Sovereign Risk with Endogenous Debt Limits

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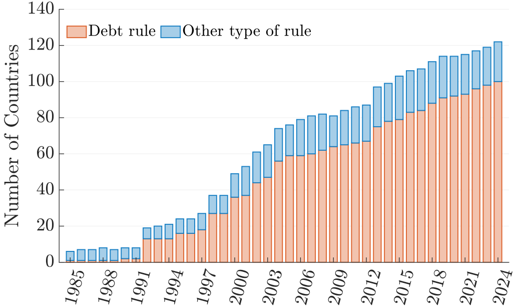
Fiscal rules are spreading—and so are breaches

Panel A. Adoption of fiscal rules



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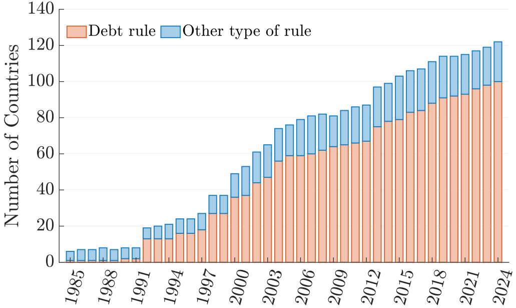
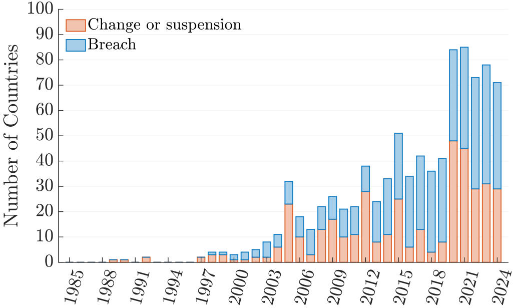


Panel B. Revisions, breaches, and suspensions



Fiscal rules are widespread, especially debt rules. But rules are repeatedly revised, suspended, or breached. The relevant question is therefore not full commitment versus no rule, but what imperfectly enforceable rules can achieve.

Source: IMF Fiscal Rules Dataset, IMF Article IVs, and IDB FISCLAC. Specific Examples

Some people wonder

Elon Musk @elonmusk Follow

What's the point of a debt ceiling if we keep raising it?

Elon Musk @elonmusk Subscribe

Hitting the debt ceiling is the only thing that will actually force the government to cut waste and fraud.

That's why the debt ceiling legislation exists!

5:52 AM · 01/07/2025 · **2.4M** Views

Question and mechanism

Question. Why do governments adopt fiscal rules they may later overturn, and what are the implications for sovereign spreads and macroeconomic outcomes?

Commitment value

- Limits future dilution of long-term debt
- Improves current bond prices
- Reduces spreads and spread volatility

Flexibility cost

- Too-tight ceilings restrict crisis borrowing
- Lower fiscal flexibility can raise default risk

Debt ceilings provide partial commitment: costly to breach, but revisable.

This paper

1. Builds simple three-period models that isolate the debt-dilution motive and the role of partial commitment.
2. Extends the three-period benchmark to stochastic period-2 output, where a non-contingent ceiling creates a commitment–flexibility trade-off.
3. Study debt ceilings in the infinite-horizon long-term debt sovereign default model.

Contribution

We provide a positive theory of debt ceilings as endogenous, partially enforceable commitment devices in sovereign debt markets. In the model, ceilings can lower spreads and improve welfare, but excessively rigid enforcement can reduce fiscal flexibility and raise default risk.

Related literature

- **Sovereign default and fiscal rules:** Hatchondo et al. (2016, 2022); Roch and Roldan (2023); Espino et al. (2022); Esquivel and Samano (2025); Acalin et al. (2025).
  $\rightarrow$ We endogenize the debt-ceiling choice and allow re-optimization by future governments.

- **Optimal fiscal policy with partial commitment:** Farhi (2010); Debortoli and Nunes (2010, 2013); Clymo and Lanteri (2019); Dovis (2019), Clymo, Lanteri, and Villa (2023); Bocola et al. (2025), Kostadinov and Roldan (2025).
  $\rightarrow$ We study partial commitment in a sovereign default model with long-term debt and dilution.

