Policy Rules and Large Crises in Emerging Countries

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New Challenges for Fiscal & Monetary Policy

February 21, 2025

Miami Herbert Business School | University of Miami

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Emerging economies are adopting policy rules to strengthen macroeconomic stability.

- ▶ Fiscal rules: debt ceilings, balanced budgets.

- ▶ Monetary rules: inflation targeting, money supply limits.

> Should rules be suspended during crises for flexibility or maintained for credibility?

Policy Rules and Flexibility During Crises in a Model of Sovereign Default

Steady State: Fiscal rules yield larger welfare gains than monetary rules.

Crisis - Suspension of rules:

▶ Gains from suspending monetary rules exceed those from fiscal rules.

▶ Suspend monetary rule: Loose monetary policy, valuable during crisis.

▶ Suspend fiscal rule: Lenders already impose discipline, limiting debt increase.

Crisis - Abandonment of rules:

▶ Losses from abandoning fiscal rules exceed those from monetary rules.

▶ Higher sovereign debt spreads and welfare losses due to debt dilution.

Model

Framework: Tradable-Nontradable Model

Small open economy model with tradable and non-tradable goods.
Incorporate: production, fiscal policy, monetary policy, and sovereign default.

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Goods

- Non-tradable (c^N, y^N): consumed and produced domestically.
- Imported good c^T: consumed domestically.
- Exported good y^T: produced domestically.
- Public good g: produced from non-tradable output.

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Endogenous prices

- Non-tradable goods (p^N)
- Wages (w)
- Nominal exchange rate (e)

The Firm's Problem: Profit Maximization

A representative firm maximizes profits:

$$\max_{y^N, y^T, h} \quad p^N y^N + e p^T \overbrace{(1 - \phi)}^{\text{Trade frictions}} y^T - wh$$

$$\text{subject to} \quad A(I) F(y^N, y^T) - h \leq 0$$

▶ $I = \{P, D\}$ indicates the government's credit standing (pay or default).

▶ Productivity: $A(I) F(y^N, y^T)$ determines the hours required to produce (y^N, y^T)

The Problem of the Household

$$V(m, B, I) = \max_{c^N, c^T, m', h} u(c^N, c^T) + v(1-h) + \vartheta(g) + \beta \mathbb{E}\left[V(m', B', I') \mid B, I\right]$$

subject to

$$p^N c^N + e(1+\phi)c^T + m'(1+\mu) \leq (1-\tau)wh + m + p^N \gamma$$

$$p^N c^N \leq \theta m$$

Cash-in-advance (CIA): velocity of money θ

Government:

▶ g: government spending

▶ μ: money growth rates distorts saving decisions m'

▶ τ: Labor income tax rate

▶ γ: Lump-sum transfers, received in units of non-tradable goods.

Government Budget Constraint and Balance of Payments

- ▶ Government Debt: Long-term, defaultable, and denominated in foreign currency.
- ▶ Expenditure: Public goods g, and exogenous transfers γ.
- ▶ Revenue Sources: τ taxes on labor, μ seigniorage, and B' borrowing.

Government Budget Constraint:

$$\underbrace{p^N(g+\gamma)}_{\text{Expenditure}} + \underbrace{e\delta B}_{\text{Debt repayments}} = \underbrace{\tau wh}_{\text{Tax revenue}} + \underbrace{\mu}_{\text{Seigniorage}} + \underbrace{eQ(B')[B'-(1-\delta)B]}_{\text{Net borrowing}}$$

Balance of Payments: Expressed in **foreign currency**

$$\underbrace{(1-\phi)p^T y^T - (1+\phi)c^T}_{\text{Net exports}} = \underbrace{\delta B}_{\text{Debt repayments}} - \underbrace{Q(B')[B'-(1-\delta)B]}_{\text{Net borrowing}}$$

Repayment vs Default

Default Consequences: Temporary exclusion from credit markets and lower productivity.

Government chooses between repayment (P) and default (D):

$$\hat{\mathcal{V}}(B, \varepsilon) = \max\{V^P(B) + \varepsilon, V^D\}$$

where ε is an i.i.d. shock drawn from a logistic distribution with variance ζ.

