Safe Assets in Emerging Market Economies

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Introduction

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  - Exchange rates (Jiang et al. (2021), Engel and Wu (2023)).
  - Channel of unconventional monetary policy (Del Negro et al. (2017), Krishnamurthy (2023)).
  - Drivers of global financial flows (Kekre and Lenel (2023)).

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- In the past $\sim$ 20 years, some EMEs have deepened the local-currency sovereign debt market and have substantially improved their credit ratings.

- **Does local-currency sovereign debt in Emerging Markets carry this convenience yield? What are their properties as Safe Assets?** Relevance

Preview

1. Derivation and estimation of convenience yields (CYs) in 9 EMEs, under two measures:
   - **Domestic investors**: portfolio of domestic private assets and measures returns in local currency.
   - **Global investors**: portfolio of dollar/local assets and measures returns in dollars.
   - I find a sizeable average CY under both (33 and 59 bps).

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2. Empirics: panel regressions with CYs on the left-hand side of the regression.
   - They respond to proxies for safety and liquidity demand.
   - Dollar-CYs respond **negatively** during episodes of high global uncertainty.
   - Drop not explained by higher credit risk or risk premia, but by a switch in investors' preferences.

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   - Drop not explained by higher credit risk or risk premia, but by a switch in investors' preferences.
3. I set up a 2-country model (SOE-limit) where a foreign and a local sovereign bond work as collateral to show:
   - Connection with macroeconomic variables.
   - Shocks to the demand for safety have markedly different effects than interest rate shocks.

Literature

- Convenience yields in sovereign bonds: Krishnamurthy and Vissing-Jorgensen (2012), Du, Im, and Schreger (2018), Jiang, Krishnamurthy, and Lustig (2021), Jiang et al. (2021), Diamond and Van Tassel (2023).
- Currency denomination of sovereign debt in EMEs: Engel and Park (2022), Hale, Jones, and Spiegel (2020), Ottonello and Pérez (2019), Onen, Shin, and von Peter (2023).
- Safe assets and global financial flows: Brunnermeier and Sannikov (2019), Jiang, Krishnamurthy, and Lustig (2019), Kekre and Lenel (2021).
- Safe asset shortages: Caballero, Farhi, and Gourinchas (2016, 2017), Brunnermeier et al. (2020), Mendoza and Quadrini (2023).

A Simple Asset Pricing Model: Domestic investor d

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- An endowment economy where investor derives utility from holding bonds of country j

$$E \sum_{t=1}^{\infty} \beta^t u(c_t + v_d(\underbrace{\theta_t^M}_{\text{Money}} + \underbrace{\kappa_t^{T,d}\theta_t^T}_{\text{Gov. bonds}} + \underbrace{\kappa_t^{P,d}\theta_t^P}_{\text{Private substitutes}} ; \text{GDP}_t)) \tag{1}$$

where $v_d' > 0$, $v_d'' < 0$, and $\lim_{\theta_t^d/\text{GDP}_t \to \infty} v_d'(\cdot) = 0$.

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- The Euler equation for holdings of 1-period sovereign bonds, θ_t^T, with L_t^T the expected default loss:

$$\begin{aligned} P_t^T &= E_t[M_{t+1}\Lambda_t^{T,d}(1-L_t^T)] \\ &= E_t[M_{t+1}] \times E_t[\Lambda_t^{T,d}] \times E_t[(1-L_t^T)] \times (1 + cov(\Lambda_t^{T,d},(1-L_t^T))) + cov(M_{t+1},\Lambda_t^{T,d}(1-L_t^T)) \end{aligned}$$

where $\Lambda_t^{T,d} \equiv 1/(1-\kappa_t^{T,d}v_d'(\cdot))$ are marginal conv. benefits of investor d of holding sov. bonds.

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- In logs, $y_t^T \approx y_t^{rf} - \lambda_t^{T,d} + l_t^T - \xi_t^{T,d}$

Data and Summary statistics

- The spread wrt a private asset with lower convenience services, y_t^p (interbank loans, term deposits):

$$y_t^p - y_t^T \approx \underbrace{(\lambda_t^{T,d} - \lambda_t^{p,d})}_{\text{Diff. CY}} + \underbrace{(l_t^p - l_t^T)}_{\text{Diff. default risk}} + (\xi_t^{T,d} - \xi_t^{p,d}) \tag{2}$$

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- For the 1-year maturity (daily data from 12/2007-3/2021) for Colombia, Chile, Indonesia, Mexico, South Africa, and Turkey:

Country	mean	std
EME conv yield	59.2	35.05

Notes: daily frequency. Sample ends on March 9, 2021.
Mean and std are calculated from 1/1/10 onwards.