- **Rules versus flexibility:** Amador et al. (2006); Halac and Yared (2014, 2017, 2020, 2022); Bocola et al. (2025).
  $\rightarrow$ The degree of flexibility is a time-consistent equilibrium object.

Cross-Country Evidence from Emerging Markets

Empirical takeaway: rules are associated with lower borrowing costs

Reduced-form evidence

Across countries in the Emerging Markets Bond Index (EMBI), fiscal rules are associated with:

- lower average sovereign spreads;
- lower spread volatility;
- effects robust to restructuring history, ratings, political risk, macro controls, and country/year fixed effects.

Cross-country specification

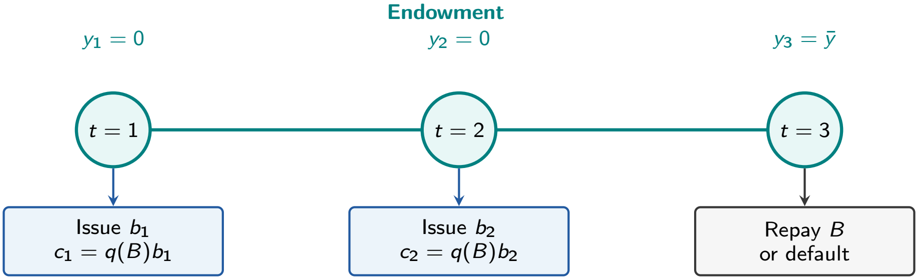
$$\text{EMBI Spread}_{i,t} = \alpha_i + \gamma_t + \beta\,\text{FiscalRule}_{i,t} + Z'_{i,t}\delta + \varepsilon_{i,t}.$$

Sample: 57 EMBI countries through 2019. Fiscal rules come from the IMF Fiscal Rules Database; restructuring controls follow Cruces and Trebesch (2013), Asonuma and Trebesch (2016).

Average spread regressions   Spread volatility regressions

Theory: three-period model

A simple three-period default model



Preferences

$$\sum_{t=1}^{3} \beta^{t-1} u(c_t), \qquad u(c) = -\frac{1}{c}.$$

Total debt and repayment slack

$$B = b_1 + b_2, \qquad x \equiv \frac{\bar{y} - B}{\bar{y}} \in (0, 1].$$

Period-2 borrowing dilutes period-1 debt: it raises B, lowers x, and reduces the bond price $q(B)$.

Default and bond pricing

Payoffs at t

$$c_3 = \begin{cases} \bar{y} - B = \bar{y}x, & \text{repayment,} \\ \dfrac{\bar{y}}{\theta}, & \text{default.} \end{cases}$$

$$\text{Repay if } \underbrace{\bar{y} - B}_{\bar{y}x} \geq \underbrace{\frac{\bar{y}}{\theta}}_{\text{default payoff}} .$$

Bond price

With risk-neutral lenders and a Pareto default-cost shock θ with shape parameter $\alpha = 1/2$:

$$q(x) = \Pr\left(\bar{y}x \geq \frac{\bar{y}}{\theta}\right) = x^{\alpha} = \sqrt{x}.$$

Continuation value as a function of repayment slack

$$\mathbb{E}[u(c_3) \mid x] = \frac{1}{\bar{y}}\left(1 - 2x^{-1/2}\right).$$

More debt lowers x: it reduces repayment consumption $\bar{y}x$, raises the repayment threshold $1/x$, and lowers the bond price $q(x)$.

Commitment benchmark

Planner's problem

Under commitment, the period-1 government chooses both issuances:

$$W_C = \max_{b_1, b_2} \quad u\left(\underbrace{c_1}_{q(x)b_1}\right) + \beta u\left(\underbrace{c_2}_{q(x)b_2}\right) + \beta^2 \mathbb{E}[u(c_3) \mid x], \qquad x = 1 - \frac{b_1 + b_2}{\bar{y}}.$$

Key implication

The commitment allocation internalizes dilution across maturities and satisfies

$$b_2^C = \sqrt{\beta}\, b_1^C.$$

Since $\sqrt{\beta} < 1$, commitment tilts issuance toward the first government and limits future dilution.

