Fiscal Rules with Fixed Exchange Rates and Sovereign Risk*

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Abstract

This paper studies the optimal design of fiscal rules for an economy subject to sovereign default risk with a pegged exchange rate. When the peg is modeled as a simple increase in income volatility (e.g., because the exchange rate cannot act as a shock-absorber), the economy prefers a tighter fiscal rule. This simple result is misleading: when the increase in income volatility is created by amplification through nominal rigidities, the optimal rule remains much closer to its floating exchange-rate benchmark. In a calibration to Ecuador (a dollarized economy), we find that the changes in the calibration (particularly, in patience and costs of default) compensate for the effect of different intensity of nominal rigidities. An economy with a pegged exchange rate and one which floats, when calibrated to match the same levels of debt and spreads, end up with similar optimal fiscal rules. However, the causal effect on optimal fiscal rules of increasing the volatility of shocks remains orders of magnitude larger than the effect of increasing the strength of nominal rigidities. These results then recommend caution in applying reduced-form estimates to calibrate optimal fiscal rules.

JEL Classification E62, F34, F41, H63

Keywords fiscal rules, fixed exchange rate, sovereign default risk, sovereign debt, output volatility

*The views expressed herein are those of the authors and should not be attributed to the IMF or the World Bank, their Executive Boards, or their management.

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Introduction

Fiscal rules have become widely adopted tools of macroeconomic governance in recent decades. Numerical constraints on government budgetary aggregates such as debt, deficits, or expenditures have proliferated across more than 100 countries since 1985, according to the IMF Fiscal Rules Database (Alonso-Albarran et al., 2025). An active literature studies the effect and design of fiscal rules by leveraging sovereign debt and default models, in which the presence of long-term debt creates time inconsistency and enables gains from committing to rules that constrain debt issuances ex-post. This literature finds that tailoring the fiscal rule to country characteristics such as output volatility determines the size and sign of welfare gains delivered by fiscal rules. Many emerging-market economies also follow exchange-rate pegs and are thus exposed to additional macroeconomic volatility (Schmitt-Grohé and Uribe, 2016; Edwards and Magendzo, 2006; Korab et al., 2023). For these economies, the careful design of fiscal rules is particularly important.

In this paper we study the problem of designing a fiscal rule for a small open economy with a strict exchange-rate peg. We analyze the welfare gains and associated tradeoffs of different fiscal rules in the context of a sovereign debt and default model tailored to the case of a pegged exchange rate. We introduce pegs, and their associated volatility, in this model in two possible ways: as a reduced-form increase in the volatility of output, and explicitly via a traded-nontraded structure and nominal wage rigidities (similar to Bianchi and Sosa-Padilla, 2024). In each case, we consider different designs for the fiscal rule, including limits to the debt level, to the deficit, and debt-brake rules which limit deficits only when debt exceeds a certain threshold. We compute the optimal parameters for each rule and compare their welfare gains relative to a no-rule benchmark.

We begin by considering comparative statics. When the peg is modeled as a simple increase in output volality, the response of the optimal rule is a strong tightening. When instead such increase in volatility comes from more powerful nominal rigidities, the optimal rule tightens dramatically less.

In calibration to Ecuador, a dollarized economy which we take as a credible peg, we find that the forces mentioned above can be muted or even overturned by a calibration to the same underlying data moments, such as spreads and debt ratios. The change in behavior which is induced by the different sources of volatility ends up being captured in the inference about impatience and costs of default.

In our case, re-calibrating a hypothetical economy without rigidities to match the same features of the economy's volatility leads to a similar optimal fiscal rule. However, this similarity comes from large forces pushing the optimal rule in different directions, so it unclear that this similarity would be generic. We do conclude that when considering how to adapt fiscal-rule de-

sign to potential changes in exchange-rate regime, the answer would strongly depend on how the change in regime is modeled.

Discussion of the Literature To be written.

Layout The rest of paper is structured as follows. Section 2 describes the model. Section 3 describes the calibration strategy and results. Section 4 presents the quantitative results regarding fiscal rules. Finally, Section 5 concludes.

2. Model

We consider a TNT setup with traded and nontraded goods. The small open economy receives an endowment of traded goods and produces nontradables with labor, subject to wage rigidities. The government issues debt in international markets. The government acts in the best interest of domestic households but lacks commitment to future actions, including borrowing and debt repayment choices. We focus on the case of a fixed exchange rate and compare it with different cases with exchange-rate flexibility.

