



# DEFAULT OR DEPRECIATE

2<sup>nd</sup> Public Debt Management Conference

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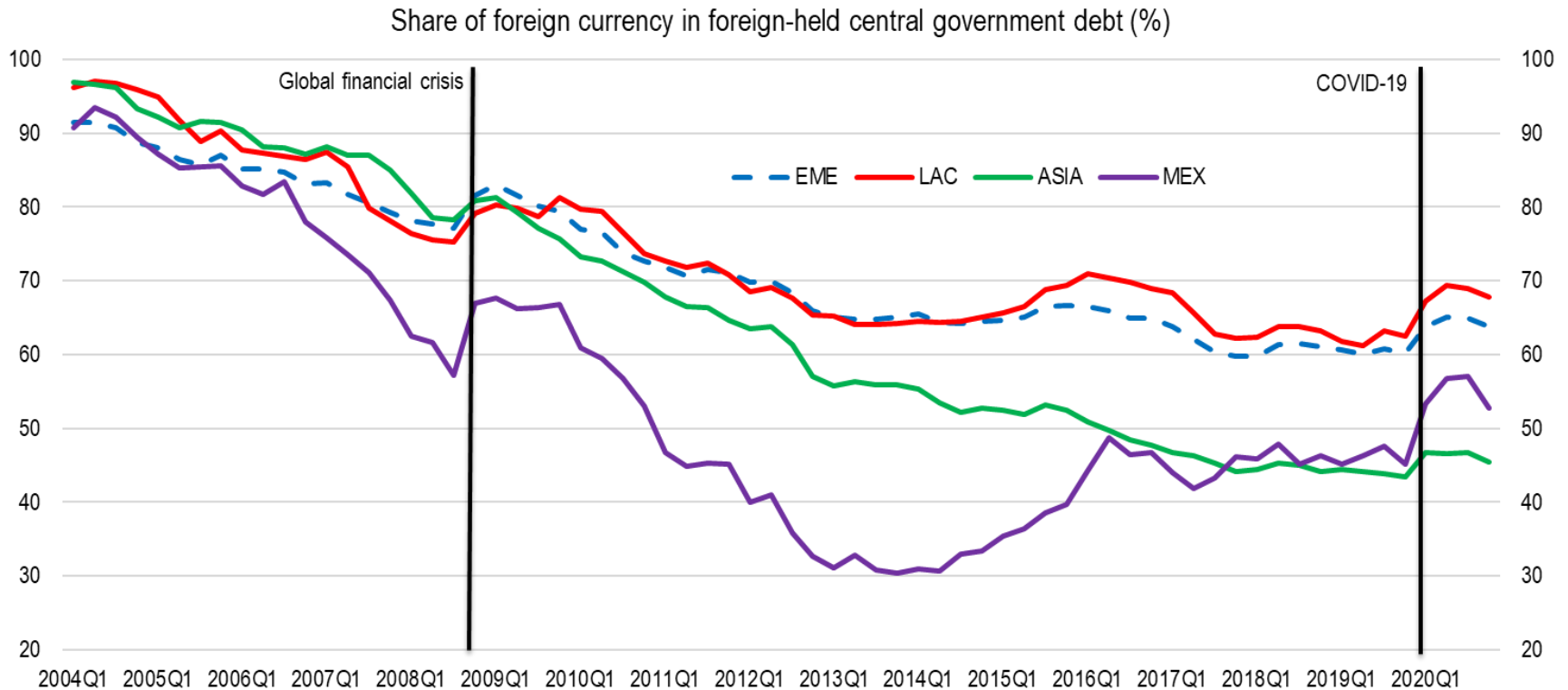
# Questions

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- How can we explain the **increased local-currency** (LC) denomination of **foreign-held** emerging-market economy (EME) sovereign debt?
  - Main challenge → LC sovereign debt carries currency risk. With no ex ante commitment to exchange-rate policy, there is an ex post currency **depreciation bias**.
- How do the **currency structure** of sovereign debt and **exchange-rate dynamics** interact with **default risk** in EMEs?
  - The double-edged sword → **Currency risk is transferred** to foreigners at the expense of **increased exposure** to reversals in global risk appetite
  - Original sin redux: [Borri \(2018\)](#), [IMF \(2020\)](#) and [Bertaut et al. \(2022\)](#).



# The dissipating original sin transfers currency risk from EME sovereigns to foreign investors

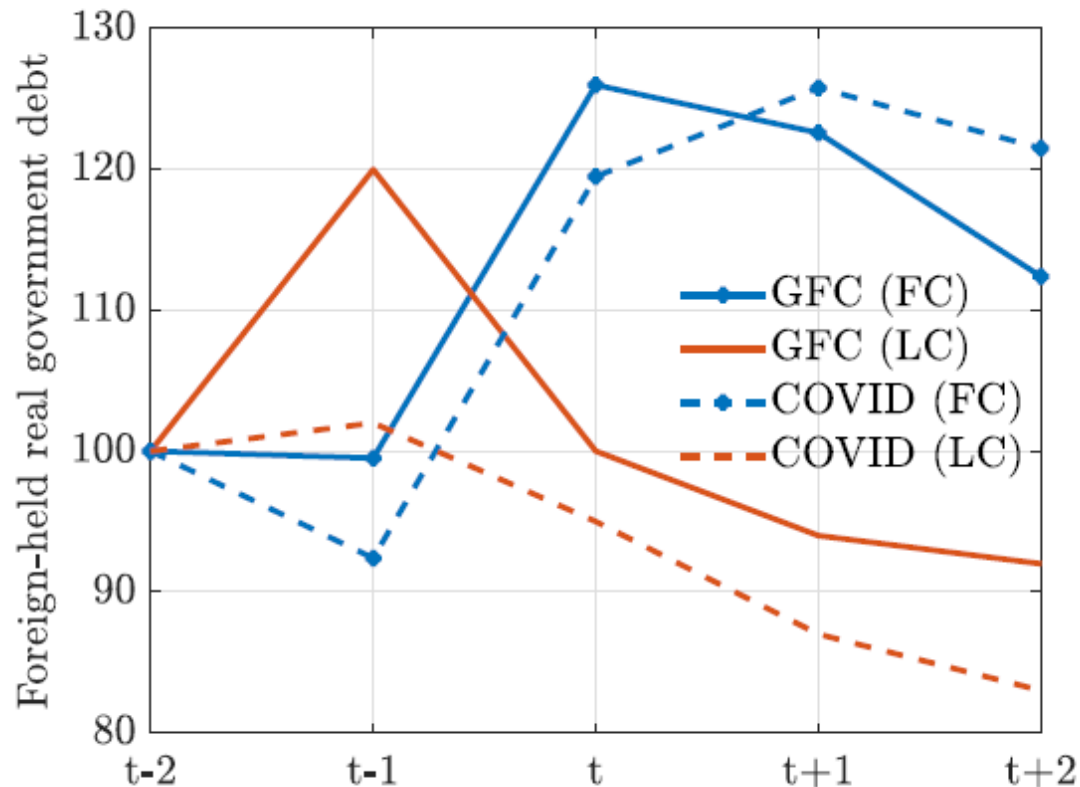


Note: Vertical lines denote quarters in which at least one monthly realisation of the volatility index VIX has surpassed the index's historical average (since 2004Q1) by at least more than four standard deviations.

Source: Refinitiv; IMF Sovereign Debt Investor Base for Emerging Markets database; authors' calculations.



## However, the increased ownership of local-currency debt by foreign investors makes governments susceptible to bond sell-off shocks: Mexico



Note: Evolution of foreign-held central government debt securities of Mexico in real units. Real series are obtained using the GDP deflator. Time  $t$  on the horizontal axis denotes the quarter for each stress episode, in which at least one monthly realisation of the volatility index VIX has been at least four standard deviations above the historical average of the index since 2004Q1.

Source: Refinitiv; OECD Economic Outlook 109 database; IMF Sovereign Debt Investor Base for Emerging Markets database; authors' calculations.



# What we do

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- Extend the canonical sovereign default model with long-term debt by [Hatchondo et al. \(2009\)](#) and [Chatterjee and Eyigungör \(2012\)](#)
  - Both **peso** and **dollar** debt issuance matched by risk averse lenders
  - **Depreciation rate of the currency** (= inflation) set **optimally** and by **discretion**
  - Ex post currency depreciations leading to real output costs
  - Greater tolerance of risk by peso lenders in normal times, with the possibility of an increase in their risk aversion should the **global risk sentiment** worsen
  - Exogenous debt recovery
- Calibrate the model to the pre-pandemic episode (2004-19) of the Mexican economy to study its quantitative properties
- Explore how the currency management of sovereign debt and the optimal exchange-rate policy interact with sovereign debt sustainability



# Key takeaways

Literature

- The analytical work shows
  - Exchange rate depreciations are countercyclical (most of the time) and help smooth consumption by providing debt relief.
  - Higher LC debt reinforces the currency depreciation/inflation bias.
- Broadly consistent with the EME business cycle properties,
  - Hard and domestic currency debt are more volatile than output and **substitute** each other.
  - Net exports, domestic- and foreign-currency bond spreads and ER depreciation are **countercyclical**.
- Optimal currency depreciations can avert EME sovereign debt crises in episodes of **macro/financial** stress.
  - True even when **tolerance of risk** towards LC debt **declines** during risk-off episodes, as occurred during the global financial crisis or the COVID-19 shock.