Analytical solution

No commitment: future governments dilute inherited debt

Given inherited debt b_1, the period-2 government chooses

$$V_2^{NC}(b_1) = \max_{b_2} u\Bigg(\underbrace{c_2}_{q(x)b_2}\Bigg) + \beta\mathbb{E}[u(c_3) \mid x], \qquad x = 1 - \frac{b_1 + b_2}{\bar{y}}.$$

The successor's best response is

$$b_2^\dagger(b_1) = \frac{\bar{y}}{4\beta}\left[-3 + \sqrt{9 + 16\beta\left(1 - \frac{b_1}{\bar{y}}\right)}\right].$$

Period-1 problem under no commitment

$$W^{NC} = \max_{b_1} \quad u\Bigg(\underbrace{c_1}_{q(x^\dagger)b_1}\Bigg) + \beta u\Bigg(\underbrace{c_2^\dagger}_{q(x^\dagger)b_2^\dagger(b_1)}\Bigg) + \beta^2\mathbb{E}[u(c_3) \mid x^\dagger], \qquad x^\dagger = 1 - \frac{b_1 + b_2^\dagger(b_1)}{\bar{y}}.$$

Intuition: no commitment shifts borrowing toward the future

Strategic interaction across governments

Under no commitment, the period-1 Euler condition contains a dilution term:

$$\beta \frac{u'(c_2)}{u'(c_1)} = 1 + b_1 \frac{q'(B)}{q(B)} \left(1 + b_2^{\dagger\prime}(b_1)\right), \qquad \frac{q'(B)}{q(B)} < 0, \quad 1 + b_2^{\dagger\prime}(b_1) > 0.$$

Hence the extra term is negative: future borrowing is effectively cheaper because the successor does not internalize dilution.

Proposition 1

Debt dilution shifts borrowing toward the future.

Fix $\beta \in (0,1)$ and $\bar{y} > 0$. Then

$$\frac{b_2^{NC}}{b_1^{NC} + b_2^{NC}} \geq \frac{b_2^{C}}{b_1^{C} + b_2^{C}} = \frac{\sqrt{\beta}}{1+\sqrt{\beta}}.$$

Intermediate commitment through debt ceilings

Given inherited debt b_1 and ceiling $\bar{b}$, the period-2 government chooses

$$V(b_1, \bar{b}) = \max_{b_2} \underbrace{u(q(x)b_2)}_{u(c_2)} - \phi \mathbb{1}_{\{b_2 > \bar{b}\}} + \beta \mathbb{E}[u(c_3) \mid x], \qquad x = 1 - \frac{b_1 + b_2}{\bar{y}}.$$

Let $b_2^\star(b_1, \bar{b})$ denote the successor's optimal borrowing rule. The period-1 government chooses inherited debt and a ceiling:

$$W^{IC} = \max_{b_1, \bar{b}} \underbrace{u(q(x^\star)b_1)}_{u(c_1)} + \beta \underbrace{u\big(q(x^\star)b_2^\star(b_1, \bar{b})\big)}_{u(c_2^\star)} - \beta \phi \mathbb{1}_{\{b_2^\star(b_1, \bar{b}) > \bar{b}\}} + \beta^2 \mathbb{E}[u(c_3) \mid x^\star],$$

$$x^\star = 1 - \frac{b_1 + b_2^\star(b_1, \bar{b})}{\bar{y}}.$$

The ceiling adds partial commitment: borrowing above $\bar{b}$ is possible, but costly. The cost ϕ nests no commitment, full commitment, and intermediate commitment.