Resources The economy receives an endowment stream of tradable goods following a stochastic process:

$$y_{T,t} = \exp(z_t) \tag{1}$$

with

$$z_t = \rho_z z_{t-1} + \sigma_z \epsilon_t^z$$

where $\epsilon_t^z \overset{iid}{\sim} \mathcal{N}(0,1)$.

Domestic firms produce nontraded goods with labor according to

$$y_N = f(h) = h^\alpha$$

World prices The price of tradable goods p_T is normalized to one ($p_T = 1$).

Households Households consume a CES aggregate of tradable and nontradable goods, with elasticity of substitution $1/(1+\eta)$

$$C = \mathscr{C}(c_N, c_T) = \left[\varpi_N c_N^{-\eta} + \varpi_T c_T^{-\eta}\right]^{-\frac{1}{\eta}}$$

where $(\varpi_N, \varpi_T) > 0, \varpi_N + \varpi_T = 1$, and $\eta > -1$. As a consequence, the consumer price index is

$$p_C = \left[\varpi_N^{\frac{1}{1+\eta}} p_N^{\frac{\eta}{1+\eta}} + \varpi_T^{\frac{1}{1+\eta}} p_T^{\frac{\eta}{1+\eta}}\right]^{\frac{1+\eta}{\eta}}$$

Another consequence of CES preferences is the first-order condition for the composition of consumption given the relative price of nontradables:

$$\frac{p_N}{p_T} = \frac{\varpi_N}{\varpi_T}\left(\frac{c_T}{c_N}\right)^{1+\eta} \tag{2}$$

Finally, households face a budget constraint equating the value of expenditures on consumption to labor income, profits from the firms, and lump-sum taxes or transfers from the government. As in many models of sovereign debt, rich tax instruments enable the government to make consumption choices directly.

Labor markets We assume that wages cannot fall below some level $\bar{w}$, while households supply labor inelastically up to $\bar{h} = 1$. Whenever the constraint on wages binds, the production of nontradables is constrained at $\bar{y}_N = f(\bar{h})$. Combining the equilibrium relative price of nontradables with the labor demand equation $w = p_N f'(h)$, we obtain the familiar relation between employment in the nontradable sector and consumption of tradables

$$h \leq \mathscr{H}(c_T, \bar{w}) = \left(p_T \frac{\varpi_N}{\varpi_T}\frac{\alpha}{\bar{w}}\right)^{\frac{1}{1+\alpha\eta}} c_T^{\frac{1+\eta}{1+\alpha\eta}}$$

Assets The government borrows from international lenders in the form of a defaultable bond which promises to pay a non-contingent stream of geometrically-decaying coupons. A bond issued in period t pays $(1-\delta)^{s-1}\kappa$ units of the tradable good in period $t+s$, effectively making a one-period-old bond a perfect substitute of $(1-\delta)$ units of newly-issued debt. The coupon rate $\kappa = r + \delta$, where r is the international risk-free rate, is chosen so that the price of a bond that is expected to never default is $q^* = 1$. This normalization ensures that one unit of the bond corresponds to a face value of one unit of the tradable good.

Upon default, the government loses access to international capital markets and faces a loss of output. There is uncertainty about the length of the exclusion period. Most of the literature assumes that the resumption of debt service payments, the recovery of market access, and the dissipation of any output costs all happen at the same time. We keep this assumption.

Government The government is benevolent and makes choices on a sequential basis to maximize the utility of a representative household with preferences given by

$$V_t \;=\; \mathbb{E}_t\left[\sum_{s=0}^{\infty}\beta^s\Big(u(\mathscr{C}(c_{t+s}^N, c_{t+s}^T)) \;+\; \epsilon_{t+s}\Big)\right] \tag{3}$$

where $\mathbb{E}[\cdot]$ denotes the expectation operator, (c_t^N, c_t^T) represents the household's consumption vector, β is a discount factor, and ϵ is a preference shock for default or repayment.

While the government is not in default, it chooses whether to repay the debt and attains a value

$$V(b,z) \;=\; \mathbb{E}\left[\max\left\{V_R(b,z)+\epsilon_R,\; V_D(z)+\epsilon_D\right\}\right], \tag{4}$$

where the ϵ's follow a Type 1 Extreme Value distribution.

