Expansionary Fiscal Consolidation Under Sovereign Risk

Carlos Esquivel
Rutgers University

Agustin Samano
World Bank

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[1]The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the World Bank Group, its Executive Directors, or the governments they represent. All errors are our own.

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- Could fiscal rules contribute to an expansionary fiscal consolidation?
- **Novel theory of fiscal rules and capital accumulation**
  - **Debt rules can reduce sovereign risk and increase capital accumulation, leading to long-term economic growth**

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- **Quantify:** welfare gains of having debt rules

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- **Sovereign spreads drop immediately as a response to the implementation of the fiscal rule and continue to further decline as the economy increases its capital**

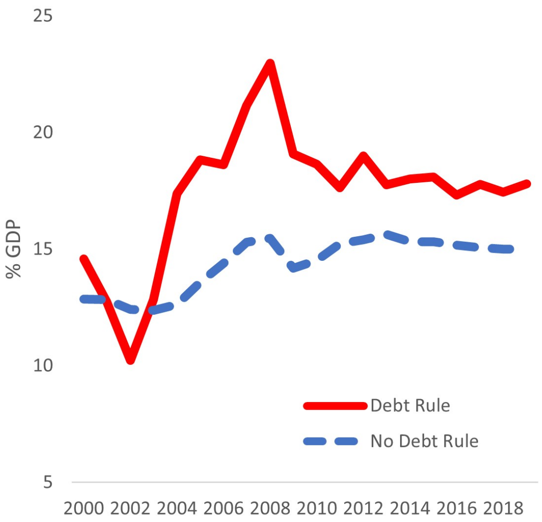
- Welfare gains are a result of a significant reduction in spreads due to expectations about future borrowing and investment

Contribution to literature

- **Fiscal rules:** Amador, Angeletos, Werning (2006); García, Restrepo, Tanner (2011); Halac, Yared (2014); Alfaro Kanczuk (2017); Halac, Yared (2018); Dovis, Kirpalani (2020); **Hatchondo, Martínez, Roch (2022)**
  - Contribution: no preference disagreement, fiscal rules still desirable
- **Sovereign debt, growth, and investment:** Amador, Aguiar, Gopinath (2009); Aguiar, Amador (2011); Gordon, Guerrón-Quintana (2018); Galli (2021); Esquivel (2023)
  - Contribution: optimal debt limits with domestic decentralized investment and default in equilibrium

Outline

Debt Rules and Private Investment



Regression Analysis: Equation

$$log\left(I/y\right)_{i,t} = \alpha_i + \beta_1\left(D_r\right)_{i,t-1} + \beta_2 log\left(\hat{y}\right)_{i,t-1} + \beta_3 log\left(B/y\right)_{i,t-1} + \gamma_i + \eta_t + \varepsilon_{i,t}$$

where:

- $\left(I/y\right)_{i,t}$ denotes private investment, normalized by GDP for country i at t
- $\left(D_r\right)_{i,t}$ represents a dummy variable that assigns 1 if there is a debt rule in the country i at period t and 0 otherwise
- $\left(\hat{y}\right)_{i,t}$ is the cyclical component of GDP for country i at period t
- $\left(B/y\right)_{i,t}$ denotes the level of public debt normalized by GDP for country i at period t
- γ_i represents time-invariant country-fixed effects
- η_t denotes time-fixed effects
- $\varepsilon_{i,t}$ denotes the regression residuals

Regression Analysis: Main Result

Table 1: Panel Regressions: Debt Rules and Private Investment

	Dependent variable: $log(I/y)$			
	(1)	(2)	(3)	(4)
DebtRule	**0.0872****	**0.0388****	**0.0431***	**0.0180**
	(0.0280)	**(0.0156)**	**(0.0241)**	**(0.0247)**
$log(\hat{y})$		1.376^{*}	1.401^{**}	1.338^{**}
		(0.657)	(0.513)	(0.581)
$log(B/y)$			-0.0574	-0.101^{***}
			(0.0461)	(0.0283)
Number of groups	27	26	26	55
Observations	513	494	488	1031

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Debt Rules and Sovereign Spreads