Main proposition: commitment regimes

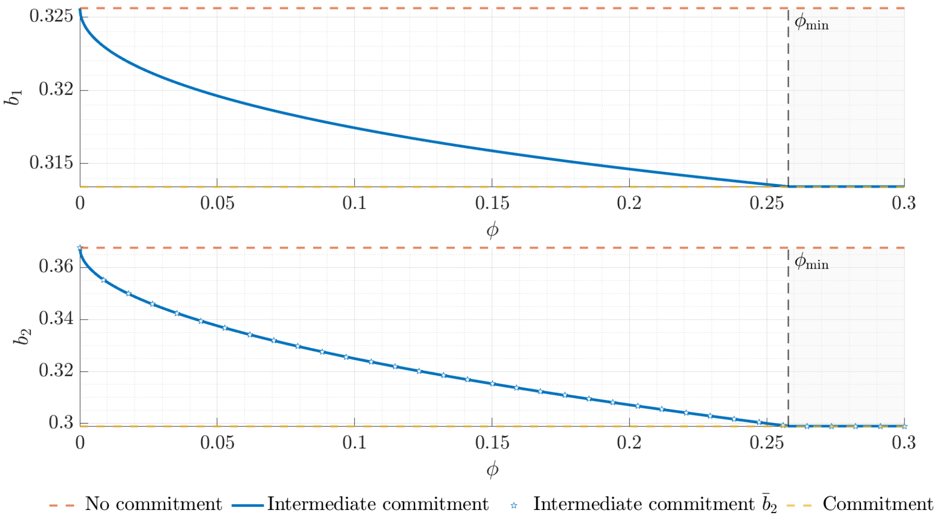
The fixed cost of breaching the ceiling determines how much commitment the rule provides.

$$\phi_{\min} \equiv \underbrace{V\left(b_2^{\dagger}(b_1^C) \mid b_1^C\right)}_{\text{value from deviating}} - \underbrace{V\left(b_2^C \mid b_1^C\right)}_{\text{value under commitment}} > 0.$$

Intermediate commitment regions

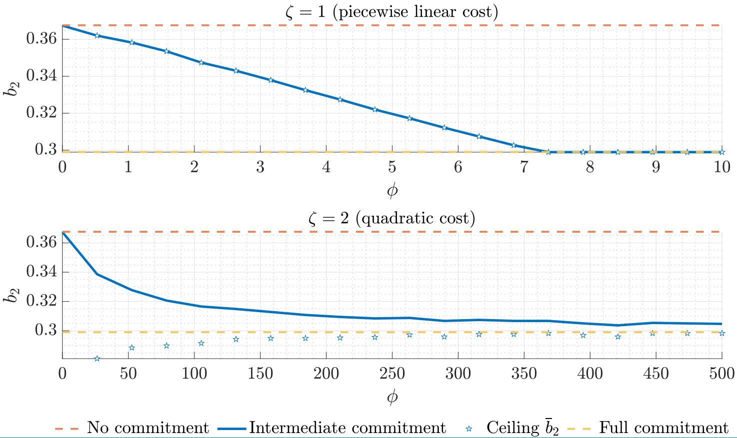
Region	Cost	Implication
No commitment	$\phi = 0$	Rule has no bite; no-commitment allocation
Partial commitment	$0 < \phi < \phi_{\min}$	Ceiling disciplines borrowing, but imperfectly
Full commitment	$\phi \geq \phi_{\min}$	Commitment allocation can be sustained

Optimal policies as a function of enforcement cost



With higher-order breach cost $\zeta > 0$

$$V(b_1, \bar{b}) = \max_{b_2} \left\{ -\frac{1}{q_2 b_2} - \phi(b_2 - \bar{b})^{\zeta} 1_{\{b_2 > \bar{b}\}} + \frac{\beta}{\bar{y}} \left(1 - 2x^{-1/2}\right) \right\}.$$



Extension with income risk: commitment versus flexibility

Now let period-2 output be stochastic:

$$y_2 \in \{y_L, y_H\}, \qquad 0 \leq y_L < y_H, \qquad \Pr(y_2 = y_L) = \pi,$$

while final output remains $\bar{y}$. Period 1 chooses b_1 and a non-contingent ceiling $\bar{b}$. After observing y_s, the successor chooses $b_2(y_s)$.