The distributional assumption for the ϵ's implies closed forms for the value function $v(b,z)$ and the (ex-post) default probability $\mathscr{P}(b,z)$

$$\begin{aligned} v(b,z) &= \chi\log\big(\exp(v_D(z)/\chi)+\exp(v_R(b,z)/\chi)\big),\\ \mathscr{P}(b,z) &= \frac{\exp(v_D(z)/\chi)}{\exp(v_D(z)/\chi)+\exp(v_R(b,z)/\chi)} \end{aligned} \tag{5}$$

Debt issuances If the government chooses to repay the debt, it can access capital markets and issue new debt b', so that

$$\begin{aligned} V_R(b,z) \;=\; & \max_{b'}\; u(\mathscr{C}(c_N,c_T)) + \beta\mathbb{E}\left[V(b',z')\mid z\right]\\ \text{subject to}\quad & c_T+\kappa b = y_T(z) \;+\; q(b',z)\left(b'-(1-\delta)b\right)\\ & c_N = f(h)\\ & h = \min\{1,\mathscr{H}(c_T,\bar{w})\} \end{aligned} \tag{6}$$

Default decision If the government chooses to default, it loses access to international capital markets, which it then recovers with a constant hazard ψ. While it is excluded, the borrowing economy suffers a loss of output $\phi(z)$. We therefore maintain the usual assumption that the resumption of payments and the renewed access to international markets happen simultaneously.

We assume that all debt is destroyed after a default for tractability and to more readily compare with other results in the literature. The value of default is

$$\begin{aligned} V_D(z) = {} & u(\mathscr{C}(c_N,c_T)) + \beta\mathbb{E}_z\left[\psi V(0,z')+(1-\psi)V_D(z')\right]\\ \text{subject to}\quad & c_T = y_T(z)(1-\phi(z))\\ & c_N = f(h)\\ & h = \min\{1,\mathscr{H}(c_T,\bar{w})\} \end{aligned} \tag{7}$$

The output loss function is defined as $\phi(z) = \max\{0, d_1 + d_2 \exp(z)\}$, where d_1 and d_2 are parameters to be calibrated.

Lenders Bonds issued by the government are purchased by deep-pocketed, risk-neutral foreign investors who equate the expected return of the debt to their cost of funds r, yielding a debt price

$$q(b', z) = \frac{1}{1+r} \mathbb{E}\left[\left(1 - \mathscr{P}(b', z')\right)\left(\kappa + (1-\delta)q(b'', z')\right) \mid z\right] \tag{8}$$

where b'' and $\mathscr{P}$ denote the government's issuance and default policy expected by lenders. We implicitly assume these are private investors.

2.1 Equilibrium

Definition. *A Markov-Perfect equilibrium consists of a set of value functions V, V_R, and V_D, a default probability $\mathscr{P}$, a borrowing rule b', and a bond price function q, such that*

1. *Given the price of debt, the value functions satisfy functional equations (4)–(7).*
2. *Given the default probability and borrowing rules, the price of debt satisfies the creditors' Euler equation (8).*
3. *Given the price of debt, the default probability and borrowing rules correspond to the policy functions solving (4) and (6).*

As is well-known in the sovereign default literature, the equilibrium with long-term debt features time-inconsistency. If the government could commit to future issuances, it would consider their effect on current prices, which can be substantial when the debt maturity is long. In this model with nominal rigidities, a force towards macroeconomic hedging countervails the time inconsistency of debt dilution.

In particular, the government's optimal choice of debt b' at state (b, z) satisfies the following first-order condition

$$\begin{aligned}\left(\frac{u'(c)}{p_C} + \xi\right)\left(q + \frac{\partial q}{\partial b'} i\right) = \beta(1-\mathscr{P}')\mathbb{E}\left[\left(\frac{u'(c')}{p'_C} + \xi'\right) \mid R\right] \mathbb{E}\left[(\kappa + (1-\delta)q') \mid R\right] \\ + \beta(1-\mathscr{P}')\mathrm{cov}\left(\kappa + (1-\delta)q', \frac{u'(c')}{p'_C} + \xi'\right)\end{aligned}$$

where $\xi = \lambda \frac{\mathscr{H}'(c_T; \bar{w})}{p_T}$ is the scaled multiplier on the wage floor constraint. The multiplier ξ reflects the marginal value of stimulus, through loosening the wage floor constraint. While this multiplier appears in many places, reflecting the value of increasing employment in the nontradable sector

both now and in the future, the last term is significant. The last term captures the covariance of the value of debt with marginal utility and the marginal value of stimulus. When this covariance is positive, the debt has higher value in those states in which extra resources are most valuable. This appears as a cost of debt issuances. This cost curtails debt issuances as the government prefers to keep the option of future stimulus in case negative shocks materialize. This precautionary behavior mitigates the more common debt dilution forces.