Repayment Probability:

$$\mathcal{P}(B) = \Pr[V^P(B) - V^D \geq -\varepsilon] = \frac{\exp\left(\frac{V^P(B)}{\zeta}\right)}{\exp\left(\frac{V^P(B)}{\zeta}\right) + \exp\left(\frac{V^D}{\zeta}\right)}$$

Continuation Value:

$$\mathcal{V}(B) = \zeta \log\left[\exp\left(\frac{V^P(B)}{\zeta}\right) + \exp\left(\frac{V^D}{\zeta}\right)\right]$$

Debt Pricing:

$$Q(B') = \frac{1}{1+r}\left[\mathcal{P}(B')\left(\delta + (1-\delta)Q(\mathcal{B}(B'))\right)\right]$$

Government optimization: Repayment

$$V^P(B) \equiv \max_{B',c^N,c^T,y^T,\mu,\tau,g} u(c^N, c^T) + v(1-h) + \vartheta(g) + \beta\mathcal{V}(B')$$

subject to

1. government budget constraint

2. balance of payment constraint

3. households and firms making optimal decisions

4. markets clearing: $c^N + g = y^N$, $A(I)F(y^N, y^T) = h$

5. constraints imposed by rules (if they apply):

   ▶ Monetary policy: $\mu = \mu^*$

   ▶ Fiscal policy: $B' < B^*$

Government optimization: Default

$$V^D \equiv \max_{c^N, c^T, y^T, \mu, \tau, g} u(c^N, c^T) + v(1-h) + \vartheta(g) + \beta\mathbb{E}[\underbrace{\pi}_{\text{re-entry prob}} \mathcal{V}(0) + (1-\pi)V^D]$$

subject to

1. government budget constraint

2. balance of payment constraint

3. households and firms making optimal decisions

4. markets clearing: $c^N + g = y^N$, $A^D(I)F(y^N, y^T) = h$

5. Rules are not enforced during default

Calibration

Quantitative analysis
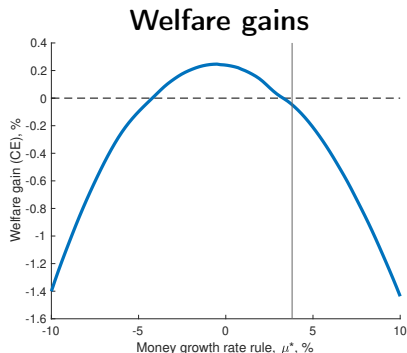
Data:

- ▶ Seven Latin American countries (1980–2018). ▷ Calibration

- ▶ EKMS (2024) studies the case with stochastic term-of-trade and TFP.

Roadmap:

1. Derive optimal monetary and fiscal rules in normal times.

2. Use COVID-19 to simulate a large, unexpected crisis

3. Evaluate welfare gains: Maintain, suspend, or abandon rules

Policy Rules

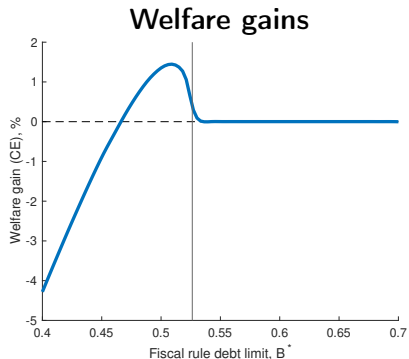# Monetary policy rule: $\mu = \mu^* = -0.5\%$

Welfare gains

The vertical line corresponds to the value of the policy in a steady state without rules. Welfare gains as % of nontradable consumption.

	Discretion	Money growth $\mu^* = -0.50\%$
Debt / GDP	0.365	0.363
Inflation	0.038	-0.005
Tax rate	0.240	0.269
Expenditure / GDP	0.250	0.251
Real GDP	1.000	0.993
Employment	0.587	0.586
Exports / GDP	0.209	0.200
Default probability	0.020	0.021
Welfare gains, %	—	0.250

Gains because of time-consistency problem in μ

No gains when $\sigma = 1$

# Fiscal policy rule: $B' \leq B^* = 0.51$

Welfare gains

The vertical line corresponds to the value of the policy in a steady state without rules. Welfare gains as % of nontradable consumption.