## Increasing lender risk aversion towards domestic currency sovereign debt during stress episodes

- Assume lenders are all risk averse, yet, during times with abundant liquidity, peso lenders are **more tolerant to risk** than hard currency lenders.
- During **stress episodes**, we assume that the pricing kernels of the two lender types get equalised, reflecting an **increase in risk aversion** towards peso debt.
- Therefore, contingent on the state of global liquidity, pricing kernels of lenders satisfy

$$m_{t,t+1}^L(\text{High liquidity}) > m_{t,t+1}^F = m_{t,t+1}^L(\text{Low liquidity})$$

- Key feature, as otherwise it is very difficult for the sovereign to issue peso debt due to a **cost of borrowing dominance**
  - Limited commitment to exchange-rate policy induces lenders to charge an ex ante **currency depreciation premium**.



# Equilibrium pricing functionals

$$q^F(b^{F'}, b^{L'}, y, l) = \mathbb{E}_{y', l' | y, l} \left\{ m_{y, y'}^F \left[ (1 - d') \left[ (1 - \delta) q^{F'} + \kappa \right] + d' q_d^{F'} \right] \right\}, \quad (6)$$

$$q^L(b^{F'}, b^{L'}, y, l) = \mathbb{E}_{y', l' | y, l} \left\{ m_{y, l, y'}^L \frac{\left[ (1 - d') \left[ (1 - \delta) q^{L'} + \kappa \right] + d' q_d^{L'} \right]}{1 + \pi'} \right\} \quad (7)$$

Equilibrium

Bonds in default

Recursive representation





## Key mechanisms affecting the local-currency sovereign debt share

%	Data 2004-19	Baseline economy	Higher risk aversion to peso debt	Lower inflation costs
Debt-to-GDP	30.3	31.2	29.1	30.6
LC debt share	48.0	46.5	<b>5.7</b>	<b>29.4</b>
Inflation	4.1	4.2	3.1	4.2

- The baseline model generates an empirically realistic peso debt share.
- Eliminating heterogeneous risk aversion severely hampers the equilibrium trade of peso debt.
  - Peso debt trades only to the extent that it helps avoid outright (non-selective) defaults.
  - Partial debt recovery upon default constrains how low bond prices can go, limiting the adverse effect of currency depreciation.
- Inflation costs act as a partial commitment device akin to an IT regime and help issue local-currency debt.

[All stats](#)

[Parameterisation](#)



## Key business cycle properties

Volatilities %	Data 2004-19	Baseline economy
$\sigma(\pi)$	0.9	0.3
$\sigma(b^F/y)$	2.9	<b>3.2</b>
$\sigma(b^L/y)$	3.2	<b>4.4</b>

Note: Standard deviation of output in the model is 2.5%.

Correlations	Data 2004-19	Baseline economy
$\rho(tb/y, y)$	-0.1	-0.6
$\rho(r^F - r^{*F}, y)$	-0.5	-0.9
$\rho(r^L - r^{*L}, y)$	-0.2	-0.9
$\rho(\pi, y)$	-0.1	<b>-0.2</b>
$\rho(b^F/y, b^L/y)$	-0.9	<b>-0.9</b>

- The lack of commitment to exchange-rate policy limits the appetite to create excessive currency fluctuations.
- Instead, the sovereign proactively tilts the currency structure of debt to minimise the likelihood of defaults.

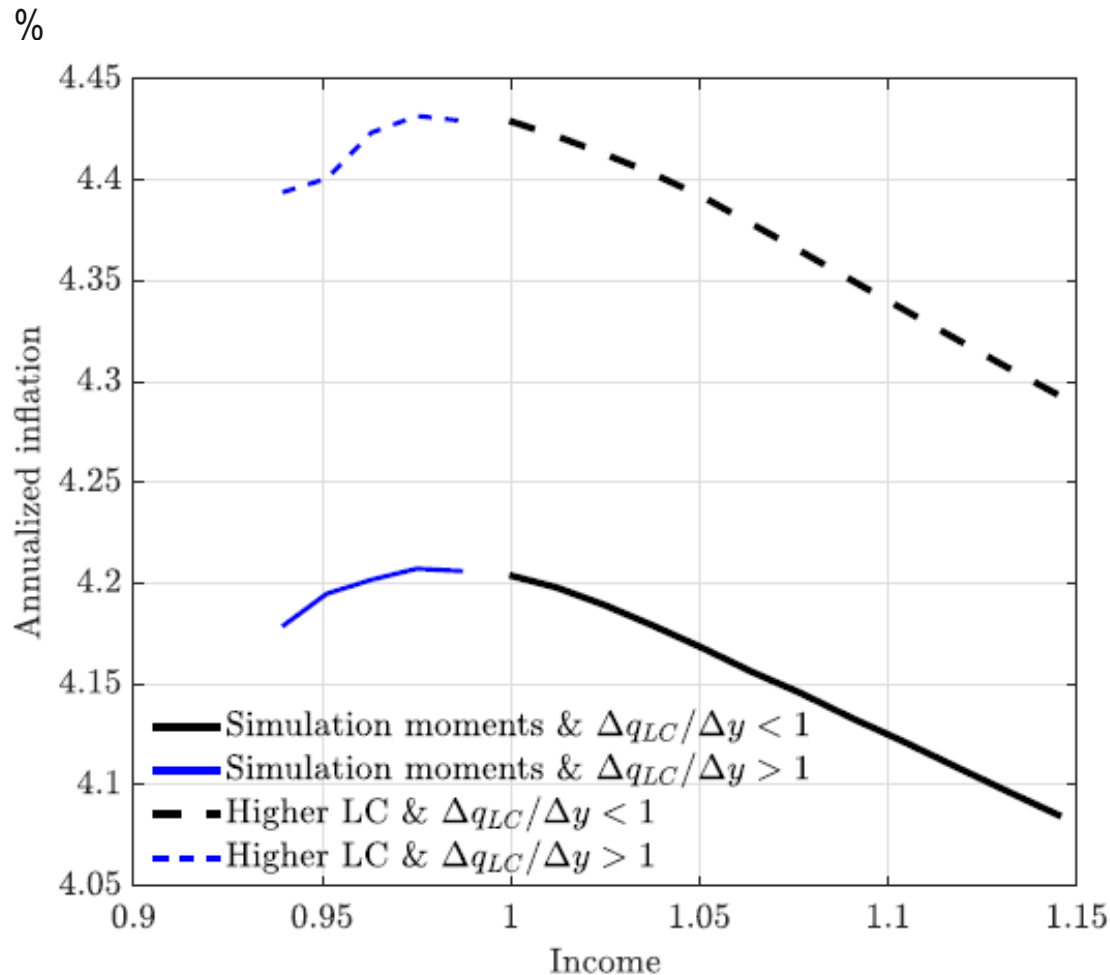
- Net exports-to-GDP ratio and bond spreads are countercyclical.
- Inflation is countercyclical, reflecting currency depreciations under adverse macroeconomic fundamentals → peso debt payments become state-contingent to improve consumption smoothing.
- Strong substitutability between hard and domestic currency sovereign debt over the business cycle

[All stats](#)

[Parameterisation](#)



# Output costs of currency depreciations outweigh fiscal relief effects under better fundamentals



Characterisation

Inflation bias

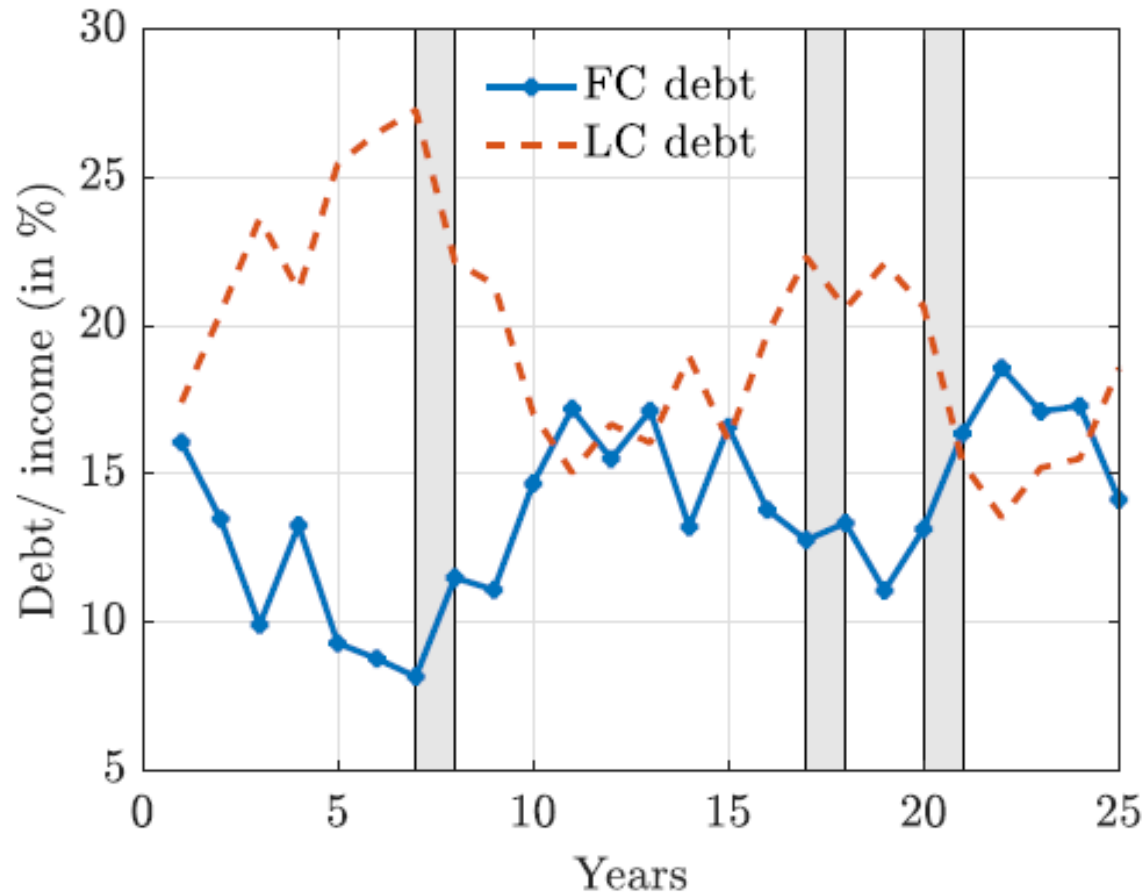
Note: Currency depreciation policy (in annualised percentage terms) in the baseline model as a function of income while outstanding LC and FC denominated debt stocks are fixed at their average over simulations. The dashed lines correspond to a higher stock of outstanding LC denominated debt. For finer lines, income elasticity of LC bond price is larger than 1.