2.2 Fiscal Rules

We consider three types of fiscal rules: a debt limit rule, a deficit limit rule, and a debt brake rule. The first two are static rules that impose ceilings on the level of debt and the overall fiscal deficit, respectively. The third is a dynamic rule that combines both instruments: once the debt threshold is breached, a deficit limit is triggered.

To compute fiscal-rule statistics, we compute debt and deficit over total (annual) GDP as

$$\begin{aligned} \textit{Debt-to-GDP} &= \frac{b}{4\left(p_T y_T + p_N y_N\right)} \\ \textit{Deficit-to-GDP} &= \frac{q \cdot (b' - (1-\delta)b)}{4\left(p_T y_T + p_N y_N\right)} = \frac{p_T c_T + \kappa b - p_T y_T}{4\left(p_T y_T + p_N y_N\right)} \end{aligned} \tag{9}$$

where we emphasize that the government's budget constraint allows computing the (overall) deficit as net borrowing or as the difference between revenues and expenditures (including interest).

In the model with a debt limit rule (with limit $\bar{d}$), the government is constrained to choosing under the constraint that *Debt-to-GDP* $\leq \bar{d}$. Under a deficit rule with limit $\bar{\delta}$, the government is constrained to choosing under the constraint that *Deficit-to-GDP* $\leq \bar{\delta}$. With a debt-brake with limits $(\bar{d}, \bar{\delta})$, the government is subject to *Deficit-to-GDP* $\leq \bar{\delta}$ every time its initial debt exceeds the debt limit $\bar{d}$.[1]

In Section 4, we compute the optimal parameters for each rule by comparing their welfare gains relative to the no-rule benchmark. We then study the sensitivity of these results to different sources of output volatility by varying σ_z and $\bar{w}$.

3. Calibration

We calibrate the model to Ecuador, a dollarized economy, by matching statistics of a 40-quarter pre-default sample to data for the period 2010q1–2019q4. We use this period, in which a sovereign

[1]The presence of endogenous objects (p_N, y_N) in the denominator of the debt ratio means that some choices for debt issuance may increase GDP and hence marginally relax the constraint.

default did not occur, to estimate the parameters of the exogenous processes and compute calibration targets. Table 1 summarizes our parametrization. Table 2 reports the fit of the model.

Table 1: Baseline Parameter Values

Externally chosen		
	Parameter	**Value**
Sovereign's risk aversion	γ	2
Preference shock scale parameter	χ	0.0005
Preference shock scale parameter	χ_b	0.0005
Risk-free interest rate	r	0.01
Duration of debt	δ	0.05
Reentry probability	ψ	0.0385
Elasticity of substitution between c_N and c_T	η	0.74
Labor share in production	α	0.67
Internally calibrated		
	Parameter	**Value**
Sovereign's discount factor	β	0.8989
Default cost: linear	d_1	-0.4063
Default cost: quadratic	d_2	0.4892
Minimum wage	$\bar{w}$	0.7602
Share of nontradables in consumption	ϖ_N	0.5324
Tradable output autocorrelation coefficient	ρ_z	0.9523
Standard deviation of z_t	σ_z	0.0094

Table 2: Model Fit

Description	Data	Model
Average external debt-to-GDP ratio, %	21.8	21.8
Average spread, bps	774	759
Std. Dev. spread, bps	220	233
Unemployment rate, %	4.5	4.1
Autocorrelation of real GDP,	0.845	0.686
Std. Dev. of real GDP,	0.0121	0.0138
Share of tradables on GDP, %	0.42	0.48

Note: Simulation moments are based on 40-quarter samples before a default on market debt, conditional on no default occurring within those 40 quarters or two years prior. Data moments are computed for Ecuador between 2010q1 and 2019q4. Model moments are computed over repayment periods only.