	Discretion	Debt ceiling
		$B^* = 0.51$
Debt / GDP	0.365	0.351
Inflation	0.038	0.036
Tax rate	0.240	0.238
Expenditure / GDP	0.250	0.250
Real GDP	1.000	1.000
Employment	0.587	0.587
Exports / GDP	0.209	0.207
Default probability	0.020	0.010
Welfare gains, %	—	1.450

Gains because of over-borrowing due to debt dilution

No gains with short-term debt

Fiscal and Monetary Rules: $\mu = \mu^* = -0.81\%, B \leq B^* = 0.51$

Welfare gains
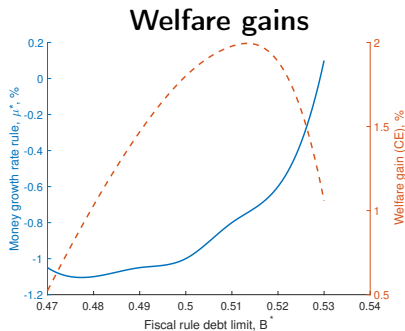
Optimal money growth rate target μ^* as a function of debt limit B^*.

	Discretion	Both $\mu^* = -0.80\%$ $B^* = 0.51$
Debt / GDP	0.365	0.347
Inflation	0.038	-0.008
Tax rate	0.240	0.268
Expenditure / GDP	0.250	0.251
Real GDP	1.000	0.992
Employment	0.587	0.586
Exports / GDP	0.209	0.197
Default probability	0.020	0.010
Welfare gains, %	—	1.978

Optimal μ increases as the debt limit increases

Complementarity between fiscal and monetary rules

Large Crises

Large Crises: Modeling a COVID-19 shock

Optimal monetary and fiscal rules:

1. Imposed prior to shock
2. Suspended during crisis
3. Reimposed afterwards

Unexpected shocks

Shock	Target
Productivity, ω_0	Δ Real GDP -9.5 %
Transfers γ	Δ Expenditure / GDP 4.1 pp
Trade costs ϕ	Δ Imports -15.4 %
Liquidity θ	Δ Inflation -0.2 pp
Cost of default ω_2	Δ Credit spreads 96.2 bps

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Non-targeted moments

	Data	Model
Δ GDP USD, %	-18.6	-21.9
Δ Employment, pp	-7.3	-2.9
Δ Exports, %	-13.2	-13.9
Δ Debt / GDP, pp	5.2	12.7
Δ Tax rate, pp	-0.8	-9.9
Δ Money growth rate, pp	28.9	15.8
Δ Depreciation, pp	8.2	13.0
Δ Inflation in 2021, pp	6.3	18.0
Welfare gain of shock, %		-13.1

High cost, equivalent to a one-period drop in non-tradable consumption of 13.1%.

Gains from flexibility during large crises

- Fiscal and monetary rules are in place before the crisis.

- What happens when the shock hits? Three cases:

  - Rules are maintained

  - Rules are suspended for the duration of the crisis (benchmark)

  - Rules are abandoned

- Why consider abandoning the rules?

 - Country may lack commitment to reinstate rules suspended during a crisis.

Maintaining, suspending, or abandoning both rules

	Both rules Maintained	Both rules Suspended	Both rules Abandoned
Δ Real GDP, %	-12.13	-9.49	-9.54
Δ Debt / GDP, %	26.95	36.64	36.88
Δ Money growth rate, pp	0.00	15.81	16.31
Δ Tax rate, pp	4.73	-9.87	-9.60
Δ Primary deficit / GDP, pp	-0.41	13.92	13.59
Δ Credit spreads, bps	94.58	96.28	218.57
Δ Inflation, pp	-1.21	-0.19	0.52
Δ Inflation 2021, pp	1.23	18.01	18.24
Welfare gains of shocks, %	-13.85	-13.13	-15.10
Welfare gains of flexibility, %	—	0.83	-1.42