# The sovereign actively manages currency composition of debt as in the data

Data

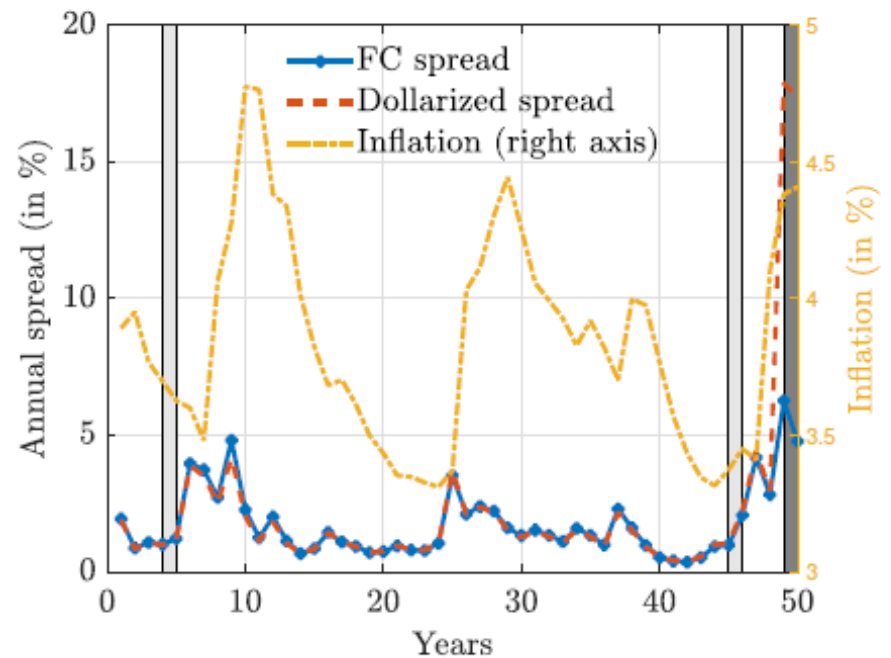
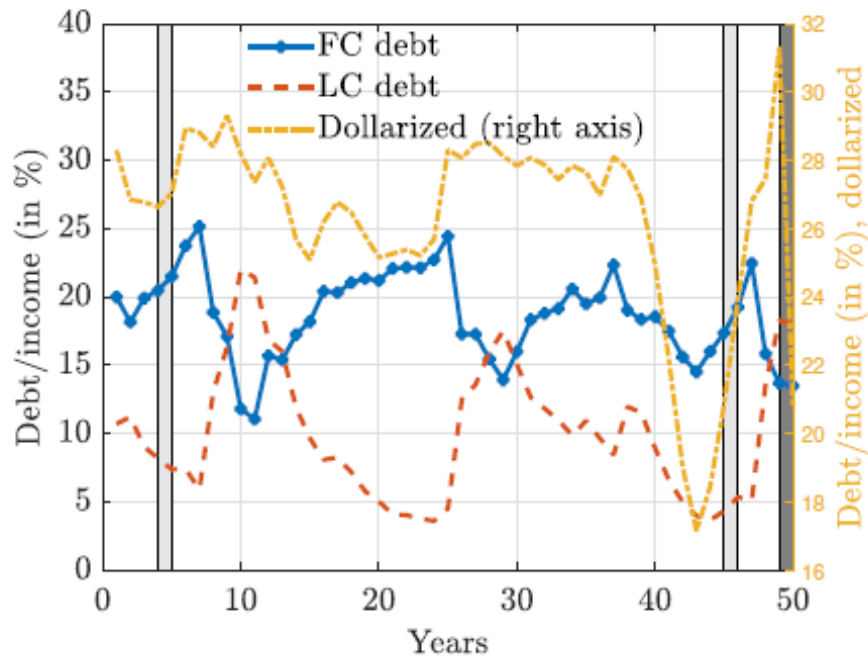
Decision rules



Note: Evolution of dollar (FC) and peso (LC) debt-to-income ratios implied by model simulations. Shaded areas denote stress episodes that lead to increased risk aversion towards peso debt.



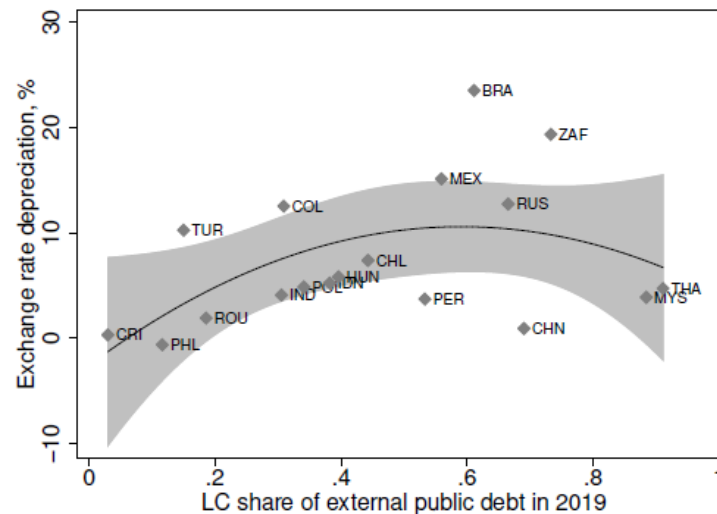
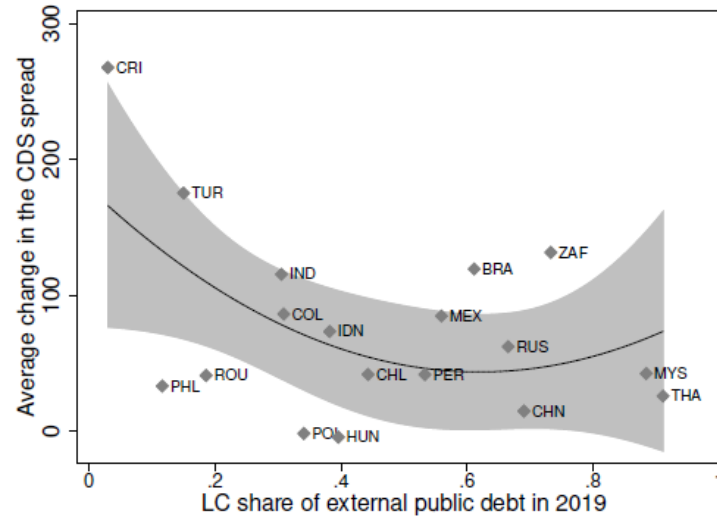
# Optimal currency management of sovereign debt helps avoid a default: an illustrative experiment



Note: Shaded areas denote low-global liquidity episodes with increased risk aversion towards peso debt. In the dark-shaded region, both global liquidity is low and macroeconomic fundamentals are exceptionally weak.