Table 2: Panel Regressions: Debt Rules and Sovereign Spreads

	Dependent variable: r_s			
	(1)	(2)	(3)	(4)
DebtRule	$\mathbf{-486}^{***}$	$\mathbf{-192}^{*}$	$\mathbf{-202}^{*}$	$\mathbf{-114}$
	(127)	**(107)**	**(115)**	**(66)**
$log(\hat{y})$		30	−1369	−3706
		(1503)	(2240)	(3341)
$log(B/y)$			−277	7
			(253)	(213)
Number of groups	26	25	25	55
Observations	446	427	427	881

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Outline

Environment

- Small-open economy: continuum of households, competitive firm, benevolent government
- Households identical with preferences

$$\mathbb{E}_0\left[\sum_{t=0}^{\infty}\beta^t u\left(c_t\right)\right]$$

with $u\left(c\right)=\frac{c^{1-\sigma}}{1-\sigma}$, $\beta\in(0,1)$

- Households own firm and capital, make investment decisions, cannot borrow from abroad
- Firm rents capital, produces output with technology

$$Y_t = z_t A K_t^{\alpha}$$

where $\log z_t = \rho\log z_{t-1}+\epsilon_t$ with $\rho\in(0,1)$ and $\epsilon_t\sim N\left(0,\sigma_z^2\right)$ iid $\forall t$

Environment

- Government finances $G \geq 0$ every period, chooses fiscal policy $g_t = (\tau_t, T_t, B_{t+1})$
  - $\tau_t \geq 0$: proportional income tax
  - $T_t \geq 0$: lump-sum transfer to households
  - B_{t+1}: stock of debt for next period

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- Debt is long-term, matures at rate γ, pays coupon κ on remaining $(1-\gamma)$, law of motion

$$B_{t+1} = i_{b,t} + (1-\gamma) B_t$$

where $i_{b,t}$ is new debt issued in t

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- Default:
  - productivity is $z_D(z_t) = z_t - \max\{0, \xi_0 z_t + \xi_1 z_t^2\}$ with $\xi_0 < 0 < \xi_1$
  - excluded from financial markets, readmission with probability θ and $B_t = 0$
  - budget constraint is:

$$G + T_t = \tau_t Y_t^D$$

where $Y_t^D = z_D(z_t) A K_t^\alpha$

Environment

- Timing within a period:

  1. Government observes state, decides to default or repay, and chooses g_t (with commitment within the period)
  2. Households observe g_t and make consumption and investment decisions
  3. Lenders observe g_t and investment and price the debt accordingly

Recursive Formulation, Households in Repayment

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where $r(K, z, 0) = \alpha z A K^{\alpha - 1}, \quad \Pi(K, z, 0) = (1 - \alpha) z A K^{\alpha}$

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- $c^P(g, x, k, z)$, $i^P(g, x, k, z)$, and $k^P(g, x, k, z)$ are the policy functions

Recursive Formulation, Households in Default

- The value of a household when the government is in default ($d = 1$) is

$$H^D(g,K,k,z) = \max_{c,i,k'} \left\{ u(c) + \mathbb{E}\left[(1-\theta+\theta d') H^D(g',K',k',z') + \theta(1-d') H^P(g',x',k',z') \right] \right\}$$

$$\begin{aligned} s.t. \qquad & c + i + \frac{\phi}{2}\frac{(i)^2}{k} \leq (1-\tau)\left[r(K,z,1)k + \Pi(K,z,1) \right] + T \\ & k' = i + (1-\delta)k \\ & g' = \Gamma_g(x',z',d') \quad x' = \Gamma_x(x,z,1), \quad d' = \Gamma_d(x',z') \end{aligned}$$

where $r(K,z,1) = \alpha z_D(z) A K^{\alpha-1}$, $\Pi(K,z,1) = (1-\alpha) z_D(z) A K^{\alpha}$

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Recursive Formulation, Government