Larger fiscal adjustment if maintaining rules

Abandoning rules generates welfare losses

# Welfare Gains of Flexibility: Fiscal vs. Monetary Rules
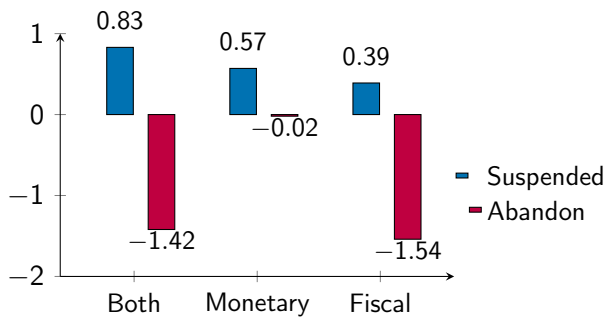
Suspending rules

▶ Gains of suspending monetary rule larger than suspending the fiscal rule

▶ Sovereign debt markets impose fiscal discipline as rules will return

Abandoning rules

▶ Losses from abandoning the fiscal rule larger than those of the monetary rule

▶ Significant increase in default probability and spreads (debt dilution)

What if rules remain suspended after crisis ends?

| Both rules | Monetary rule | Fiscal rule |
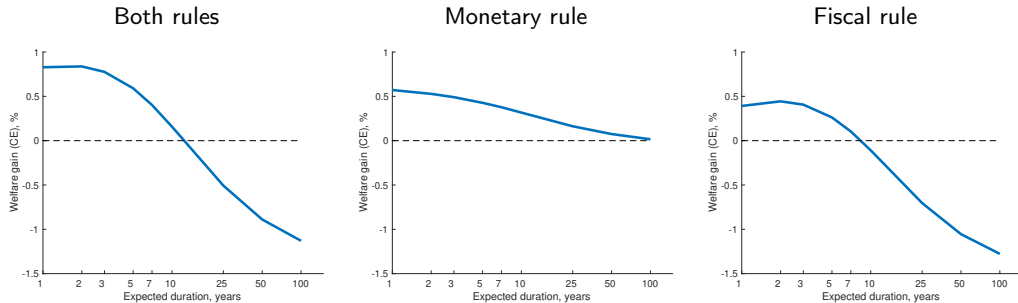
- ▶ Positive gains when both rules are expected to be suspended for up to 14 years
- ▶ Flat for a number of years after the crisis ends
- ▶ Reimposing rules can be safely delayed

Unpacking the gains from flexibility during large crises

Shocks				Both rules are		Monetary rule is		Fiscal rule is	
TFP	γ	ϕ	θ	Suspended	Abandoned	Suspended	Abandoned	Suspended	Abandoned
$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	0.83	-1.42	0.57	-0.02	0.39	-1.54
$\checkmark$	$\checkmark$	$\checkmark$	$\times$	0.39	-1.72	0.19	-0.35	0.25	-1.58
$\checkmark$	$\checkmark$	$\times$	$\checkmark$	0.49	-1.74	0.40	-0.20	0.17	-1.75
$\checkmark$	$\times$	$\checkmark$	$\checkmark$	0.56	-1.67	0.32	-0.26	0.33	-1.59
$\times$	$\checkmark$	$\checkmark$	$\checkmark$	0.66	-1.54	0.46	-0.12	0.31	-1.58

▶ Suspending a rule is always beneficial (unanticipated crisis and lasts one period)

▶ The value of abandoning is always detrimental for welfare

▶ Benefits of suspension diminish when the shock to money demand, θ, is absent

Monetary and fiscal rules in emerging countries

In normal times:

▶ rules mitigate time-consistency problems in debt choice

▶ debt limit particularly beneficial as the debt-dilution problem is severe

▶ monetary and fiscal rules are complementary

During times of crisis:

▶ flexibility might be warranted to implement a better policy response

▶ **Caution:** prolonged suspension of rules beyond crisis may lead to welfare losses

Appendix

Related Literature

▶ Sovereign Default
Eaton and Gersovitz (1981); Aguiar and Gopinath (2006); Arellano (2008); **Hatchondo and Martinez (2009)**; Chatterjee and Eyigungor (2012).

▶ Sovereign Default + Fiscal Policy
Cuadra, Sánchez, and Sapriza (2010); Bianchi, Ottonello, and Presno (2023).

▶ Sovereign Default + Monetary Policy
Na, Schmitt-Grohé, Uribe, and Yue (2018); Arellano, Bai, and Mihalache (2020); Bianchi and Sosa-Padilla (2023); **Espino, Kozlowski, Martin, and Sánchez (2024)**.