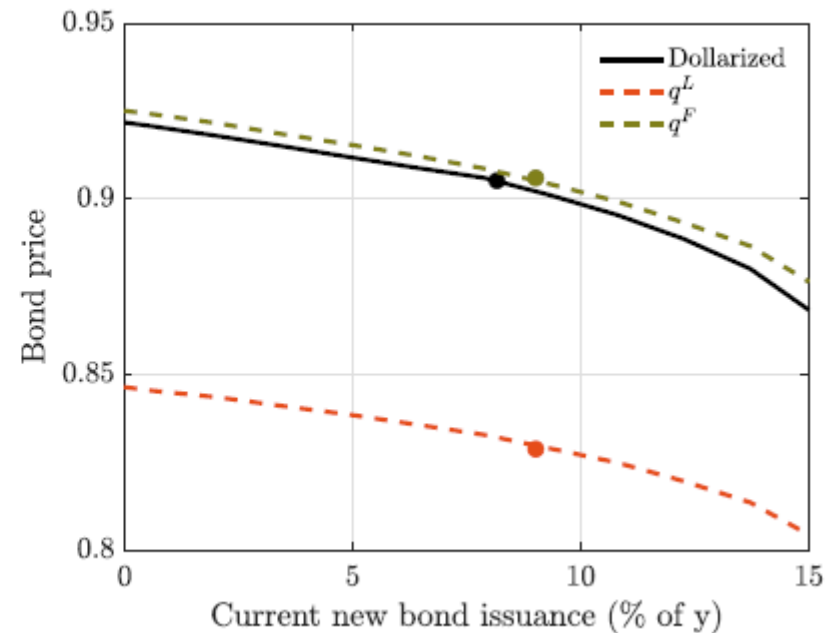
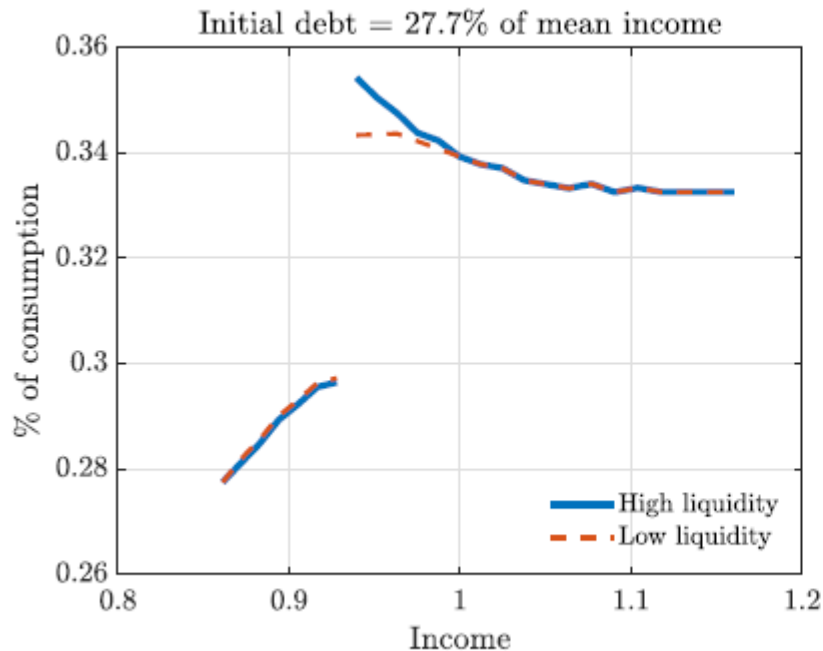
# EMEs with a higher LC share in foreign-held public debt faced lower rises in default risk and higher currency depreciations after the COVID-19 shock



Source: OECD Exchange Rate database; IMF Sovereign Debt Investor Base for Emerging Markets dataset; Refinitiv; and Factset.



# Managing the currency structure of sovereign debt increases welfare despite costly inflation



Note: Consumption-equivalent welfare gains on the left are calculated by ensuring that the switch to multiple currency debt issuance occurs at an initial sovereign indebtedness that coincides with the ergodic debt-to-income ratio of the dollarised economy. New bond issuance on the right is defined as the ratios of  $\tilde{b}^{F'} - (1 - \delta)b^F$  to mean income in the dollarised economy and the ratios of  $b^{F'} - (1 - \delta)b^F$  and  $b^{L'}$  to mean income for dollar and peso debt in the baseline economy. Without loss of generality, the low-liquidity state is assumed in the right panel to illustrate the pricing effects more explicitly.



## Concluding remarks and policy implications

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- Currency structure of EME government debt has been dramatically tilted towards domestic currency denomination.
- Improved monetary policy credibility, more developed domestic financial markets and the evolution of the EME debt investor base play a key role.
- The dissipating original sin has partly transferred the currency risk to foreigners, while making EME sovereigns more susceptible to large swings in global risk sentiment.
- We account for these tradeoffs using a default model with risk averse lenders and global risk-off episodes feeding back to investors' risk tolerance towards LC bonds.
- Our analysis lends support to the view that LC debt can work as insurance in bad times as it provides debt relief.
- EMEs can only benefit from this tool by building enough LC stock of debt in good times → sticking to credible inflation targeting/exchange-rate policy frameworks.





# THANK YOU FOR YOUR ATTENTION

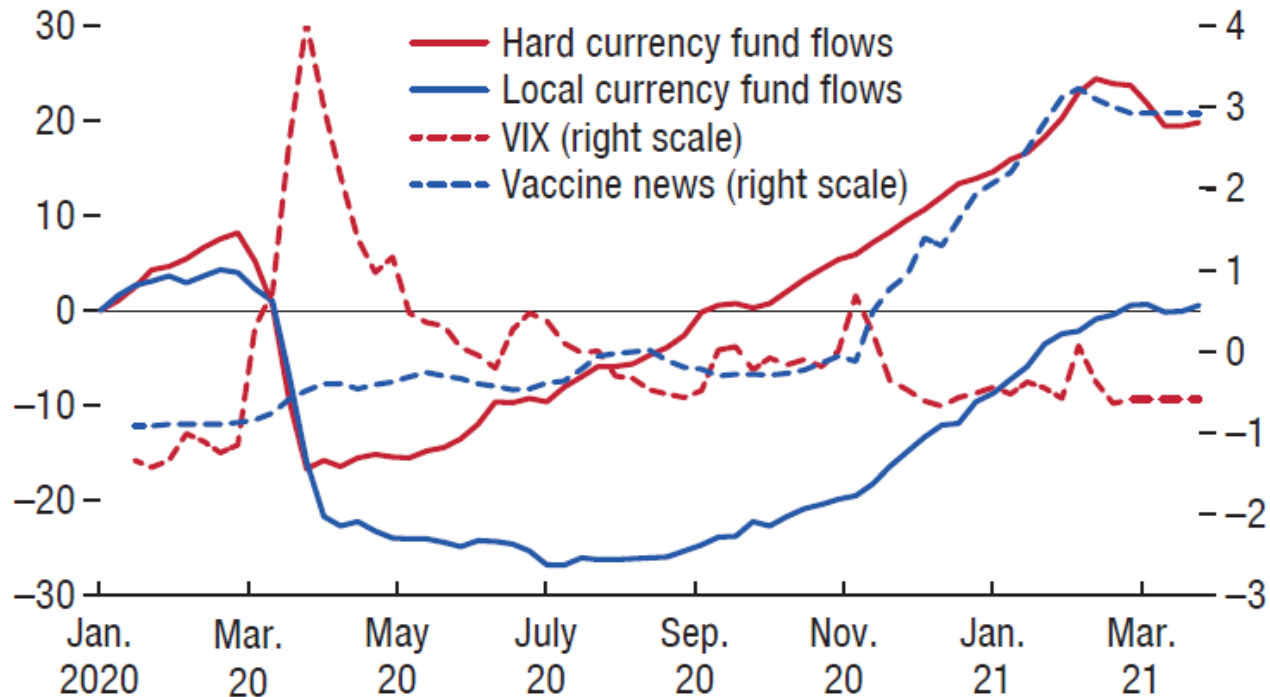
[enes.sunel@oecd.org](mailto:enes.sunel@oecd.org)

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# Currency structure of EME debt fund flows responds to reversals in global risk sentiment

**1. Emerging Market Debt Fund Flows and External Risk Factors**  
(Billions of US dollars, cumulative since Jan. 2020, left scale;  
z-score, right scale)



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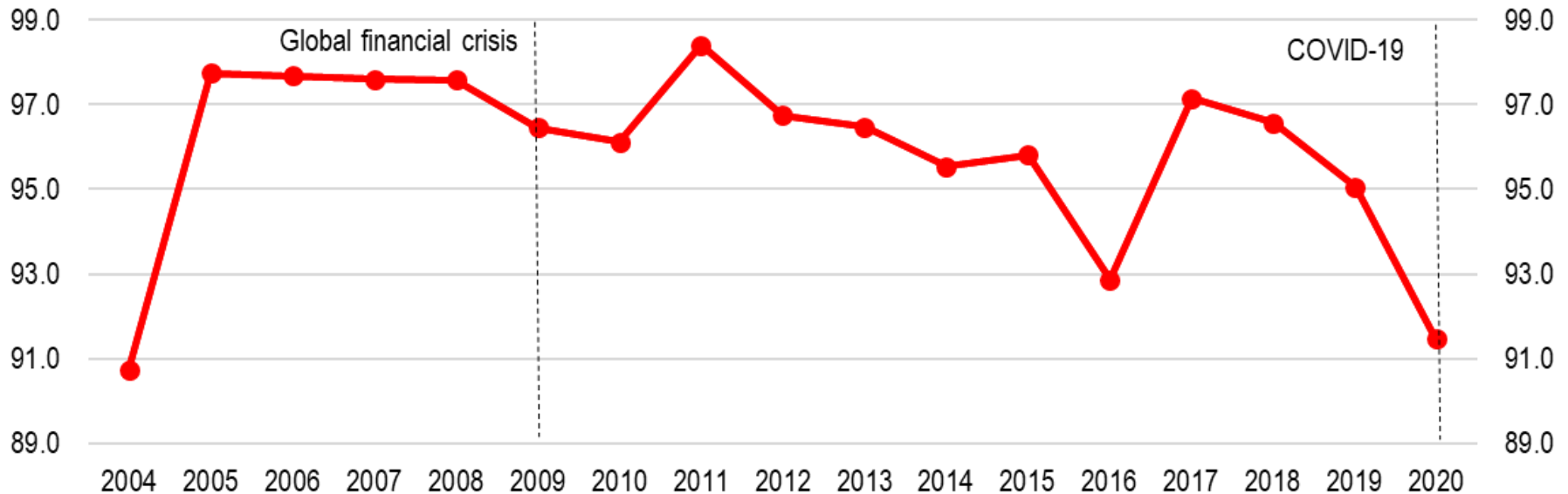
Source: IMF Global Financial Stability Report, 2021 April.