4. Quantitative Results

We summarize the optimal fiscal rules and their associated welfare gains in Table 3. We find the optimal debt limit is 22.25% of GDP and yields a welfare gain of 0.9% of permanent consumption. The optimal deficit limit is 1.25% of GDP and yields a welfare gain of 1.9% of permanent consumption; it coincides with the optimal debt-brake rule which is an unconditional deficit limit of 1.25% of GDP.

Table 3: Optimal Fiscal Rules

	Baseline	**Debt Limit** $\bar{d} = 22.25\%$	**Deficit Limit** $\bar{\delta} = 1.25\%$	**Debt Brake** $(\bar{d}, \bar{\delta}) = (0\%, 1.25\%)$
Debt-to-GDP (%)	20.6	21.1	21.7	21.7
Spread (bps)	670	83.1	0.34	0.34
SD. Spread (bps)	255	25.7	0.69	0.69
Unemp. (%)	3.55	2.77	2.72	2.72
Default Freq. (%)	3.04	0.33	0	0
Welfare Gain (%)	–	0.89	1.94	1.94

Note: Each type of rule is evaluated at its optimal parametrization. Statistics are based on simulations of the ergodic distribution of each model, conditional on repayment. Welfare gains are relative to a no-rule benchmark and expressed as percent of permanent consumption.

Figure 1 shows the welfare gains associated with each debt-brake rule. While the optimal

debt-brake rule is an unconditional deficit rule, tighter deficit limits do benefit from conditional activation at high debt levels.

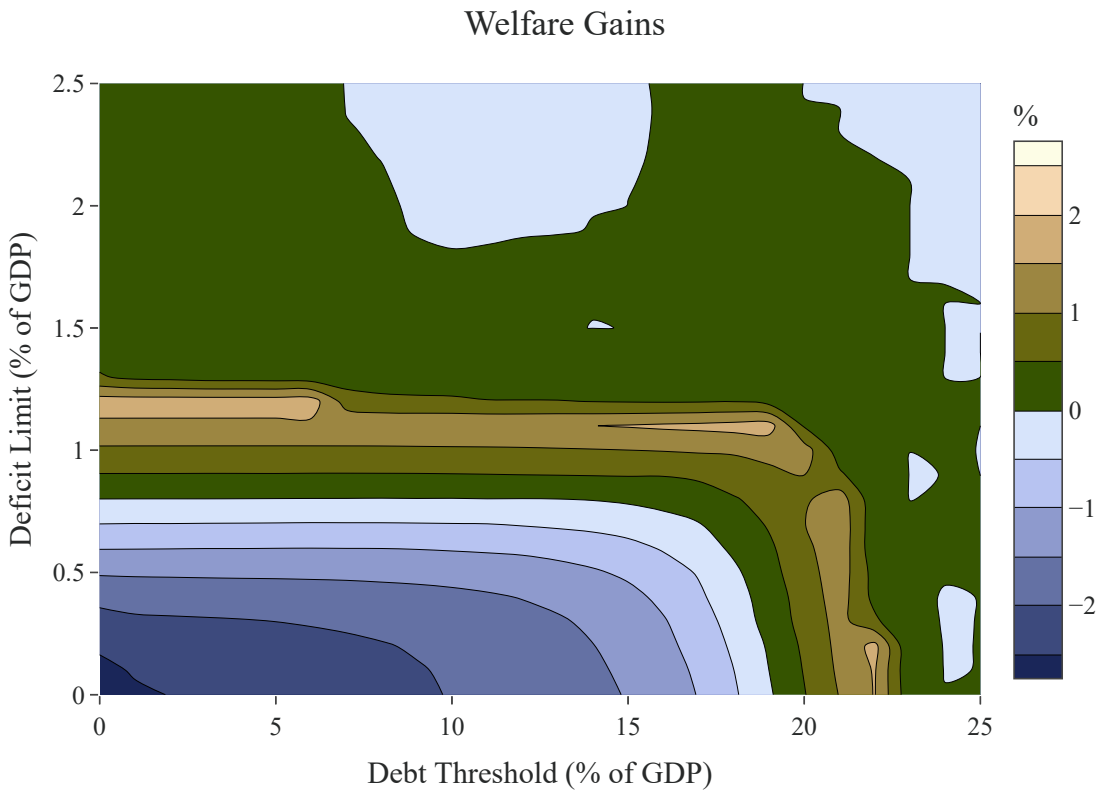


Figure 1: Debt Brake Rule - Welfare Gains

Note: Maximum welfare gain of 1.94% with a debt-to-GDP threshold of 0% and a deficit-to-GDP limit of 1.25%. Welfare gains are relative to a no-rule benchmark and expressed as percent of permanent consumption.