▶ Sovereign Default + Policy Rules
Bianchi and Mondragon (2021); Hatchondo, Roch, and Martinez (2022).

Functional forms

Preferences:

$$u(c^N, c^T) = \alpha^N \frac{\left(c^N\right)^{1-\sigma}}{1-\sigma} + \alpha^T \frac{\left(c^T\right)^{1-\sigma}}{1-\sigma}, \quad v(\ell) = \alpha^H \frac{\ell^{1-\varphi}}{1-\varphi}.$$

Labor requirement for production:

$$F(y^N, y^T) = \left[\left(y^N\right)^\rho + \left(y^T\right)^\rho\right]^{1/\rho}$$

Cost of default:

$$A(P) = {\omega_0}^{-1}, \qquad A(D) = (\omega_0 - \omega_1)^{-1}$$

Cost of default in crisis:

$$A(D) = (\omega_0 - \max\{\omega_1 + \omega_2 \times gap(\omega_0, \gamma, \theta, \phi), 0\})^{-1}$$

where *gap* is the deviation from the steady state of the GDP in dollars.

Exogenous Parameters

Parameter	Description	Value	Basis
r	risk-free rate	0.03	Long-run average
φ	curvature of leisure	1.50	Frisch elasticity
α^T	preference share for c^T	1.00	Normalization
θ	velocity of circulation	1.00	Normalization
ϕ	trade cost	0.00	Normalization
p^T	price of exports	1.00	Normalization
π	re-entry probability	0.17	Exclusion duration
δ	fraction of maturing coupons	0.20	Debt maturity
σ	curvature of $u(c^N, c^T)$	0.50	EKMS
ρ	elasticity of substitution in $F(y^N, y^T)$	1.50	EKMS

Parameters calibrated internally and matched statistics

Parameter	Value	Statistic	Target
β	0.8563	Inflation, %	3.800
γ	0.1082	Transfers/GDP	0.117
α^H	0.9366	Employment/Population	0.587
α^G	0.4397	Gov. Consumption/GDP	0.133
α^N	2.7880	Exports/GDP	0.209
ω_0	1.4575	Real GDP	1.000
ω_1	0.1034	Debt/GDP	0.365
ζ	0.0663	Default, %	2.000

COVID-19 Impact on Real GDP Growth in 2020

To calibrate the shock, we target the impact of COVID-19 on some macro variables.
The impact of COVID-19 is the difference between the data for 2020 and the WEO forecast for 2020 made in October on 2019.

Country	Actual GDP (%)	WEO Forecast (%)	Impact (%)
Argentina	-9.9	-1.3	-8.6
Brazil	-4.1	2.0	-6.1
Chile	-5.8	3.0	-8.9
Colombia	-6.8	3.6	-10.4
Mexico	-8.3	1.3	-9.6
Peru	-11.0	3.6	-14.6
Uruguay	-5.9	2.3	-8.2
Average	-7.4	2.1	-9.5

Welfare gains

Value in the repayment and default states, given compensation Δ:

$$V^P (B, \Delta) = u \left((1 + \Delta) c^N, c^T \right) + v (1 - h) + \vartheta(g) + \beta \mathcal{V} (B')$$

$$V^D (\Delta) = u \left((1 + \Delta) c^N, c^T \right) + v (1 - h) + \vartheta(g) + \beta \delta \mathcal{V} (0) + \beta (1 - \delta) V^D$$
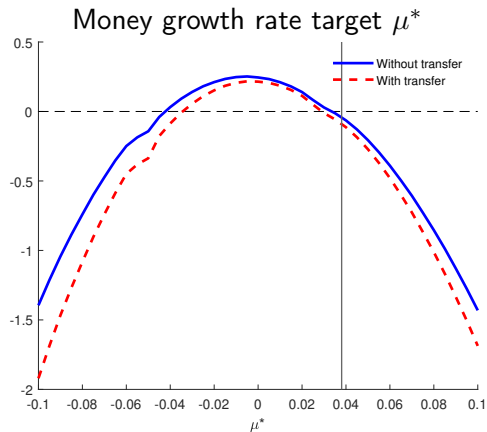
Ex ante value (before the extreme value shock is realized) is given by

$$\mathcal{V} (B, \Delta) = \zeta \log \left[exp \left(\frac{V^P (B, \Delta)}{\zeta} \right) + exp \left(\frac{V^D (\Delta)}{\zeta} \right) \right]$$