$$f_0(b_2 \mid b_1, y_s) = u(y_s + q(B)b_2) + \beta\mathbb{E}[u(c_3) \mid B], \qquad B = b_1 + b_2.$$

Let $b_2^\dagger(b_1, y_s) \in \operatorname{argmax}_{b_2} f_0(b_2 \mid b_1, y_s)$. Since marginal utility is higher in the low-output state,

$$b_2^\dagger(b_1, y_L) > b_2^\dagger(b_1, y_H).$$

A non-contingent ceiling disciplines borrowing in good states, but may be too tight precisely when additional borrowing has high insurance value.

With a fixed-cost ceiling, breaches can be state contingent

For fixed breach cost $\Phi(b_2, \bar{b}) = \phi 1_{\{b_2 > \bar{b}\}}$, define the state-specific value of breaching:

$$\Delta_s(b_1, \bar{b}) = f_0\left(b_2^\dagger(b_1, y_s) \mid b_1, y_s\right) - f_0\left(\bar{b} \mid b_1, y_s\right), \qquad s \in \{L, H\}.$$

Because extra borrowing is more valuable in the low-output state,

$$\Delta_L(b_1, \bar{b}) > \Delta_H(b_1, \bar{b}).$$

State-contingent discipline

Region	Enforcement cost	Period-2 outcome
Breach in both states	$0 = \phi$	$b_2(y_s) = b_2^\dagger(b_1, y_s)$ for both states
State-contingent breach	$\Delta_H \leq \phi < \Delta_L$	$b_2(y_H) \leq \bar{b} = b_2^C(y_H)$, $b_2(y_L) = b_2^\dagger(b_1, y_L)$
No breach	$\phi \geq \Delta_L$ or $0 < \phi < \Delta_H$	$b_2(y_s) \leq \bar{b} \neq b_2^C(.)$ for both states

Smooth costs: the ceiling trade-off

Suppose

$$\Phi(b_2, \bar{b}) = \phi(b_2 - \bar{b})^2 1_{\{b_2 > \bar{b}\}}.$$

After observing state s, an interior breach satisfies

$$\frac{\partial}{\partial b_2} f_0(b_2 \mid b_1, y_s) = 2\phi(b_2 - \bar{b}), \qquad b_2 > \bar{b}.$$

Thus, breaches are larger when the marginal value of borrowing is high [low-output states].

For an interior ceiling chosen at $t = 1$,

$$\underbrace{-u'(c_1) b_1 q_{1,\bar{b}}(b_1, \bar{b})}_{\text{marginal commitment value of tightening}} = \underbrace{\beta \mathbb{E}_s \left[2\phi(b_2(y_s) - \bar{b}) 1_{\{b_2(y_s) > \bar{b}\}} \right]}_{\text{marginal expected flexibility cost of tightening}} .$$

Uncertainty gives a looser ceiling an option value: it preserves fiscal flexibility in adverse states while still disciplining borrowing in normal times.

Infinite-horizon model

Sovereign debt model with a debt ceiling

Eaton–Gersovitz model with long-term debt and an additional state variable: the inherited ceiling $\bar{B}$.

1. The country enters the period with debt B and ceiling $\bar{B}$.
2. In repayment, it chooses next-period debt B' and next-period ceiling $\bar{B}'$.
3. New debt above the inherited ceiling triggers an enforcement cost:

$$\Phi(B', \bar{B}) = \begin{cases} 0, & B' < \bar{B}, \\ \phi(B' - \bar{B})^{\zeta}, & B' \geq \bar{B}. \end{cases}$$

4. In default, there is no recovery and no inherited ceiling. Reentry occurs with probability θ, no debt, and maximum ceiling $\bar{B}_{Max}$.