- The value of the government in good standing is

$$V(x,z) = \max_{d} \left\{ dV^{D}(K,z) + (1-d)\, V^{P}(x,z) \right\}$$

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- The value of default is

$$V^{D}(K,z) = \max_{g \in \mathcal{F}(z,x)} \left\{ u\left(c^{D}(g,K,K,z)\right) + \beta \mathbb{E}\left[(1-\theta)\, V^{D}(K',z') + \theta V(x',z') \right] \right\}$$

$$s.t. \quad G + T = \tau z_{D}(z)\, AK^{\alpha}$$

$$B' = 0 \quad K' = k^{D}(g,K,K,z)$$

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$$\begin{aligned} s.t.\quad & G + T = \tau z_D(z)\, AK^{\alpha} \\ & B' = 0 \quad K' = k^D(g,K,K,z) \end{aligned}$$

- The value of repayment is

$$V^P(x,z) = \max_{g \in \mathcal{F}(z,x)} \left\{ u\left(c^P(g,x,K,z)\right) + \beta \mathbb{E}\left[V(x',z') \right] \right\}$$

$$\begin{aligned} s.t.\quad G + \left[\gamma + \kappa(1-\gamma)\right] B + T &= \tau z A K^{\alpha} + q(x',z)\left[B' - (1-\gamma)\, B\right] \\ K' &= k^P(g,x,K,z) \end{aligned}$$

denote the policy for debt as $b^P(x,z)$

Equilibrium

An equilibrium is (i) value, policy, and beliefs functions for the household, (ii) value and fiscal policy functions for the government, and (iii) a price schedule q such that:

1. Given q, the government's policy functions, and household's beliefs, the value and policy functions of the household solve its dynamic programs
2. Given q and the household's policy functions, the value and policy functions of the government solve its dynamic programs
3. Lenders break even in expectation

$$q\left(x', z\right) = \frac{\mathbb{E}\left[\left(1-d'\right)\left[\gamma + \left(1-\gamma\right)\left(\kappa + q\left(x'', z'\right)\right)\right]\right]}{1+r^{*}}$$

where $x'' = \left(k^{P}\left(g', x', K', z'\right), b^{P}\left(x', z'\right)\right)$

Outline

Default risk and investment

Three channels:

- **Productivity penalty**: with $z_D(z) \leq z$ default risk depresses investment
- **Distortionary taxation**: with $\tau(x, z, 1) \geq \tau(x, z, 0)$ default risk depresses investment
- **Investment externality**: with $\frac{\partial \hat{q}}{\partial K'} \geq 0$ households underinvest in borrowing periods $(B' - (1 - \gamma) B \geq 0)$

Outline

Parameters Calibrated from the Data

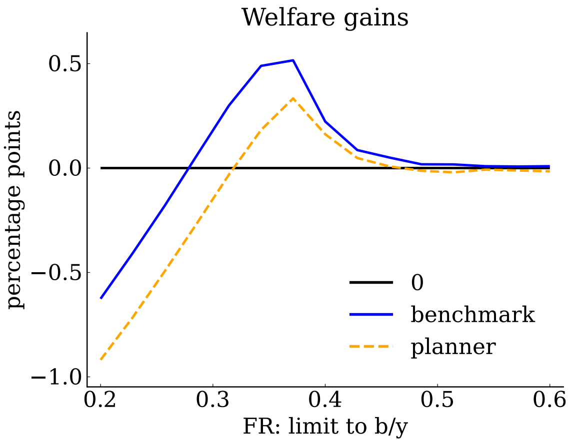
Parameter	Description	Value	Source / Target
σ	Risk aversion	2	Standard
r^*	Risk-free interest rate	0.01	Annual US-Treasury bills rate = 4.0%
δ	Capital depreciation rate	0.05	Standard
γ	Bond maturity rate	0.05	*ChatterjeeEyigungor2012
κ	Bonds coupon rate	0.03	*ChatterjeeEyigungor2012
θ	Probability of re-entry	0.0325	*ChatterjeeEyigungor2012
A	Scaling parameter	0.63	Steady-state GDP=1.0
G	Fixed government expenditure	0.10	10% of Steady-state GDP
χ	Debt limit	∞	No debt limit for Benchmark
α	Capital share	0.33	Standard
ρ	Persistence of productivity	0.95	Standard
σ_z	Volatility of productivity	0.027	Standard