Let $\mathcal{V}^R(B)$ be the corresponding value function under policy rule $R = \{\mu^*, B^*\}$. For a given debt level B, the welfare measure Δ solves:
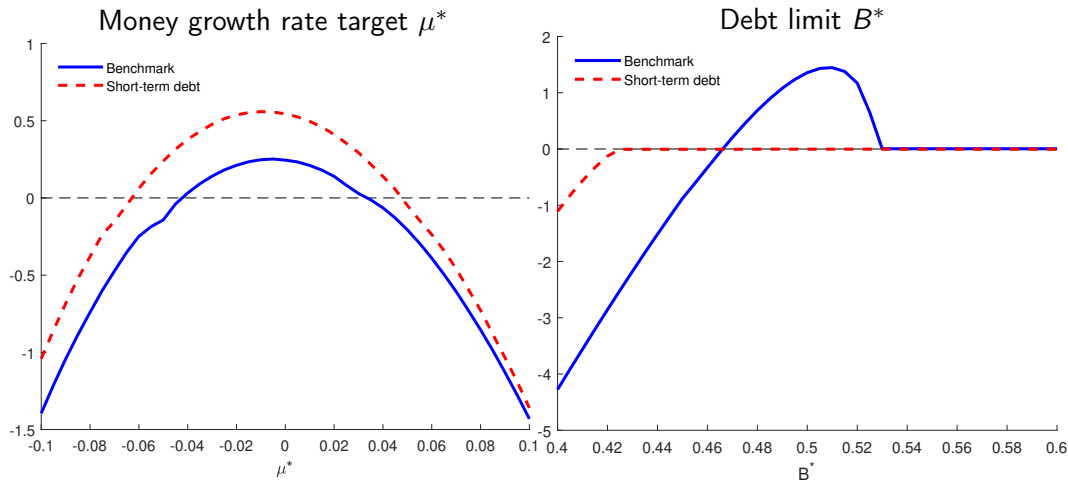
$$\mathcal{V} (B, \Delta) = \mathcal{V}^R(B)$$

Welfare implications with indifferent lenders

Money growth rate target μ^*

Debt limit B^*
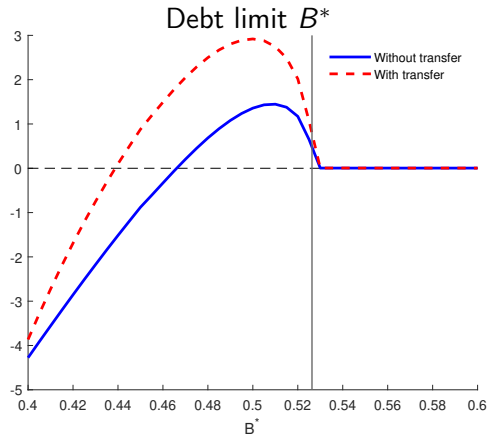
Note: Debt is at the steady state value, $B = B^{ss}$.