Recursive problem

The government solves

$$V(y,B,\bar{B}) = \max_{d\in\{0,1\}} (1-d)V^R(y,B,\bar{B}) + dV^D(y).$$

In repayment,

$$V^R(y,B,\bar{B}) = \max_{c,B',\bar{B}'} u(c) + \beta\mathbb{E}[V(y',B',\bar{B}')]$$

subject to

$$c + (\delta+z)B = y + q(y,B',\bar{B}')\,[B' - (1-\delta)B] - \Phi(B',\bar{B}).$$

In default,

$$V^D(y) = u(\varrho(y)) + \beta\mathbb{E}\left[\theta V(y',0,\bar{B}_{Max}) + (1-\theta)V^D(y')\right].$$

Numerical exercise

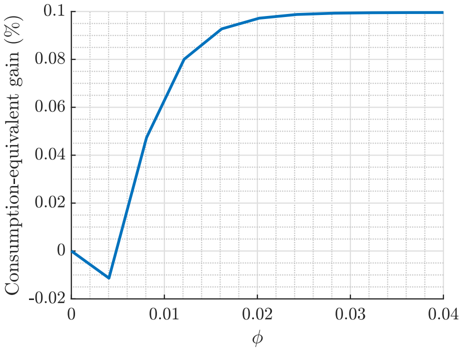
The no-ceiling model is calibrated to Chatterjee and Eyigungor (2012). For each (ϕ, ζ), compute the welfare of a patient planner who evaluates the policy rules of impatient governments:

$$V^{SP}(y_0, B_0 \mid \phi) = \sum_{t=0}^{\infty} \frac{u\left[\mathscr{C}\left(\mathscr{D}_G^{\phi}(t), \mathscr{B}_G^{\phi\prime}(t), \bar{\mathscr{B}}_G^{\phi\prime}(t)\right)\right]}{(1+r)^t}.$$

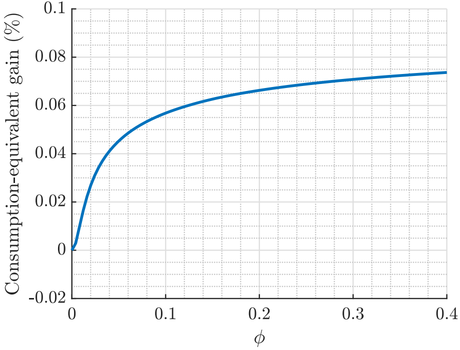
Questions

Do debt ceilings generate welfare gains? Are those gains monotone in enforcement? How do ceilings affect spreads, spread volatility, debt, and default risk?

Welfare gains are positive but non-monotone



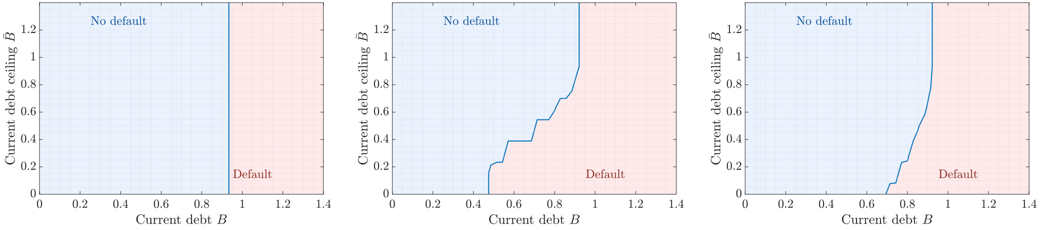
Fixed cost $\zeta = 0$



Quadratic cost $\zeta = 2$

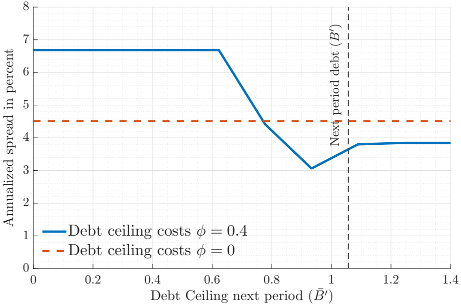
Moderate enforcement improves welfare by limiting dilution. Very loose enforcement can reduce welfare because restricting flexibility in bad states is too costly so the rule is breached.

On the one side, tight ceilings can trigger defaults...