We are interested in how economic volatility affects the optimal fiscal rule. The model economy features volatile output because of tradable output shocks but also because of amplification through nominal rigidities.

4.1 Optimal rules for different sources of volatility

To investigate how different sources of volatility affect the optimal fiscal rule, Figure 2 shows the optimal fiscal rule as we vary the economy's volatility by varying $\bar{w}$ and σ_z. To ensure that the comparison is on equal footing, we plot the optimal fiscal rule against the resulting volatility of real GDP in each case.

(A) Optimal Debt Limits (B) Optimal Deficit Limits

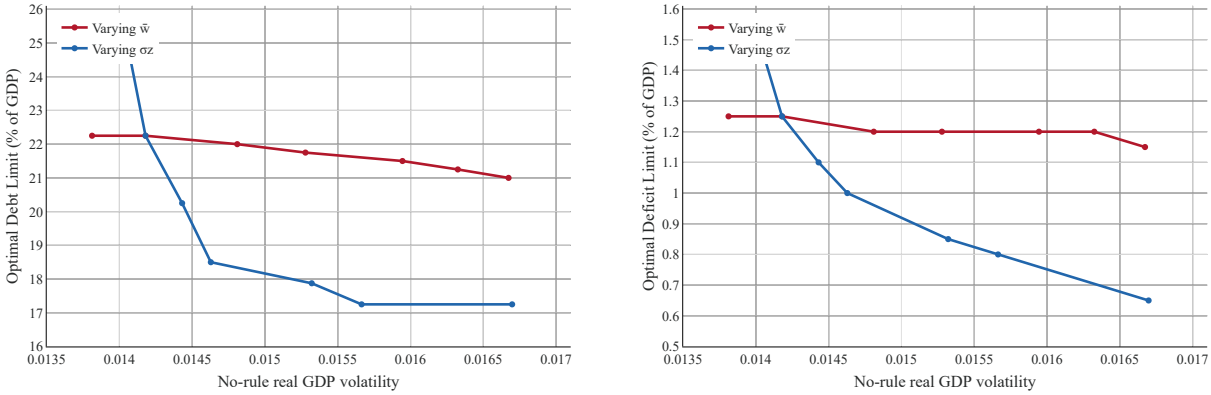


Figure 2: Optimal Fiscal Rules and Volatility

Figure 2 presents our main result. We solve our model for different values of the underlying volatility of tradable output σ_z and the wage floor $\bar{w}$. In each case, we compute the volatility of real GDP that each parameter induces (in the equilibrium without fiscal rules). We then compute and plot the optimal debt (on the left) and deficit (on the right) limits. The optimal rule tightness exhibits a strong response to volatility when volatility comes from underlying shocks (σ_z), and a much muted response when volatility comes from rigidities.

4.2 *A flexible-price model*

We consider a variant of the main model with flexible prices. The model without nominal rigidities is calibrated to the same data moments (except for unemployment) and, crucially, matches the same volatility of real GDP as our baseline. In this sense, it targets the same economic fundamentals but without resorting to frictions introduced by a fixed exchange-rate regime.

Table 4: Calibrated Parameters for Flexible-Price Model

	Parameter	Value
Sovereign's discount factor	β	0.9228
Default cost: linear	d_1	-0.2164
Default cost: quadratic	d_2	0.3265
Minimum wage	$\bar{w}$	0
Share of nontradables in consumption	ϖ_N	0.5749
Tradable output autocorrelation coefficient	ρ_z	0.9226
Standard deviation of z_t	σ_z	0.0296

Table 5: Flexible-Price Model Fit

Description	Data	Model
Average external debt-to-GDP ratio	21.8	21.7
Average spread, bps	774	760
Std. Dev. spread, bps	220	225
Unemployment rate	4.5	–
Autocorrelation of real GDP	0.845	0.812
Std. Dev. of real GDP	0.0121	0.0117
Share of tradables on GDP	0.42	0.44

Note: Simulation moments are based on 40-quarter samples before a default on market debt, conditional on no default occurring within those 40 quarters or two years prior. Data moments are computed for Ecuador between 2010q1 and 2019q4. Model moments are computed over repayment periods only.