Short-term debt

Money growth rate target μ^*

Debt limit B^*
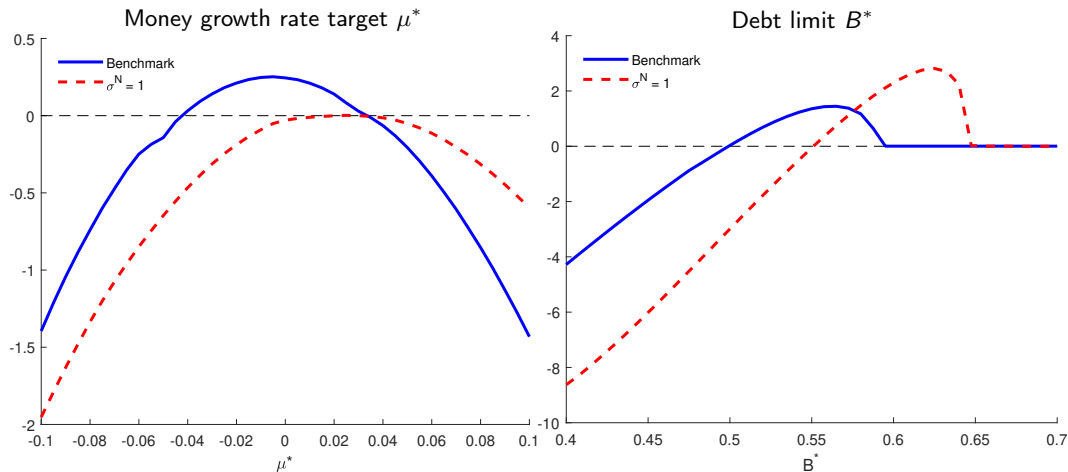
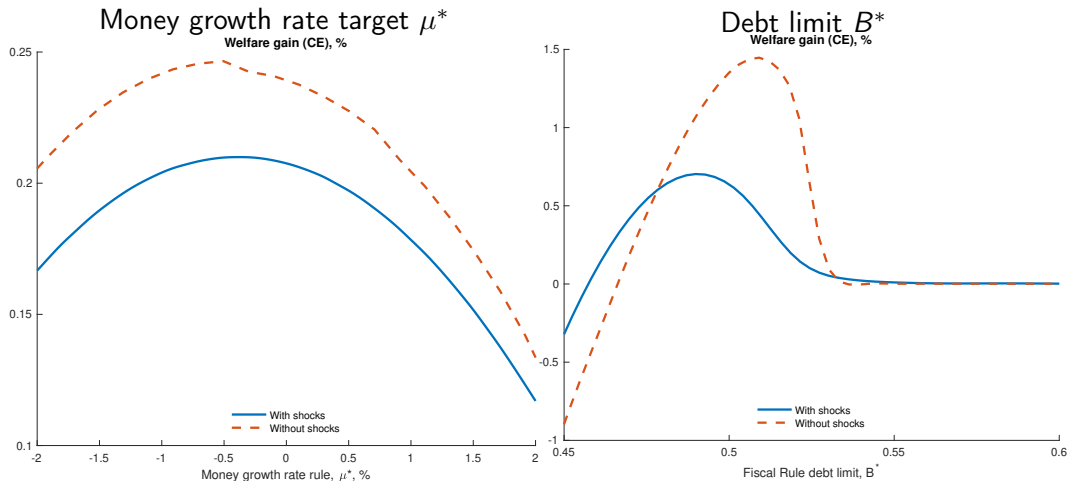Note: Debt is at the steady state value, $B = B^{ss}$.

Money demand

With $\sigma^N = 1$, the intertemporal distortion in debt choice, which stems from a time-consistency problem due to the demand for money, disappears.

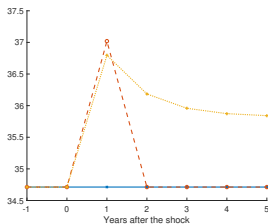Note: Debt is at the steady state value, $B = B^{ss}$.
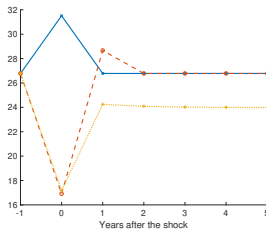
Expected terms of trade shocks

Note: Debt is at the steady-state value, $B = B^{ss}$.
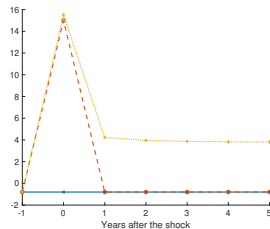
Dynamics of a large crisis
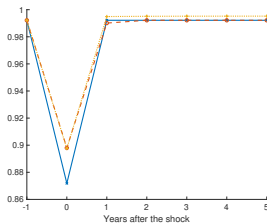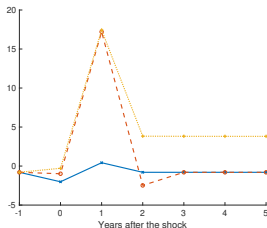

Debt/GDP$_{-1}$, %

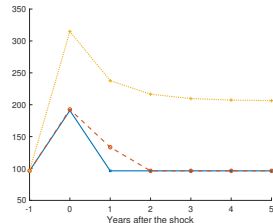Tax rate, %

Money growth rate, %

Real GDP

Inflation, %

Credit spreads, bps

- - - Suspended   —— Maintained   - - - Abandoned

[]Arellano, C., Bai, Y., and Mihalache, G. P. Monetary policy and sovereign risk in emerging economies (nk-default). Technical Report 26671, National Bureau of Economic Research, 2020.