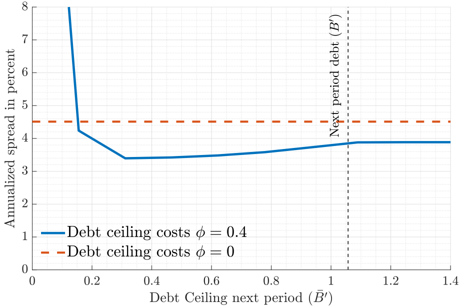


No cost $\phi = 0$ Fixed $\zeta = 0$, $\phi = .4$ Quadratic $\zeta = 2$, $\phi = .4$

...on the other side, promising reasonable austerity can lower borrowing costs

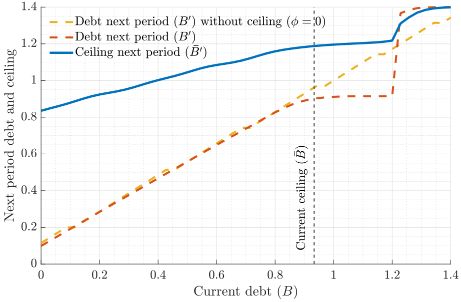


Fixed cost $\zeta = 0$

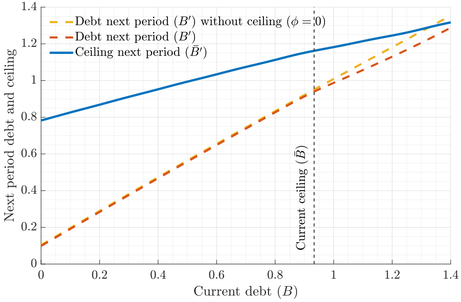


Quadratic cost $\zeta = 2$

Ceilings are partially enforced

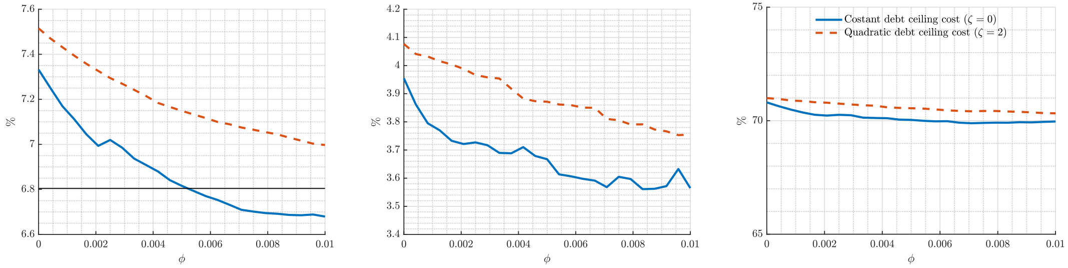


Fixed cost $\zeta = 0$



Quadratic cost $\zeta = 2$

Spreads, spread volatility, and debt across enforcement costs



(a) Mean spread **(b)** Spread volatility **(c)** Average debt-to-output

Higher enforcement lowers spreads and spread volatility by reducing dilution, while average debt changes little. The spread moment is illustrative rather than directly calibrated to the empirical fiscal-rule coefficient.

Conclusions

This paper studies self-imposed fiscal rules as imperfectly enforceable debt ceilings.

- Promising lower future ceilings can lower current borrowing costs.
- Current ceilings reduce debt issuance when they are not too tight.
- Too-tight ceilings can trigger defaults and reduce welfare.
- Stochastic output creates a commitment–flexibility trade-off: optimal enforcement disciplines borrowing in normal times but preserves flexibility in crises.

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Next step

Can political frictions sustain fiscal rules? Incumbents may lose credibility when they violate rules, while opposition parties may prefer rigidity in booms and flexibility in crises.