Parameters Calibrated by Simulation

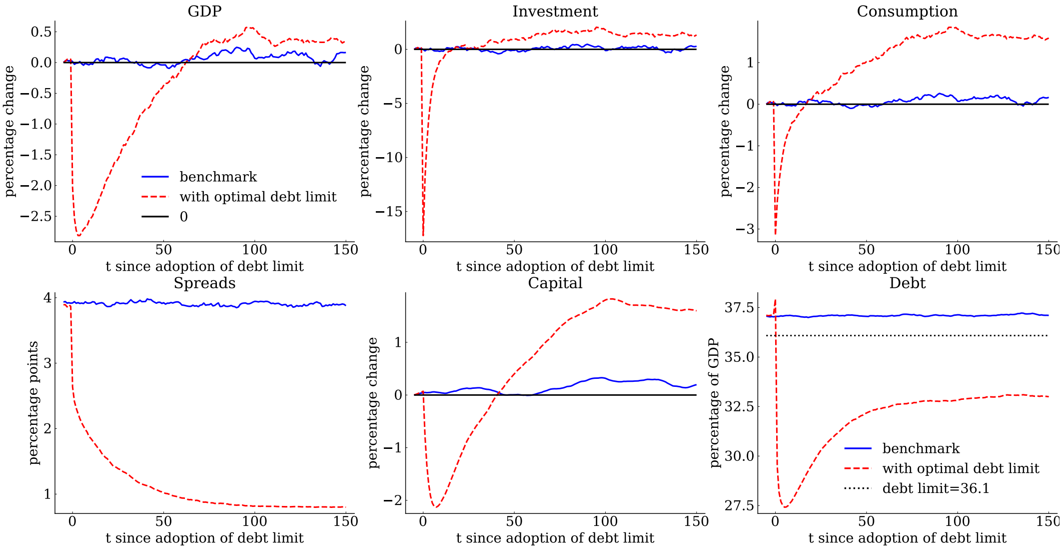
Parameter	Description	Value	Target	Planner (targeted)	Decentralized) (not targeted)
β^F	Discount factor	0.971	Debt-to-GDP ratio $= 0.40$	0.37	0.38
ϕ	Capital adjustment	7.679	$\sigma_i/\sigma_y = 2.7$	2.5	3.3
ξ_0	Default cost	-0.284	Av. spread $= 2.6\%$	2.4%	3.4%
ξ_1	Default cost	0.422	Std. Spreads $= 0.90\%$	1.2	2.2

Optimal Debt Limit

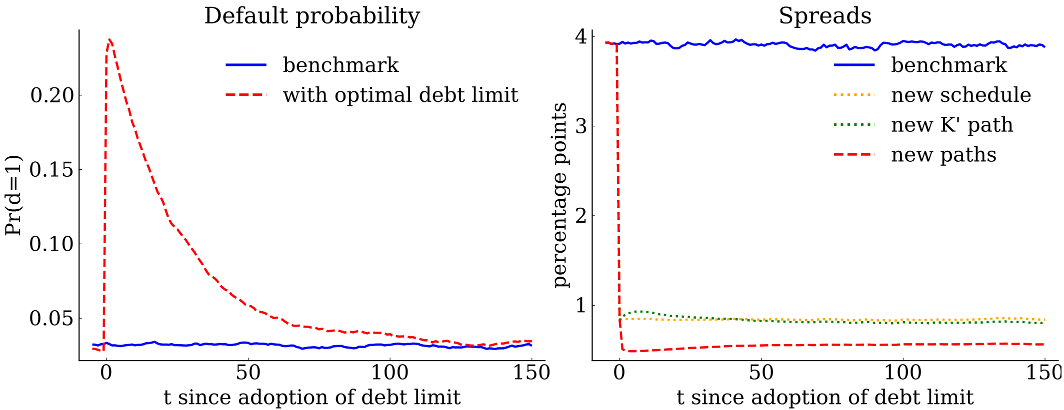
- Half of the welfare gains come from investment distortions



Average Transition Paths



Sovereign Spreads and Default Probability



Conclusion

- The optimal debt limit generates an economic expansion in the long run
- Welfare gains result from a significant reduction in spreads due to expectations about future borrowing and investment
- Our results highlight the importance of institutional mechanisms that provide credibility
- We are silent about comprehensive consolidation plans that could weigh trade-offs between lowering expenditures or raising taxes, which we leave for future research.