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[ ]Bianchi, J. and Sosa-Padilla, C. Reserve Accumulation, Macroeconomic Stabilization, and Sovereign Risk. *The Review of Economic Studies*, 2023.

[   ]Bianchi, J., Ottonello, P., and Presno, I. Fiscal Stimulus under Sovereign Risk. *Journal of Political Economy*, 131(9):2328–2369, 2023.

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Maintaining, suspending, or abandoning monetary rule

	Both rules Maintained	Monetary Suspended	Monetary Abandoned
Δ Real GDP, %	-12.13	-9.30	-9.41
Δ Debt / GDP, %	26.95	30.90	31.26
Δ Money growth rate, pp	0.00	17.94	17.90
Δ Tax rate, pp	4.73	-9.16	-9.06
Δ Primary deficit / GDP, pp	-0.41	12.94	12.85
Δ Credit spreads, bps	94.58	74.80	95.66
Δ Inflation, pp	-1.21	1.72	1.99
Δ Inflation 2021, pp	1.23	15.95	16.99
Welfare gains of shocks, %	-13.85	-13.35	-13.87
Welfare gains of flexibility, %	—	0.57	-0.02

Rule forces substitution between μ and τ

Similar to inflation targeting

Maintaining, suspending, or abandoning fiscal rule

	Both rules Maintained	Fiscal Suspended	Fiscal Abandoned
Δ Real GDP, %	-12.13	-11.91	-11.92
Δ Debt / GDP, %	26.95	33.28	33.42
Δ Money growth rate, pp	0.00	0.00	0.00
Δ Tax rate, pp	4.73	2.40	2.90
Δ Primary deficit / GDP, pp	-0.41	2.18	1.61
Δ Credit spreads, bps	94.58	117.94	242.09
Δ Inflation, pp	-1.21	-2.99	-2.70
Δ Inflation 2021, pp	1.23	5.14	3.78
Welfare gains of shocks, %	-13.85	-13.51	-15.20
Welfare gains of flexibility, %	—	0.39	-1.54

Rule reduces borrowing and increases μ

Suspending and abandoning rule implies ↑ spreads

Rules vs. flexibility when the crisis is expected to last for two years

	Both rules are			Monetary rule is		Fiscal rule is	
	Suspended	Maintained	Abandoned	Suspended	Abandoned	Suspended	Abandoned
Δ Real GDP, %	-8.57	-11.35	-8.61	-8.57	-8.62	-11.35	-11.44
Δ Debt / GDP, %	27.01	21.90	26.30	27.01	26.79	21.90	21.35
Δ Tax rate, pp	-9.15	6.12	-8.87	-9.15	-9.04	6.12	6.63
Δ Primary deficit / GDP, pp	12.64	-2.12	12.29	12.64	12.51	-2.12	-2.68
Δ Money growth rate, pp	19.84	0.00	20.44	19.84	20.01	0.00	0.00
Δ Credit spreads, bps	497.58	647.62	752.54	497.57	562.59	647.48	916.19
Δ Default probability, pp	13.62	17.20	18.78	13.61	15.21	17.19	22.09
Δ Inflation, pp	1.80	-1.94	2.63	1.80	2.13	-1.94	-1.42
Δ Inflation 2021, pp	16.80	1.11	17.33	16.80	17.65	1.11	0.33
Welfare gains of shocks, %	-22.53	-23.08	-24.29	-22.53	-23.00	-23.08	-24.60
Welfare gains of flexibility, %	0.66	–	-1.46	0.66	0.10	0.00	-1.84

► Suspending only the fiscal rule does not yield any welfare gains

► Large surge in credit spreads → fiscal rule not binding