Default with Policy-Randomness Overestimation

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Outline

Motivation

A Persistent Puzzle

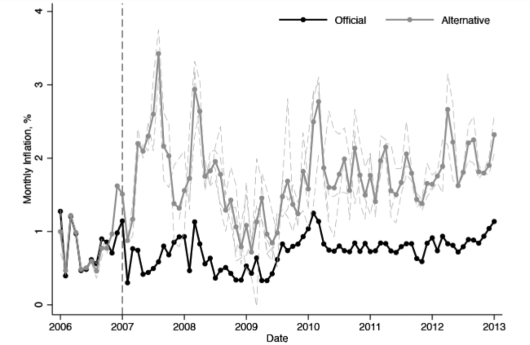
Some sovereigns face persistently high spreads despite moderate debt and improving fundamentals.

Event evidence (e.g., Argentina's inflation misreporting) shows spread decoupling beyond direct balance-sheet effects.

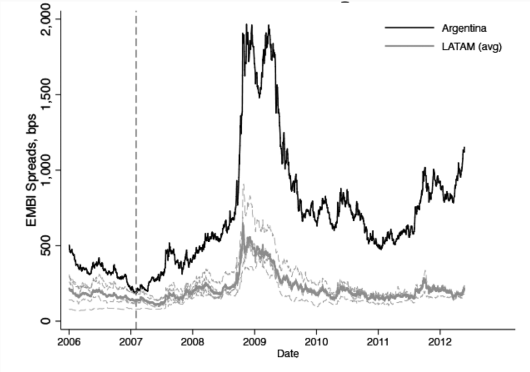
Standard models struggle to match elevated average premia with lower volatility.

This paper: a single pricing operator with a second-moment belief wedge (PRO) that *pivots* price/spread schedules.

Argentina: Data Misreporting and Spread Decoupling



(a) Official CPI vs. alternative measures



(b) EMBI+ spreads: Argentina vs. LA peers

Source: Morelli and Moretti, 2023

Interpretation: reputational channel (type) + **PRO** (policy dispersion) both active.

Literature on Sovereign Risk, Information and Behavior

Long-term debt with exclusion/costs; matches countercyclical spreads but struggles with *persistently high premia at moderate debt*.

- [Aguiar & Gopinath 2007; Arellano 2008; Chatterjee & Eyigungor 2012; Mendoza & Yue 2012]

Worst-case tilts raise premia *uniformly across states*; strong fit for high spreads, less for *cross-maturity divergence* after information shocks.

- [Hansen & Sargent 2008; Pouzo & Presno 2016; Roch & Roldán 2023; Klibanoff, Marinacci & Mukerji 2005; Maccheroni et al. 2006]

Agents optimally allocate attention; allows state-dependent distortions in perceived moments (mean/variance) consistent with pricing wedges.

- [Sims 2003; Maćkowiak & Wiederholt 2009; Matějka & McKay 2015; Van Nieuwerburgh & Veldkamp 2009; Veldkamp 2011]

This Paper

PRO Mechanism: Lenders overweight policy dispersion $\Rightarrow$ bond-price pivot around a state-dependent threshold $\Rightarrow$ safe states cheaper for lenders, risky states *softening of doom*

Comparative statics: Higher default thresholds, deleveraging yet higher average spreads (*stability illusion*), welfare loss

RI microfoundation: Optimal attention to dispersion $\Rightarrow$ **state-dependent** tail weight of *default* entering the same operator

Policy & information: Limits of fiscal transfers; negativity-biased learning persistence; transparency improves welfare

Model

Environment

AR(1) Endowment:

$$\ln y' = (1 - \rho_y)\mu_y + \rho_y \ln y + \sigma_y \varepsilon'$$

Debt Setup: long-term bond with coupon κ, decay δ, risk-free rate r

Consequences of Default:

1. Excluded to autarky with prob. $1 - \gamma$
2. Output cost $h(y) = y - \max\{0, \lambda_0 y + \lambda_1 y^2\}$

Preferences:

$$\max \sum_{t=0}^{\infty} \beta^t u\left(c_t\right)$$

with $u(c) = (c^{1-\sigma} - 1)/(1 - \sigma)$

So far so standard

Ex-ante and Ex-post Values

Ex-post Value: Given *ex-ante* value of default $V^D(y)$ and value of repay $V^R(y,B)$:

$$\tilde{V}^D(y,\varepsilon_d) = V^D(y) + \varepsilon_d, \quad \tilde{V}^R(y,B,\varepsilon_r) = V^R(y,B) + \varepsilon_r$$

The sovereign observes the shocks ε_d and ε_r and chooses the action that yields the highest *ex-post* value

$$V(y,B) = \mathbb{E}_{\varepsilon_d,\varepsilon_r}\left[\max\left\{\underbrace{V^D(y)+\varepsilon_d}_{\tilde{V}^D(y,\varepsilon_d)}, \underbrace{V^R(y,B)+\varepsilon_r}_{\tilde{V}^R(y,B,\varepsilon_r)}\right\}\right]$$

where $\varepsilon_R,\ \varepsilon_D \overset{i.i.d.}{\sim}$ Type-I EV$(-\eta\gamma,\eta)$

Default Choice: Let $d \in \{0,1\}$ denote the default choice:

$$\Pr\{d=1|y,B\} = \Pr\left\{\tilde{V}^D(y,\varepsilon_d) > \tilde{V}^R(y,B,\varepsilon_r)|y,B\right\} = \frac{\exp\frac{V^D(y)}{\eta}}{\exp\frac{V^D(y)}{\eta} + \exp\frac{V^R(y,B)}{\eta}}$$

Value of Default/Repay

Default: Upon re-entry, all past debts are forgiven, so it starts with $B = 0$:

$$V^D(y) = u(h(y)) + \beta \mathbb{E}_{y'|y}\left[\gamma V(y', 0) + (1-\gamma) V^D(y')\right]$$

Repay: Pays the coupon κB , the ex-ante value is:

$$W(y, B, B') = u\left(y - \kappa B + \left[B' - (1-\delta)B\right] q(y, B')\right) + \beta \mathbb{E}_{y'|y}\left[V(y', B')\right]$$

assuming $\{\varepsilon_{B'}\}_{B' \in \mathcal{B}} \overset{i.i.d.}{\sim}$ Type-I EV$(-\rho\gamma, \rho)$, we have

$$V^R(y, B) = \rho \ln\left(\sum_{B' \in \mathcal{B}} \exp \frac{W(y, B, B')}{\rho}\right)$$

and the policy distribution follows $\Pr\{B'|y, B\} = \exp \frac{W(y,B,B')}{\rho} / \sum_{B_j \in \mathcal{B}} \exp \frac{W(y,B,B_j)}{\rho}$.

Pricing with PRO

Intuition: Lenders perceive the sovereign to be more *erratic* or "*irrational*" than it truly is

Formally: Lenders estimate the price with scale $\tilde{\eta} = \theta \cdot \eta$ where $\theta > 1$:

- Their *perceived* probability of default:

$$\tilde{P}(y', B') = \frac{\exp \frac{V^D(y')}{\theta\eta}}{\exp \frac{V^D(y')}{\theta\eta} + \exp \frac{V^R(y', B')}{\theta\eta}}$$

- θ captures the *degree of* ***policy-randomness overestimation (PRO)***

Price:

$$q(y, B') = \frac{1}{1+r} \mathbb{E}_{y'|y} \left[\left(1 - \tilde{P}(y', B')\right) \left(\kappa + (1-\delta) \mathbb{E}_{B''|y', B'} \left[q(y', B'') \right] \right) \right]$$

Lenders **correctly** understand borrowing ρ but **misperceive** default η.