The recalibration of the economy with a fixed exchange rate has a good fit to the same data quantities (despite of course generating full employment at all times). As expected, this calibration requires a much larger volatility of the shock to tradable output σ_z, as the total volatility of real GDP is not amplified through nominal rigidities. However, other aspects of the calibration, particularly the government's patience and the costs of default, also change in important ways. Particularly, the government becomes more patient.

Table 6: Optimal Fiscal Rules with Flexible Exchange Rate

	Baseline	**Debt Limit** $\bar{d} = 24.5\%$	**Deficit Limit** $\bar{\delta} = 1.3\%$	**Debt Brake** $(\bar{d}, \bar{\delta}) = (0\%, 1.3\%)$
Debt-to-GDP (%)	20.7	20.5	23.4	23.4
Spread (bps)	707	455	202	202
SD. Spread (bps)	226	113	120	120
Unemp. (%)	0	0	0	0
Default Freq. (%)	3.46	2.2	0.91	0.91
Welfare Gain (%)	–	0.18	1.1	1.1

Note: Each type of rule is evaluated at its optimal parametrization. Statistics are based on simulations of the ergodic distribution of each model, conditional on repayment. Welfare gains are relative to a no-rule benchmark and expressed as percent of permanent consumption.

Table 6 shows the optimal fiscal rules for the model solved and recalibrated with a flexible exchange rate ($\bar{w} = 0$). The optimal rule, a deficit limit of 1.3%, is similar to the optimal rule obtained in the case of a fixed exchange rate ($\bar{\delta} = 1.25\%$). This stands in stark contrast with the results ob-

tained in comparative statics, where increasing the volatility of underlying shocks and reducing nominal rigidities seems to imply a strong tightening in the optimal fiscal rule. The increase in patience and default costs required by the re-calibration interacts with the comparative-statics motives and, in this calibration, fully compensate for them. These results point to a strong interplay between assumptions about nominal rigidities and the inference about costs of default drawn from models calibrated to spreads and debt ratios before default.

4.3 A pseudo-fixed model

The model with nominal rigidities and the flexible-price model that generates the same volatility of real GDP are still different in two respects. In the nominal-rigidities model case, the conditional distribution of future output (given today's output) has the same volatility but is more skewed with a fatter left tail. In addition, in this case the stimulative effectiveness of fiscal policy is larger: the same increase in spending (or debt) leads to a larger response of output in the region of the state space where nominal rigidities bind.

To separate these two aspects and assess their relative importance, we construct a "pseudo-fixed" model, which uses a calibrated distribution for the innovations to the tradable endowment ϵ_z in order to match exactly the forecasting distribution of future real GDP given current real GDP in simulated data. Figure 3 in the Appendix shows that the achieved fit is near perfect. It also plots the outcome in a fully flexible-price model (which just corresponds to setting $\bar{w} = 0$ at our baseline parametrization) to underscore the left-skewness of our baseline model. Table 7 shows the optimal fiscal rules for the pseudo-fixed model.

Table 7: Optimal Fiscal Rules for the Pseudo-Fixed Model

	Baseline	**Debt Limit** $\bar{d} = 16.5\%$	**Deficit Limit** $\bar{\delta} = 0.8\%$	**Debt Brake** $(\bar{d}, \bar{\delta}) = (0, 0.8\%)$
Debt-to-GDP (%)	14.3	14.5	12.8	12.8
Spread (bps)	2151	965	0.09	0.09
SD. Spread (bps)	781	370	0.12	0.12
Unemp. (%)	0	0	0	0
Default Freq. (%)	11.8	6.52	0	0
Welfare Gain (%)	–	0.27	1.15	1.15

Note: Each type of rule is evaluated at its optimal parametrization. Statistics are based on simulations of the ergodic distribution of each model, conditional on repayment. Welfare gains are relative to a no-rule benchmark and expressed as percent of permanent consumption.

The optimal fiscal rule for the pseudo-fixed economy is a deficit limit of 0.8% of GDP, which

is tighter than the optimal deficit limit in the baseline economy with nominal rigidities (1.25%).