# Sovereign debt issuance tilted towards foreign currency during risk-off episodes in Mexico

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Local currency share in gross debt issuance, %



Note: Corresponds to total issuance of government debt including that in the domestic market.

Source: Refinitiv.



# Related literature

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- [Ottonello and Perez \(2019\)](#)
  - Currency composition of EME sovereign debt. Limited commitment in debt issuance and inflation policy. No outright default in equilibrium.
  - Ex-post inflation bias and/or real depreciation bias cause FX shares to be higher.
- [Du et al. \(2020\)](#)
  - Explore why countries that have a tendency to display procyclical inflation are able to issue more LC debt than countries who resort to the countercyclical use of inflation. Monetary policy credibility explains higher LC shares as in OP2019. No outright default.
- [Önder and Sunel \(2021\)](#)
  - Analyze the hypothetical experiment of Grexit from a debt sustainability perspective.
  - No feedback from global liquidity conditions to aversion of risk towards LC debt.
- [Engel and Park \(forthcoming\)](#)
  - Consider enforcement constraints pertaining to default and currency debasement choices and show that the debt composition is biased toward FC debt under less credible monetary policy. Commitment to inflation policy. Debasement causes permanent original sin.
- [Hurtado, Nuño and Thomas \(forthcoming\)](#)
  - Welfare and debt sustainability consequences of defaultable nominal debt with no ex ante commitment to price stability.



# A sovereign default model of currency structure and optimal exchange-rate depreciations

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$$v(b^F, b^L, y, l) = \max \left\{ v^r(b^F, b^L, y, l), v^d(b^F, b^L, y, l) \right\} \quad (1)$$

$$v^r(b^F, b^L, y, l) = \max_{b^{F'}, b^{L'}, \pi, c \geq 0} \left\{ u(c) + \beta \mathbb{E}_{y', l' | y, l} \left[ v(b^{F'}, b^{L'}, y', l') \right] \right\}, \quad \text{subject to} \quad (2)$$

$$c = y \left( 1 - \frac{\theta}{2} [\pi - \pi^*]^2 \right) + q^F (b^{F'} - (1 - \delta)b^F) - \kappa b^F + q^L \left( b^{L'} - \frac{(1 - \delta)b^L}{1 + \pi} \right) - \kappa \frac{b^L}{1 + \pi}$$

$$v^d(b^F, b^L, y, l) = u(y - \phi(y)) \quad (3)$$

$$+ \beta \mathbb{E}_{y', l' | y, l} \left[ \psi v(\omega b^F (1 + r^*), \omega b^L (1 + r^*), y', l') + (1 - \psi) v^d(b^F (1 + r^*), b^L (1 + r^*), y', l') \right]$$

[No-buyback](#)



## Explicit formulation of heterogeneous lender risk aversion

$$m_{t,t+1}^F = \exp \left[ - \left( r^* + \bar{\alpha} \varepsilon_{t+1} + \frac{\bar{\alpha}^2 \sigma_\varepsilon^2}{2} \right) \right] \quad (4)$$

$$m_{t,t+1}^L = \exp \left[ - \left( r^* + \alpha(l_t) \varepsilon_{t+1} + \frac{\alpha(l_t)^2 \sigma_\varepsilon^2}{2} \right) \right] \quad (5)$$

$\alpha(l^H) = \underline{\alpha}$  and  $\alpha(l^L) = \bar{\alpha}$  for  $l^H > l^L$  and  $\bar{\alpha} > \underline{\alpha}$ .



# More tolerance of risk by the foreign investor base of local-currency EME sovereign debt

- [Sinaert \(2012\)](#) describes the widening investor base of EMEs sovereign debt
  - Benchmarked funds take an index (e.g. JP Morgan GBI-EM index) as reference
  - The official sector (mainly including central banks and sovereign wealth funds)
  - Hedge funds (tolerating more risk than official investors)
  - Benchmarked funds that have not been focusing on EMEs before (e.g. funds that target Barclays Global Aggregate Index, Global AGG or Citibank World Government Bond Index, Citi WGBI).
- [Arslanalp and Tsuda \(2015\)](#)
  - Benchmark-driven funds (e.g. Barclays EMs Local Currency Government Index and the Citi EMs Government Bond Index) typically **do not impose minimum investment rating requirements**
  - In contrast with global bond indices (e.g. Global AGG index and Citi EGBI).
- [Maggiori et al. \(2020\)](#)
  - Home bias; nationals living abroad versus foreign investors.
  - Currency of a security is a stronger predictor of an investor's nationality than that of the issuer.
- [OECD \(2020\)](#) evidence on debt issuance during COVID-19
  - The share of FC in **investment-grade** sovereign debt issuance **tripled**, whilst the share of FC in **below-investment grade** debt issuance declined to **less than one-third** of its historical average of the last five years.
- [Bertaut et al. \(2022\)](#)
  - The foreign (US) investor base of **LC (FC)** EME sovereign debt is tilted towards **mutual** (insurance/pension) funds.

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## IMF Sovereign Debt Investor Base for Emerging Markets database by Arslanalp and Tsuda (2014)

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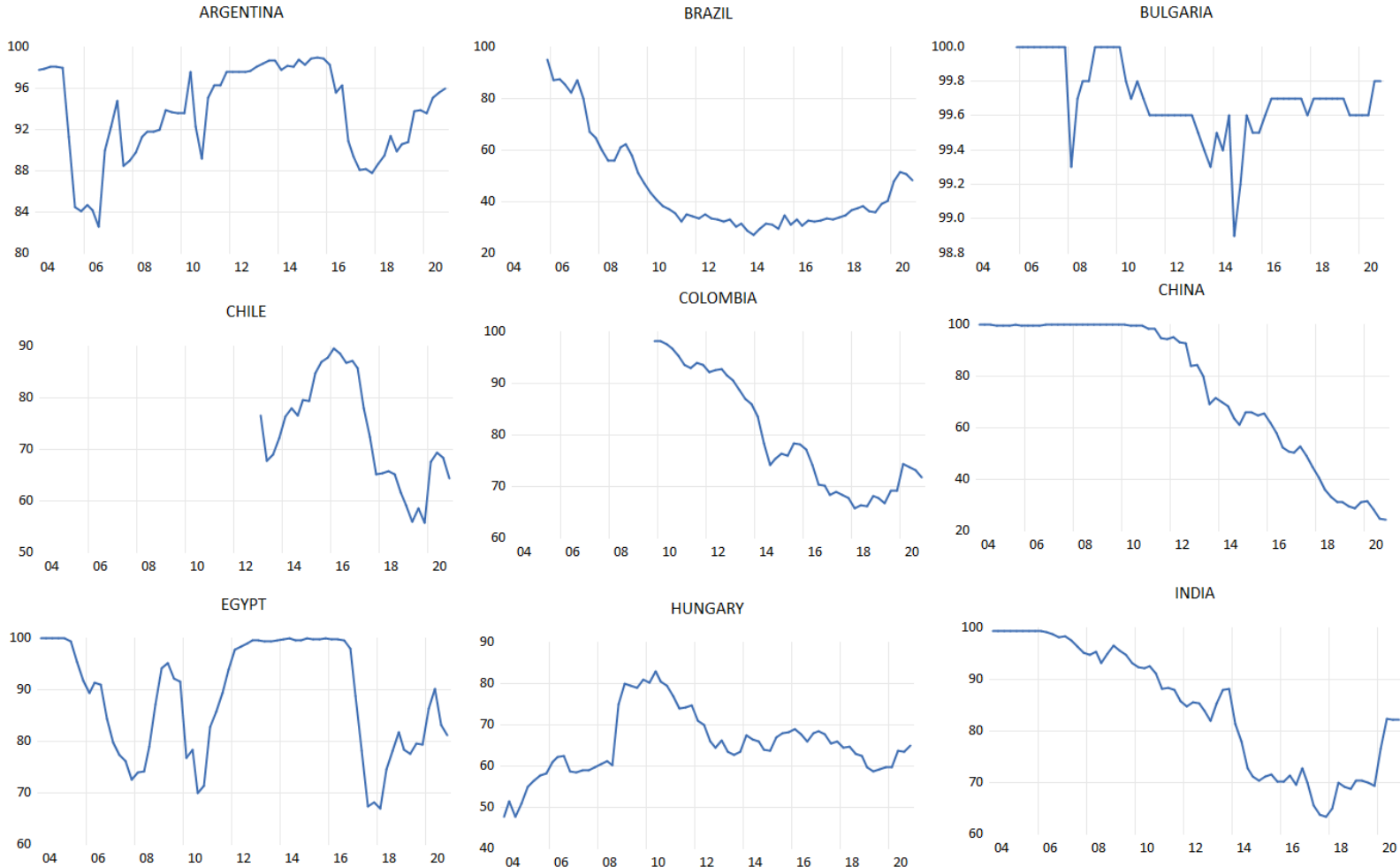
- General government gross debt, on a consolidated basis, which excludes intergovernmental holdings. Currently, 2004:Q1 - 2021:Q4, updated twice a year.
- BIS International Banking Statistics; ECB; Eurostat; IMF International Financial Statistics (IFS); IMF Coordinated Portfolio Investment Survey (CPIS); IMF Currency Composition of Official Foreign Exchange Reserves (COFER); IMF-World Bank Quarterly External Debt Statistics; national data sources.
- Compiled either at face value or, adjusted for valuation changes if needed.
- Foreign investor holdings are divided into foreign official sector, foreign banks, and foreign nonbanks.
- 24 countries covering investable universe of EME government debt.