Appendix

	EMBI	EMBI	EMBI	EMBI	EMBI
Fiscal Rules	-60.552***	-34.343	-34.800*	-42.239*	-52.712**
	(20.296)	(23.241)	(21.016)	(22.292)	(20.919)
Corporate yield	54.983***	56.090***	56.099***	54.961***	55.100***
	(4.120)	(4.210)	(4.151)	(4.167)	(4.128)
Debt-to-GDP	4.060***			4.823***	3.857***
	(1.213)			(1.089)	(1.229)
GDP growth	-10.659***			-13.559***	-10.367***
	(2.566)			(3.143)	(2.634)
Reserves	-1.613***				-1.585***
	(0.452)				(0.453)
Inflation	0.214*				0.198
	(0.124)				(0.121)
Balance-to-GDP	-12.494***				-12.219***
	(3.832)				(3.933)
CA-to-GDP	-5.789***				-5.826***
	(1.591)				(1.647)
Restructuring dummy	No	Yes	Yes	Yes	Yes
Ratings control	Yes	No	Yes	No	Yes
Political risk control	Yes	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes	Yes
N	9186	9194	9186	9194	9186
R-squared	0.691	0.603	0.661	0.648	0.693

Back

	Vol. EMBI	Vol. EMBI	Vol. EMBI	Vol. EMBI	Vol. EMBI
Fiscal Rules	-4.903***	-4.301**	-4.236***	-4.602***	-4.524***
	(1.571)	(1.670)	(1.616)	(1.652)	(1.601)
Corporate yield	3.832***	3.877***	3.877***	3.827***	3.834***
	(0.453)	(0.453)	(0.454)	(0.451)	(0.452)
Debt-to-GDP	0.142			0.211**	0.130
	(0.096)			(0.089)	(0.096)
GDP growth	-0.564***			-0.802***	-0.587***
	(0.192)			(0.217)	(0.195)
Reserves	-0.038				-0.040
	(0.034)				(0.034)
Inflation	0.032***				0.030***
	(0.008)				(0.008)
Balance-to-GDP	-0.764***				-0.749***
	(0.264)				(0.269)
CA-to-GDP	-0.278**				-0.257**
	(0.113)				(0.120)
Restructuring dummy	No	Yes	Yes	Yes	Yes
Ratings control	Yes	No	Yes	No	Yes
Political risk control	Yes	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes	Yes
N	8989	8996	8989	8996	8989
R-squared	0.269	0.248	0.260	0.261	0.271

Back

Commitment benchmark: analytical solution

Under commitment, the period-1 government chooses both issuances:

$$W_C = \max_{b_1, b_2} -\frac{1}{q(x)b_1} - \frac{\beta}{q(x)b_2} + \beta^2 \mathbb{E}[u(c_3) \mid x], \qquad x = 1 - \frac{b_1 + b_2}{\bar{y}}.$$

Optimal debt levels are

$$\frac{b_1^C}{\bar{y}} = \frac{-\frac{3(1+\sqrt{\beta})}{2} + \sqrt{4\beta^2 + \frac{9}{4}(1+\beta+2\sqrt{\beta})}}{2\beta^2},$$

$$\frac{b_2^C}{\bar{y}} = \frac{-\frac{3(1+\sqrt{\beta})}{2} + \sqrt{4\beta^2 + \frac{9}{4}(1+\beta+2\sqrt{\beta})}}{2\beta^{3/2}}.$$

The commitment allocation satisfies $b_2^C = \sqrt{\beta}\, b_1^C$.

Back to commitment benchmark

Recent examples

Back

Peru: repeated revisions to debt limits

- New ceilings for 2020–2023 under *Decreto de Urgencia No. 032-2019*.
- Debt ceiling raised in July 2024 under *Decreto Legislativo No. 1621*.
- In May 2025, the Finance Minister proposed raising the 2025 cap after breaches in 2023 and 2024.

The issue is not limited to emerging markets.

Advanced-economy examples

- **Germany:** Bundestag amended the debt brake for defense spending in June 2022 and again in March 2025.
- **United Kingdom:** Fiscal rules revised in October 2024 to accommodate infrastructure spending.
- **Sweden:** Constitutional budget rule relaxed in October 2024.
- **European Union:** Stability and Growth Pact reformed in October 2023.