We can see that optimal fiscal rules become substantially tighter in the pseudo-fixed model, which has the same conditional distribution of future output as the baseline model but does not feature nominal rigidities. However, we can observe that the baseline pseudo-fixed economy is very different from the baseline economy with nominal rigidities, exhibiting a much higher default frequency and spreads, and a lower debt-to-GDP ratio. The latter is related with the fact that the stimulative effect of fiscal policy is smaller in the pseudo-fixed economy because of the lack of nominal rigidities, making debt issuance less attractive. In addition, the fatter left tail of the conditional distribution of future output makes the government more concerned about default risk, which disciplines its debt levels.

[deepen discussion and comparison with fix and flex]

5. Concluding Remarks

This paper studies the design of fiscal rules in an economy with a pegged exchange rate, subject to sovereign default risk. In our calibration to Ecuador, the tradeoff between reducing default risk and restricting debt issuance is resolved by deficit limits, which are preferred to debt limits. The optimal deficit limit applies at all levels of debt; this is, the optimal debt brake rule is an unconditional deficit rule.

The results also show that the source of volatility matters for policy design. When the peg is represented as higher exogenous output volatility, the optimal fiscal rule becomes tighter as volatility increases. However, when it is modeled explicitly through its impact on nominal rigidities, the desired tightness of the rule becomes much less sensitive to the degree of rigidity, even though the welfare gains from adopting a rule may be larger for a dollarized economy. Taken together, these findings suggest that fiscal rules should be carefully calibrated to the underlying macroeconomic characteristics.

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A. Estimation of Real GDP Process

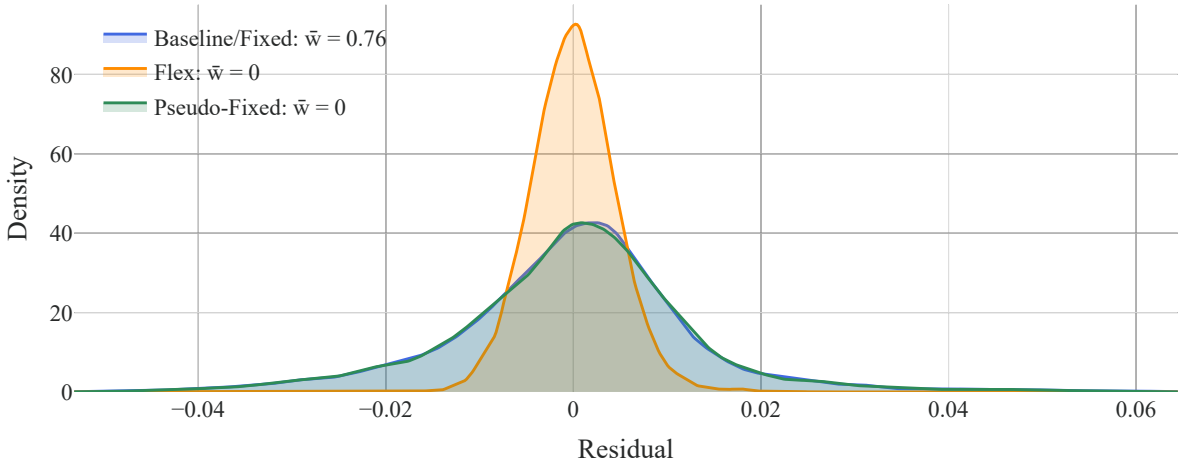
Table 8: AR(1) for Real GDP Process

N = 40	Coefficient	SE	p-value	95% CI	
ρ_Y	0.845	0.092	0.000	0.665	1.025
σ_Y	0.012	0.001	0.000	0.010	0.015

Note: We estimate an AR(1) process over the HP-filtered ln(Real GDP) of Ecuador during 2010q1-2019q4.

B. Additional Tables and Figures

Figure 3: Distributions of AR(1) Residuals for ln(Real GDP)



Note: The figure reports kernel-density estimates of the residuals u_t from model-specific OLS regressions $\log Y_t = a + \rho \log Y_{t-1} + u_t$, where $Y_t = (p_{T,t} y_{T,t} + p_{N,t} y_{N,t})/p_{C,t}$. "Baseline" is the fixed economy with wage rigidity; "Flex" sets $\bar{w} = 0$ while retaining Normal tradable-output innovations; and "Pseudo-Fixed" sets $\bar{w} = 0$ but uses a generalized Tauchen process based on the kernel-smoothed distribution of baseline residuals, with its innovation scale calibrated to match baseline residual volatility.