Baseline Results

Main Result: Bond Price Pivot

Main Proposition: Consider 2 economies with $\theta > 1$ and $\theta = 1$. Let $q_1(B', y)$ and $q_\theta(B', y)$ be the respective equilibrium bond price functions. For a given endowment level y, there exists a debt threshold $B^*(y)$ such that the price difference $\Delta q(B', y) \equiv q_\theta(B', y) - q_1(B', y)$ satisfies:

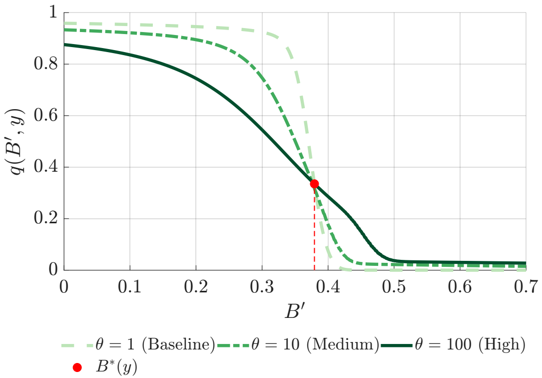
- For levels of future debt $B' < B^*(y)$, $\Delta q(B', y) < 0$
- For levels of future debt $B' > B^*(y)$, $\Delta q(B', y) > 0$

Corollary: Given the spread defined by $s(y, B') = \frac{\kappa}{q(y, B')} - \delta - r$, the spread difference $\Delta s(B', y) \equiv s_\theta(B', y) - s_1(B', y)$ satisfies the opposite relationship to the price difference at the same threshold $B^*(y)$.

Low position $\Rightarrow$ Elevated average premia

Pivoting I

Figure 1: Pivoting Bond Price Schedules



Pivoting II

PRO economy is **less** responsive to positive news:

Proposition 3 *The threshold* $B^*(y)$ *is monotonically increasing in the endowment level* y*. That is,* $\frac{dB^*(y)}{dy} > 0$.

With PRO, it's more **unlikely** to default:

Proposition 4 *Let* $B^*_{D,i}(y)$ *be the sovereign's default threshold for economy* $i \in \{1, \theta\}$*. For any given endowment level* y*, the default threshold is higher in the economy with PRO lenders:*

$$B^*_{D,\theta}(y) > B^*_{D,1}(y).$$

And the sovereign tries to **deleverage**:

Proposition 5 *Let* $\mathbb{E}_i[B'|y, B]$ *be the expected next-period debt. For states* (y, B) *where the sovereign chooses not to default,*

$$\mathbb{E}_\theta[B'|y, B] < \mathbb{E}_1[B'|y, B].$$

Pivoting III

The overall welfare decreases for a PRO economy.

Policy-Randomness Overestimation (PRO)
$\theta > 1$

Pricing

Price Pivot
$q_\theta(B', y) \gtrless q_1(B', y)$
at $B^*(y)$

Algebraic

Spread Pivot
$s_\theta(B', y) \lessgtr s_1(B', y)$
at $B^*(y)$

"Doom Softening"

"PRO Premium"

Higher Default Threshold
$B^*_{D,\theta}(y) > B^*_{D,1}(y)$

Welfare Loss
$V_\theta(y, B) < V_1(y, B)$

Deleveraging
$\mathbb{E}_\theta[B'|y, B] <$
$\mathbb{E}_1[B'|y, B]$

Parameters

Table 1: Baseline Calibration (Quarterly)

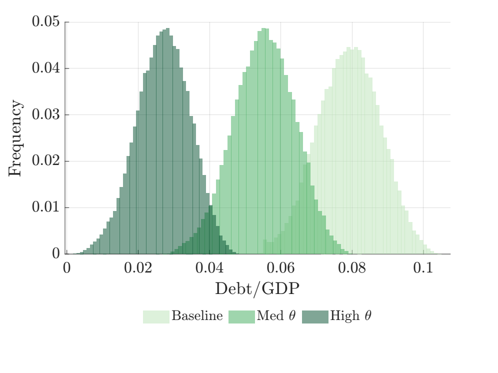
Parameter	Value	Description
Preferences and Endowments		
σ	2.0	CRRA coefficient of relative risk aversion
β	0.9775	Sovereign's discount factor
ρ_y	0.95	Persistence of log endowment AR(1)
σ_y	0.005	Std. dev. of endowment innovations
Debt and Default		
r	0.01	Quarterly risk-free interest rate (4% ann.)
δ	0.04	Principal decay rate (for 5-year duration)
κ	0.05	Coupon rate ($\delta + r$)
γ	0.125	Re-entry probability (avg. 2-year exclusion)
λ_0, λ_1	-0.48, 0.525	Output cost function parameters
Computational Parameters		
η	5×10^{-4}	Scale of default taste shock
ρ	1×10^{-5}	Scale of borrowing taste shock
θ	1.0	Baseline PRO coefficient