Domestic Assets Time Series By Country

A Simple Asset Pricing Model: Foreign investor f

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- The dollar asset is a non-Treasury safe dollar bond. Its yield is given by:

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- EME asset is a synthetic dollar bond: an EME LC sovereign bond with its cash flows swapped into dollars via a forward contract. The additional risks it faces are:
  - Regulatory risks, k_t.
  - Currency depreciation in default, q_t^T, or controls imposition, p_t.

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- The yield decomposition gives:

$$\underbrace{y_t^T}_{\text{LC yield}} - \underbrace{\rho_t}_{\text{Fwd premium}} \approx y_{rf,t}^{US} - \underbrace{\lambda_t^{T,f}}_{\text{CY}} + \underbrace{(l_t^T - q_t^T) + (k_t - p_t)}_{\text{Credit + reg. risk}} - \xi_t^{T,f} - \ldots \tag{4}$$

A Simple Asset Pricing Model: Foreign investor

- The spread between the two is:

$$\underbrace{y_t^{US} - (y_t^T - \rho_t)}_{\text{CIP deviation}} = \underbrace{\lambda_t^{T,f} - \lambda_t^{US,f}}_{\text{EME convenience yield}} + \underbrace{(l_t^{US} - l_t^T)}_{\text{Differential default risk}} - \underbrace{(k_t}_{\text{Regulatory risk}} \underbrace{-q_t^T - p_t - (\xi_t^{US,f} - \xi_t^{T,f}) - \dots)}_{\text{Covariances}} \tag{5}$$

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- To approximate the terms in red, I use the spread between:
  - Foreign currency bond issued under international law...
  - and the currency-hedged local-currency bond issued under domestic law.

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- To approximate the terms in red, I use the spread between:
  - Foreign currency bond issued under international law...
  - and the currency-hedged local-currency bond issued under domestic law.

- The spread captures (1) the regulatory risk of domestic law, and (2) currency covariances Formally

Data and Summary statistics

- The spread between the two gives:

$$y_t^{US} \quad - \quad (y_t^T - \rho_t) \quad = (\lambda_t^{T,f} - \lambda_t^{US,f}) + (l_t^{US} - l_t^T) - \text{Foreign/dom. spread}$$

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$$\underbrace{y_t^{US}}_{\text{US bonds}} - \underbrace{(y_t^T - \rho_t)}_{\text{Du et al. (2018)}} = \underbrace{(\lambda_t^{T,f} - \lambda_t^{US,f})}_{\text{Diff. CY}} + \underbrace{(l_t^{US} - l_t^T)}_{\text{CDS data}} - \underbrace{\text{Foreign/dom. spread}}_{\text{Bloomberg}}$$

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- What is y_t^{US}? US Agency, AAA Corporate, or BBB Corporate bonds indices.
- EMEs: Data available for 9 countries: Brazil, Colombia, Chile, Indonesia, Mexico, Peru, Philippines, South Africa, and Turkey.
- For the 5-year maturity (daily data from 12/2007-3/2021):

	(1)	(2)
Country	mean	std
EME conv yield	32.9	17.05
US	45.6	12.51

Notes: daily frequency. Sample ends on March 9, 2021.
Mean and std are calculated from 1/1/10 onwards.

Full Table | Time series | US Treasury premium

Robustness Checks

1. Eurobonds See
   - Bonds in local currency issued under international law (no regulatory risk!).
2. Illiquidity of forward contracts See
   - Liquidity premium could come from shorting the swap contract.
3. Market segmentation See
   - Local investors holding local-currency bonds, and foreigners holding foreign-currency bonds.
   - Local investors participate under domestic law, and foreigners participate under foreign law.

The Role of Safety/Liquidity

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- In the model, $CY_t^i = \lambda_t^{T,i} - \lambda_t^{P,i} = (\kappa_t^{T,i} - \kappa_t^{P,i}) v'(\theta_t^i / \mathrm{GDP}_t^i)$ for $i \in \{d, f\}$

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- In the model, $CY_t^i = \lambda_t^{T,i} - \lambda_t^{P,i} = (\kappa_t^{T,i} - \kappa_t^{P,i})v'(\theta_t^i/\text{GDP}_t^i)$ for $i \in \{d, f\}$
- Estimate panel regressions of the form:

$$cy_{i,t} = \beta_1 \underbrace{(\text{Gov. Debt/GDP})_{i,t-1}}_{\text{Proxy for supply of safe assets}} + \beta_2 \underbrace{i^{MP}_{i,t-1}}_{\text{Proxy for price of money}} + \beta_3 \underbrace{X_{i,t-1}}_{\text{controls}} + c_i + \tau_t + \epsilon_{i,t} \tag{6}$$

- where:
  - β_1 is the slope of demand for safety/liquidity.
  - i_i^{MP}: monetary policy rate (hikes reduce the supply of "money").
  - c_i, τ_t: country and year fixed effects.
  - Controls: Risk premia: the slope of the yield curve or the output gap.