# Dissipating original sin in emerging-market economies-1

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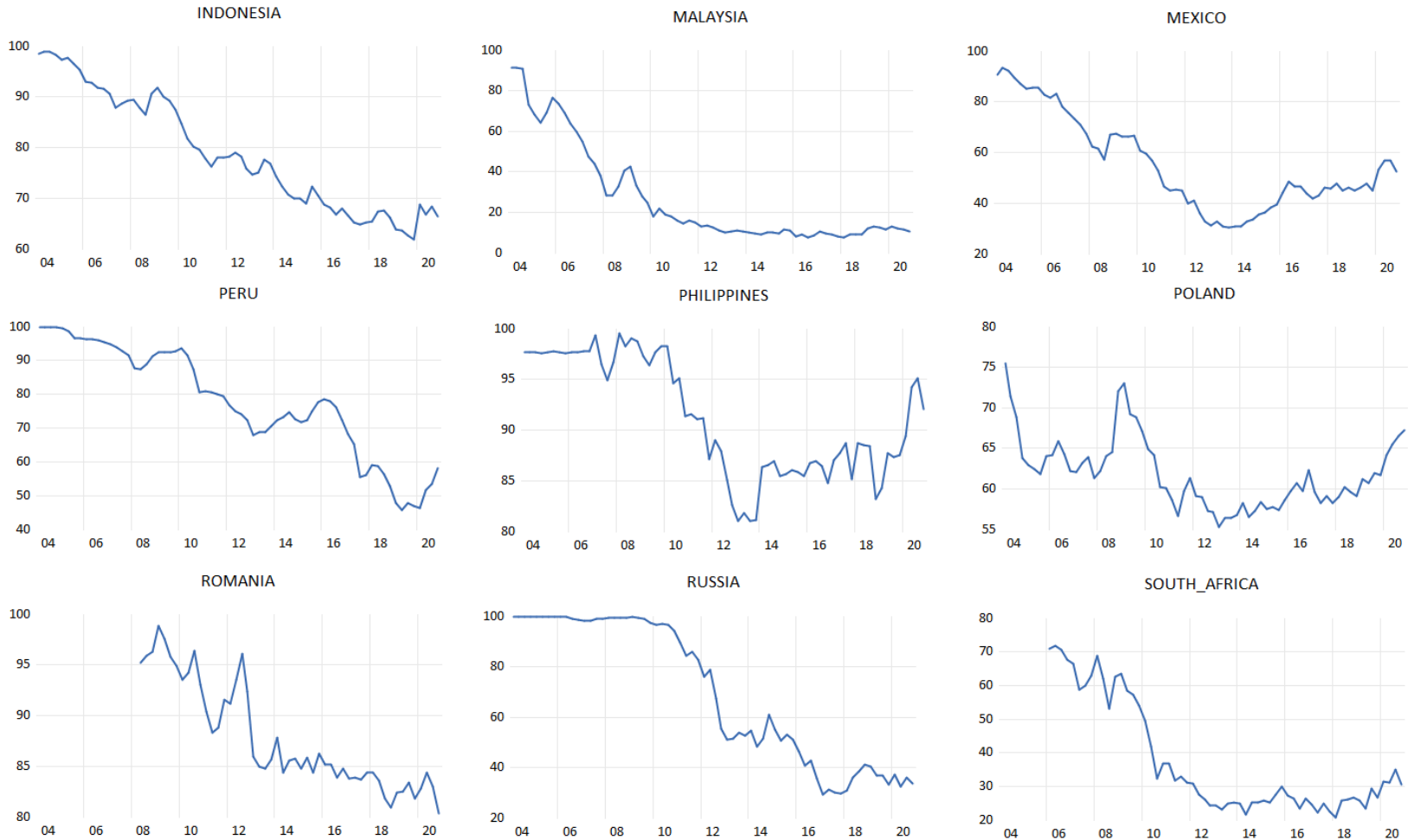
Source: IMF Sovereign Debt Investor Base for Emerging Markets database; authors' calculations.

Note: Percentage share of foreign currency in foreign-held central government debt.



# Dissipating original sin in emerging-market economies-2

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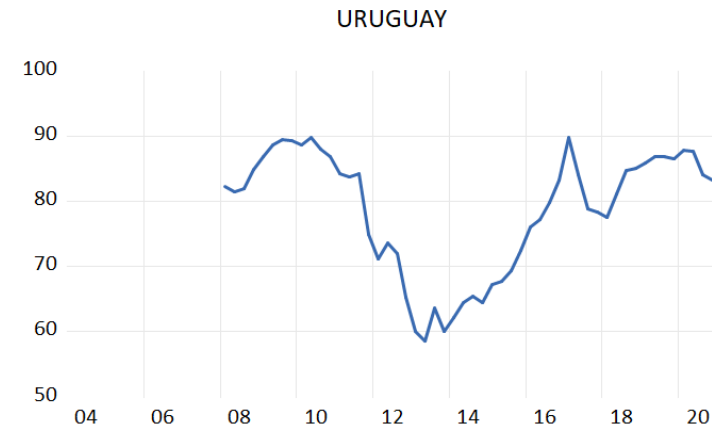
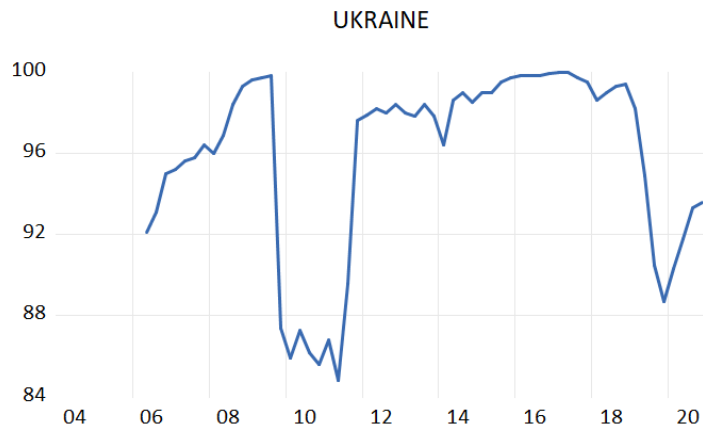
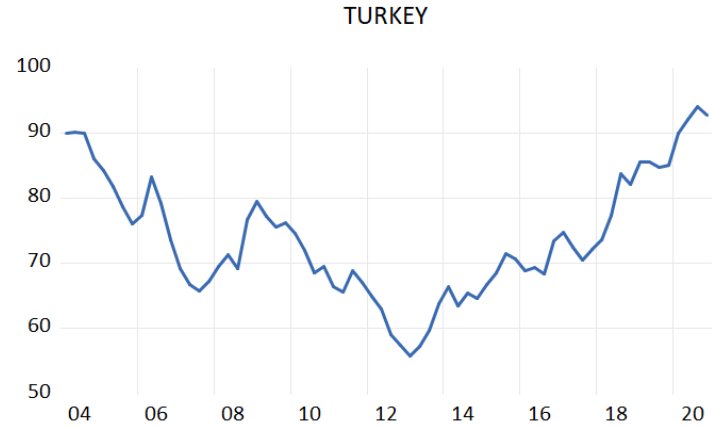
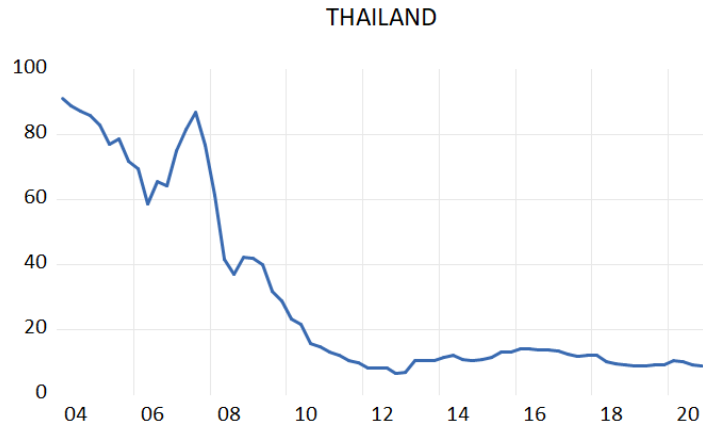
Source: IMF Sovereign Debt Investor Base for Emerging Markets database; authors' calculations.

Note: Percentage share of foreign currency in foreign-held central government debt.



# Dissipating original sin in emerging-market economies-3

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Source: IMF Sovereign Debt Investor Base for Emerging Markets database; authors' calculations.  
Note: Percentage share of foreign currency in foreign-held central government debt.