Business Cycle

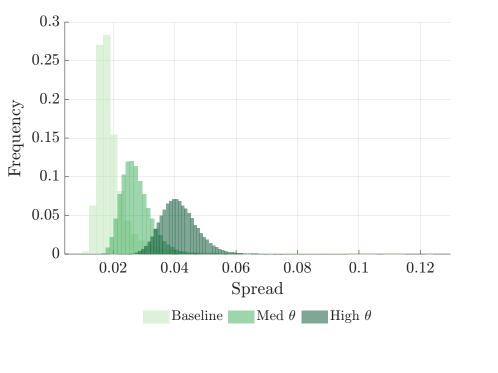
Table 2: Business Cycle Implications of PRO

Moment	Baseline ($\theta = 1$)	Med. ($\theta = 10$)	High ($\theta = 100$)
Mean and Volatility			
Mean Debt-to-GDP Ratio (%)	7.90	5.53	2.70
Std. Dev. of Debt-to-GDP Ratio (%)	0.87	0.85	0.74
Mean Spread (annualized, %)	2.00	2.75	4.15
Std. Dev. of Spread (annualized, %)	0.77	0.49	0.58
Std. Dev. of ln(Consumption) (%)	3.48	3.53	3.41
Std. Dev. of ln(GDP) (%)	3.04	3.19	3.19
Mean Trade Balance/GDP (%)	0.42	0.32	0.18
Std. Dev. of Trade Balance/GDP (%)	0.51	0.43	0.32
Correlations			
Corr(Spread, ln(GDP))	-0.43	-0.80	-0.89
Corr(Trade Balance/GDP, ln(GDP))	-0.28	-0.28	-0.26
Corr(Debt/GDP, ln(GDP))	0.70	0.79	0.84

Deleveraging and Low-debt Trap I



(a) Debt-to-GDP Ratio Distribution



(b) Credit Spread Distribution

PRO $\Rightarrow$ Punitive pricing $\Rightarrow$ Conservative finances **BUT** Trapped in a low-debt **trap** $\Rightarrow$ Continued **higher** capital costs

Deleveraging and Low-debt Trap II

Why does the average spread rise while deleveraging?

$$\bar{s}_\theta - \bar{s}_1 = \kappa \underbrace{\mathbb{E}_{\mu_\theta}\left[\frac{1}{q_\theta} - \frac{1}{q_1}\right]}_{\text{price wedge at PRO weights}} + \kappa \underbrace{\left(\mathbb{E}_{\mu_\theta}\left[\frac{1}{q_1}\right] - \mathbb{E}_{\mu_1}\left[\frac{1}{q_1}\right]\right)}_{\text{composition (policy) effect}}$$

Average spread dominance

- The first term (price wedge at PRO weights) is **strictly positive** and *strengthened* by deleveraging, mass shifts toward $B' < B^*(y)$ where $1/q_\theta - 1/q_1 > 0$.
- The second term (composition effect at baseline prices) is weakly negative since $1/q_1$ is lower at smaller B'.
- Under mild regularity, the first term **dominates** the second $\Longrightarrow \bar{s}_\theta > \bar{s}_1$

IRFs I

../../pro-default-model/results/comparison_figure_13.pdf

../../pro-default-model/results/c

(c) Output

(d) Debt