot), \omega_t, m_{t+1})$
- Candidate elected, $\pi_t \equiv (g_t, r_t, b_t, \tau_t, d_{t+1}, e_{t+1})$
- Expectations formed
- Competitive equilibrium

Markov perfect equilibrium

- Policy functions $\pi(\cdot)$ of the state $z_t \equiv (\hat{z}_t, k_t, d_t, e_t)$

Equilibrium

Competitive equilibrium, and policy functions

Fixed points

- Private sector choices optimal given state, prices, current and (correctly) anticipated policy …

  …but future policy is function of state $\pi(\cdot)$

- Government choices optimal given state, competitive equilibrium, government budget constraint, $\pi(\cdot)$ …

  …equilibrium requires $\pi(\cdot)$ to be consistent with optimal government choice

Characterization of Equilibrium

Program (domestic debt, d, normalized to unity)

$$\begin{aligned}
\max \quad & \omega_t \{u_t^o + v_t\} + \nu_t\{u_t^y + v_t + \delta \mathbb{E}_t[u_{t+1}^o + v_{t+1}(g(z_{t+1}))]\} + \varphi_t \\
\text{s.t.} \quad & g_t + (1+e_t)r_t + b_t = \tau_t(y_t + r_t + b_t) + \nu_t q_t^d \\
& \qquad\qquad\qquad\qquad\qquad\qquad + \nu_t e_{t+1} \mathbb{E}_t[m_{t+1} r^e(z_{t+1})] \\
& c_t^o = (k_t R_t + r_t + b_t)(1-\tau_t) \\
& c_t^y = w_t(1-\tau_t) - k_{t+1} - q_t^d \\
& k_{t+1} = w_t(1-\tau_t)\kappa_t^1, \qquad q_t^d = w_t(1-\tau_t)\kappa_t^2 \\
& c_{t+1}^o = \left(k_{t+1} R(k_{t+1}) + q_t^d \frac{r(z_{t+1})}{q_t^d} + b(z_{t+1}) \right) (1 - \tau(z_{t+1})) \\
& r_t \geq 0, \quad b_t \geq 0
\end{aligned}$$

Public goods spending

$$(\omega_t + \nu_t) v_t'(g_t) = \mu_t$$

Social security transfers and explicit debt service

$$\omega_t u'(c_t^o) - \mu_t \leq 0, \quad b_t \geq 0$$

$$\omega_t u'(c_t^o) - \mu_t + \frac{\partial \varphi_t(y_t, e_t, r_t)/\partial r_t - \mu_t e_t}{1-\tau_t} \leq 0, \quad r_t \geq 0$$

Taxes

$$\omega_t u'(c_t^o)(k_t R_t + r_t + b_t) + \nu_t \left(u'(c_t^y) w_t - \mathcal{B}_t^\tau \right) = \mu_t \left(y_t + r_t + b_t + \nu_t \mathcal{Q}_t^\tau \right)$$

$\mathcal{Q}_t^\tau$ reflects induced change in debt revenue

$\mathcal{B}_t^\tau$ reflects indirect welfare effects for young

Ageing drives debt dynamics, consistent with data

- Ageing $\Rightarrow$ low return on capital $\Rightarrow$ debt

  $v_t \downarrow \Rightarrow k_t R_t / w_t \downarrow \Rightarrow u'(c_t^y)/u'(c_t^o) \downarrow$

  Political process compensates: $r_t + b_t \uparrow$

- r_t vs. b_t?

  Depends on ownership structure

  But demographic change does not change ownership structure (much)

$\Rightarrow$ Ageing increases implicit relative to explicit debt

Inequality is "bad" (old vs. young)

- Non-binding floor on transfers, $b_t > 0$, allows smoothing cost-benefit ratio of taxation

$$\text{cb}_t^o = \mu_t = \text{cb}_t^y$$

- Binding floor, $b_t = 0$, prevents smoothing

$$\text{cb}_t^o < \mu_t < \text{cb}_t^y$$

  Drives up μ_t

  Reduces return on explicit and thus, external debt

  (Similarly, other constraints on domestic burden-sharing)

Conflict is "good" (voters vs. unborn generations)

- Voters exploit market power vis-à-vis future cohorts
- $\mathcal{B}_t^\tau > 0$ reduces cost of taxation for young (hurts unborn)

  Drives down μ_t

  Increases return on all debt tranches
- $\mathcal{B}_t^\tau > 0$ also implies $\omega u'(c_t^o) < u'(c_t^y)$

  Domestic burden sharing $\neq$ domestic consumption smoothing

Functional Form Assumptions

Mainly logarithmic utility, Cobb-Douglas production

- Closed form solutions, conditional on e_t, e_{t+1}

  Numerical solution only for e_{t+1}

- Proposition 5

  Interior steady state subject to exogenous $e > 0$:

  With demographic ageing, social security transfers eventually exceed domestic and external debt service

Numerical Analysis

To endogenize e_{t+1}

Can analyze

- Demographic shocks
- Factor share shocks
- Credibility (cost of default) shocks
- Shocks to the demand for government services (wars) ...

Only politically incentive compatible hedging

Conclusions

Tractable model of domestic, external, implicit debt in PEE

Demographic ageing drives debt dynamics

Two types of conflict shape debt returns

Looking Ahead

Symmetric countries . . .

. . . in an integrated world economy

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