# Pricing functionals for bonds in default

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$$q_d^F(b^{F'}, b^{L'}, y, l) = \mathbb{E}_{y', l' | y, l} \left\{ m_{y, y'}^F (1 + r^*) \left[ \psi \omega \left( (1 - d') \left[ (1 - \delta) q^{F'} + \kappa \right] + d' q_{dd}^{F'} \right) + (1 - \psi) q_d^{F'} \right] \right\}, \quad (8)$$

$$q_d^L(b^{F'}, b^{L'}, y, l) = \mathbb{E}_{y', l' | y, l} \left\{ m_{y, l, y'}^L (1 + r^*) \left[ \psi \omega \frac{\left[ (1 - d') \left[ (1 - \delta) q^{L'} + \kappa \right] + d' q_{dd}^{L'} \right]}{1 + \pi'} + (1 - \psi) q_d^{L'} \right] \right\} \quad (9)$$

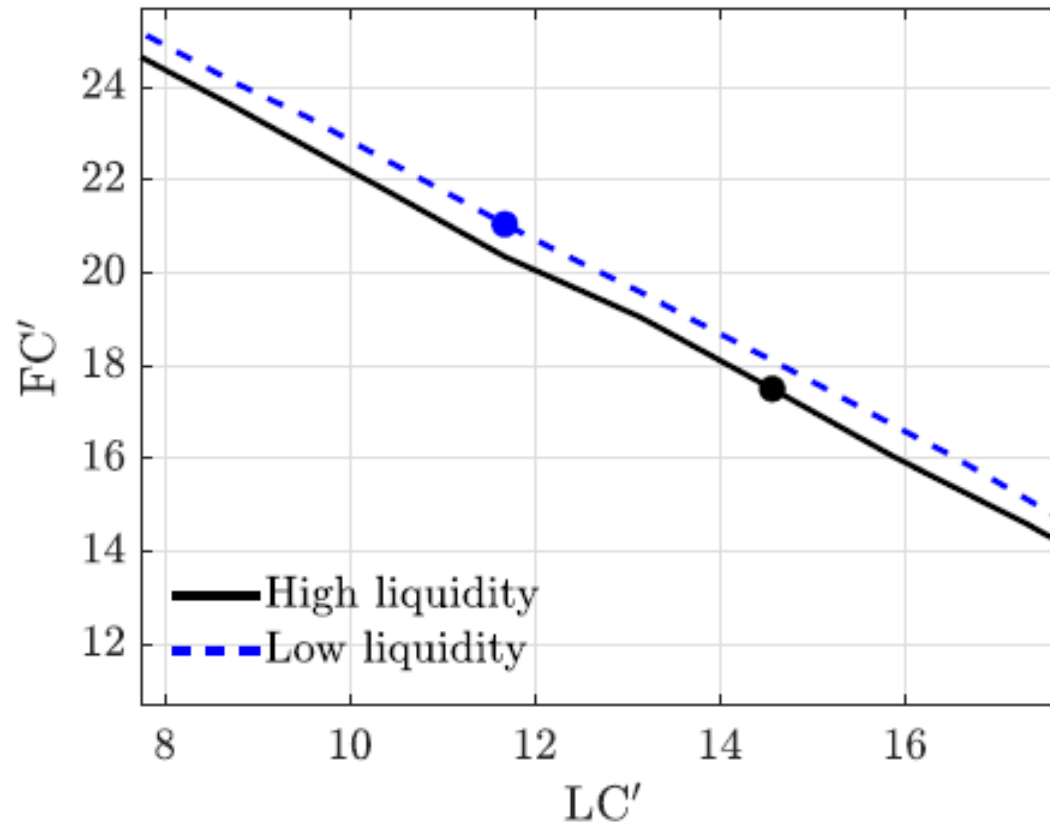


# Risk-off episodes tilt sovereign debt issuance towards hard currency

% of mean income (normalised to 1)

[Characterisation](#)

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Note: The panel on the left plots the debt issuance frontier (as a percent of mean income that is normalised to one) that supports a reference consumption level in the baseline model for high- and low-liquidity states. Thick dots coincide with equilibrium realisations.



# Characterisation of the currency depreciation policy

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$$\frac{\partial \hat{b}^L}{\partial \pi} = \frac{\overbrace{\theta y \pi - [q^L(b^{F'}, \hat{b}^L, y)(1 - \delta) + \kappa] b^L / (1 + \pi)^2}^{\text{Net reduction in the budget introduced by inflation}}}{\underbrace{q^L(b^{F'}, \hat{b}^L, y) + \frac{\partial q^L(b^{F'}, \hat{b}^L, y)}{\partial \hat{b}^L} \left[ \hat{b}^L - \frac{(1 - \delta)b^L}{1 + \pi} \right] + \frac{\partial q^F(b^{F'}, \hat{b}^L, y)}{\partial \hat{b}^L} [b^{F'} - (1 - \delta)b^F]}_{\text{Net revenue from issuing peso debt}}}$$

$$\mathbb{E}_{y', y' | y, l} \left[ (1 - d') u_1(c') \frac{[q^{L'}(1 - \delta) + \kappa]}{1 + \pi'} \right] \underbrace{\frac{\partial \hat{b}^L}{\partial \pi}}_{\text{Effect of inflation on portfolio}} = 0$$

$$\frac{\partial \pi}{\partial y} = \frac{-\theta \pi + \frac{\partial q^L(b^{F'}, \hat{b}^L, y)}{\partial y} \frac{(1 - \delta)b^L}{(1 + \pi)^2}}{\theta y + 2[q^L(b^{F'}, \hat{b}^L, y)(1 - \delta) + \kappa] b^L / (1 + \pi)^3}$$

$$\frac{\partial \pi}{\partial b^L} = \frac{q^L(b^{F'}, \hat{b}^L, y)(1 - \delta) + \kappa}{\theta y(1 + \pi)^2 + 2[q^L(b^{F'}, \hat{b}^L, y)(1 - \delta) + \kappa] b^L / (1 + \pi)} > 0,$$



# Characterisation of the currency structure

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$$\frac{\partial \hat{b}^L}{\partial b^{F'}} = \frac{\overbrace{\left( q^F(b^{F'}, \hat{b}^L, y) + \frac{\partial q^F(b^{F'}, \hat{b}^L, y)}{\partial b^{F'}} [b^{F'} - (1 - \delta)b^F] + \frac{\partial q^L(b^{F'}, \hat{b}^L, y)}{\partial b^{F'}} \left[ \hat{b}^L - \frac{(1 - \delta)b^L}{1 + \pi} \right] \right)}^{\text{Net revenue from issuing dollar debt}}}{\underbrace{\left( q^L(b^{F'}, \hat{b}^L, y) + \frac{\partial q^L(b^{F'}, \hat{b}^L, y)}{\partial \hat{b}^L} \left[ \hat{b}^L - \frac{(1 - \delta)b^L}{1 + \pi} \right] + \frac{\partial q^F(b^{F'}, \hat{b}^L, y)}{\partial \hat{b}^L} [b^{F'} - (1 - \delta)b^F] \right)}_{\text{Net revenue from issuing peso debt}}}$$

$$\mathbb{E}_{y', l' | y, l} \left[ (1 - d') \underbrace{u_1(c') [q^{F'}(1 - \delta) + \kappa]}_{\text{Cost of increasing dollar debt}} \right] = \mathbb{E}_{y', l' | y, l} \left[ (1 - d') \underbrace{u_1(c') \frac{[q^{L'}(1 - \delta) + \kappa]}{1 + \pi'}}_{\text{Benefit of reducing peso debt}} \right] \overbrace{\left( - \frac{\partial \hat{b}^L}{\partial b^{F'}} \right)}^{\text{Portfolio adjustment}}$$



# No-buyback constraints

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$$b^{F'} - (1 - \delta)b^F \geq 0 \text{ if } b^{L'} - \frac{(1 - \delta)b^L}{1 + \pi} > 0,$$

$$b^{L'} - \frac{(1 - \delta)b^L}{1 + \pi} \geq 0 \text{ if } b^{F'} - (1 - \delta)b^F > 0,$$





# Markov perfect equilibrium

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**Definition 1 (Markov perfect equilibrium)** *Given the exogenous states of the economy  $y, l$ , a Markov perfect equilibrium is characterized by value functions  $v, v^r$  and  $v^d$ , bond pricing functionals  $q^F, q^L, q_d^F, q_d^L$ , a symmetric default rule  $\hat{d}$ , borrowing rules  $\hat{b}^F, \hat{b}^L$  and an inflation rule  $\hat{\pi}$  such that*

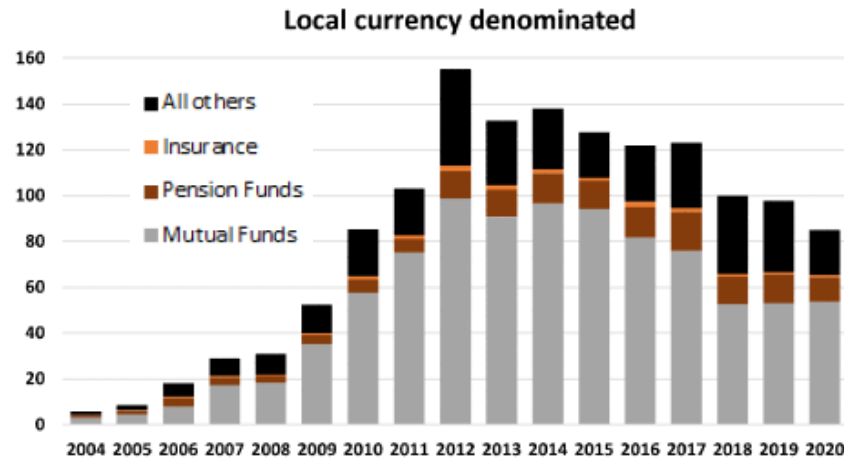
1. *Given the bond pricing functionals, government policy rules  $\{\hat{d}, \hat{b}^F, \hat{b}^L, \hat{\pi}\}$  solve the utility maximization problem defined in equations (1), (2) and (3).*
2. *Given government policy rules  $\{\hat{d}, \hat{b}^F, \hat{b}^L, \hat{\pi}\}$ , the bond pricing functionals  $q^F, q^L, q_d^F, q_d^L$  satisfy conditions (6), (7), (8) and (9).*



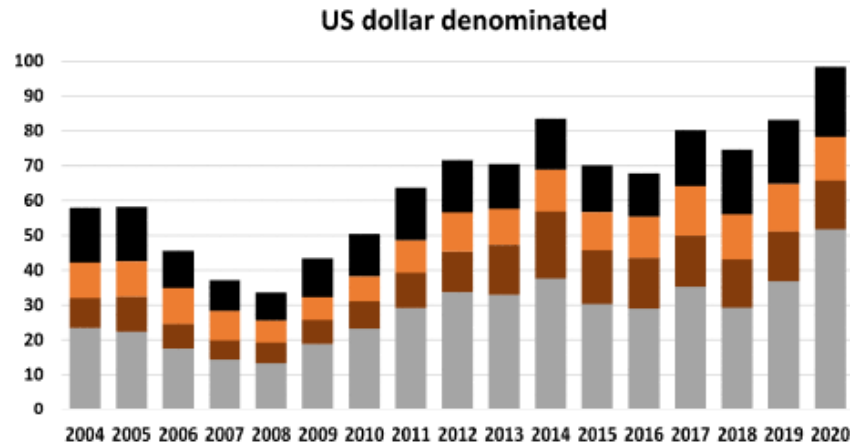
# The (US) investor base of EME sovereign bonds displays sharp differences in the currency dimension

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USD bn



USD bn



Source: Bertaut et al. (2022).

Note: Investor base for a sample of sixteen EMEs. The 'All Others' category includes other funds, depository institutions, other financial institutions, and non-financial institutions.



# Parameterisation of the model

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	Parameter	Value
Discount factor	$\beta$	0.92
Risk aversion of households	$\sigma$	2
Income autocorrelation coefficient	$\rho$	0.65
Standard deviation of innovations	$\sigma_\epsilon$	0.0283
Mean log income	$\bar{y}$	$(-1/2)\sigma_\epsilon^2$
Debt duration	$\delta$	0.2845
Risk-free rate	$r^*$	0.04
Coupon payment	$\kappa$	0.312
Probability of re-entry after default	$\psi$	0.6667
Debt recovery rate	$\omega$	0.63
Inflation target	$\pi^*$	0.03
Transition probability of lower LC risk tolerance	$p_{HL}^0$	0.38
Transition probability of lower LC risk tolerance	$p_{HL}^1$	38
Transition probability of higher LC risk tolerance	$p_{LH}$	1
Risk aversion of peso investors	$\underline{\alpha}$	1

*Jointly calibrated in the baseline economy*

Output cost of default	$d_0$	-1.45
Output cost of default	$d_1$	1.6
Inflation cost intensity	$\theta$	4
Risk aversion of dollar investors	$\bar{\alpha}$	6.25



# Effect of LC debt risk aversion and inflation costs

	(1)	(2)	(3)	(4)
	Data	Baseline economy	Higher risk aversion to peso debt	Lower inflation costs
Long-term debt statistics <sup>a</sup> (%)				
Debt-to-GDP	30.3	31.2	29.1	30.6
Share of LC debt	48.0	46.5	5.7	29.4
$r^F - r^{*F}$	2.2	2.2	2.0	2.2
$r^L - r^{*L}$	0.5	1.5	1.9	1.5
Inflation	4.1	4.2	3.1	4.2
Volatilities (%) <sup>b</sup>				
$\sigma(c)/\sigma(y)$	1.1	1.5	1.0	1.4
$\sigma(tb/y)$	0.8	2.0	0.4	1.6
$\sigma(r^F - r^{*F})$	0.5	1.0	1.0	1.0
$\sigma(r^L - r^{*L})$	0.4	0.8	0.9	0.8
$\sigma(\pi)$	0.9	0.3	0.0	0.4
$\sigma(b^F/y)$	2.9	3.2	1.0	2.4
$\sigma(b^L/y)$	3.2	4.4	0.4	3.2
Correlations <sup>b</sup>				
$\rho(c, y)$	0.8	0.9	1.0	0.9
$\rho(tb/y, y)$	-0.1	-0.6	-0.3	-0.5
$\rho(r^F - r^{*F}, y)$	-0.5	-0.9	-0.9	-0.9
$\rho(r^L - r^{*L}, y)$	-0.2	-0.9	-0.9	-0.2
$\rho(\pi, y)$	-0.1	-0.2	-0.1	-0.2
$\rho(b^F/y, y)$	-0.0	0.0	-0.9	-0.1
$\rho(b^L/y, y)$	-0.1	-0.3	-0.1	-0.2
$\rho(b^F/y, b^L/y)$	-0.9	-0.9	0.4	-0.7

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<sup>a</sup> Long-term statistics are annualized.

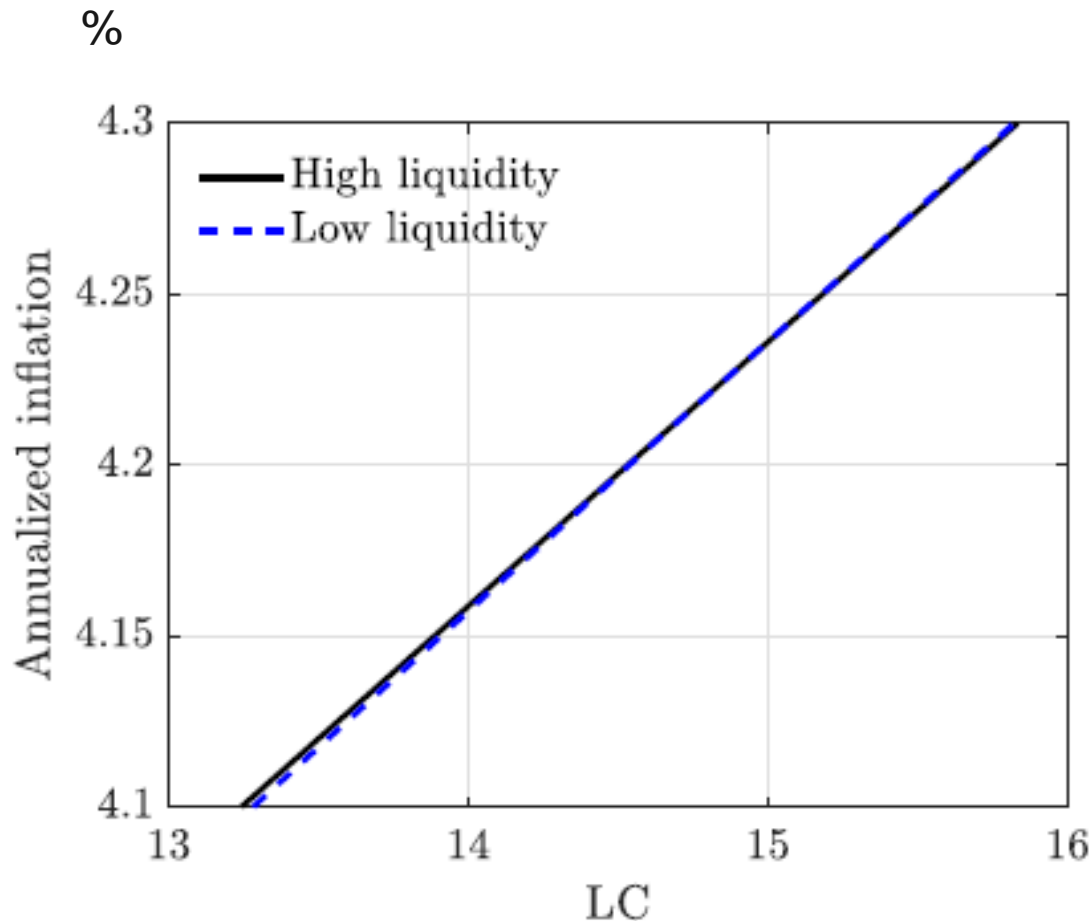
<sup>b</sup>  $\sigma(k)$  denotes the standard deviation of a variable  $k$ .  $\rho(k, l)$  denotes the correlation coefficient between variables  $k$  and  $l$ .



# A larger stock of domestic currency debt reinforces the sovereign's inflation bias

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Note: Decision rule for currency depreciation (in annualised percentage terms) as a function of the state of liquidity and outstanding LC debt, while fixing outstanding FC debt at its average over simulations.