Results
Credit risk

	Dep. var.: dollar CY	Dep. var.: domestic CY
	(1)	(4)
Local MP rate$_{t-1}$	0.867*	10.51***
	(0.509)	(1.486)
U.S. MP rate$_{t-1}$	11.66***	1.649
	(3.269)	(9.517)
$\log(\frac{\text{Local gov debt}}{GDP_{local}})_{t-1}$	14.33*	-31.73***
	(8.018)	(10.50)
$\log(\frac{\text{U.S. gov debt}}{GDP_{US}})_{t-1}$	-131.0***	119.4
	(39.74)	(87.53)
slope$_{local,t-1}$		
slope$_{US,t-1}$		
Output gap$_{t-1}$		
Constant	-297.0***	20.2
	(71.78)	(127.9)
Observations	1,137	955
R-squared	0.670	0.324

Results

Credit risk

	Dep. var.: dollar CY		Dep. var.: domestic CY	
	(1)	(2)	(4)	(5)
Local MP rate$_{t-1}$	0.867*	1.209	10.51***	8.468***
	(0.509)	(0.741)	(1.486)	(3.182)
U.S. MP rate$_{t-1}$	11.66***	7.878**	1.649	-6.917
	(3.269)	(3.144)	(9.517)	(13.30)
$\log(\frac{\text{Local gov debt}}{GDP_{local}})_{t-1}$	14.33*	11.07	-31.73***	-31.65***
	(8.018)	(7.719)	(10.50)	(9.284)
$\log(\frac{\text{U.S. gov debt}}{GDP_{US}})_{t-1}$	-131.0***	-132.2***	119.4	97.37
	(39.74)	(36.78)	(87.53)	(104.3)
slope$_{local,t-1}$		1.350		-9.233
		(1.611)		(7.818)
slope$_{US,t-1}$		-3.407		-9.810
		(3.683)		(11.97)
Output gap$_{t-1}$				
Constant	-297.0***	-300.3***	20.2	24.91
	(71.78)	(64.91)	(127.9)	(140)
Observations	1,137	1,103	955	906
R-squared	0.670	0.681	0.324	0.338

Results

Credit risk

	Dep. var.: dollar CY			Dep. var.: domestic CY		
	(1)	(2)	(3)	(4)	(5)	(6)
Local MP $rate_{t-1}$	0.867*	1.209	0.482	10.51***	8.468***	10.46***
	(0.509)	(0.741)	(0.485)	(1.486)	(3.182)	(1.464)
U.S. MP $rate_{t-1}$	11.66***	7.878**	9.501**	1.649	-6.917	2.033
	(3.269)	(3.144)	(4.701)	(9.517)	(13.30)	(9.394)
$\log(\frac{\text{Local gov debt}}{GDP_{local}})_{t-1}$	14.33*	11.07	-0.727	-31.73***	-31.65***	-31.79***
	(8.018)	(7.719)	(10.507)	(10.50)	(9.284)	(10.51)
$\log(\frac{\text{U.S. gov debt}}{GDP_{US}})_{t-1}$	-131.0***	-132.2***	-152.8***	119.4	97.37	119.1
	(39.74)	(36.78)	(56.49)	(87.53)	(104.3)	(87.60)
$slope_{local,t-1}$		1.350			-9.233	
		(1.611)			(7.818)	
$slope_{US,t-1}$		-3.407			-9.810	
		(3.683)			(11.97)	
Output gap_{t-1}			16.68**			-7.285
			(6.559)			(11.12)
Constant	-297.0***	-300.3***	-317.9***	20.2	24.91	19.75
	(71.78)	(64.91)	(105.1)	(127.9)	(140)	(128.0)
Observations	1,137	1,103	833	955	906	955
R-squared	0.670	0.681	0.699	0.324	0.338	0.324

CYs and the Global Financial Cycle
Event studies

	Dep. var.: dollar CY	Dep. var.: domestic CY
	(1)	(5)
Previous regressors	Y	Y
vix_{t-1}	-1.015***	0.744
	(0.299)	(0.485)
Capital inflows	N	N
Risk premia	N	N
ToT	N	N
Political risk	N	N
Observations	1,137	955
R-squared	0.692	0.325

CYs and the Global Financial Cycle

Event studies

	Dep. var.: dollar CY		Dep. var.: domestic CY	
	(1)	(2)	(5)	(6)
Previous regressors	Y	Y	Y	Y
vix_{t-1}	-1.015***	-0.857***	0.744	0.508
	(0.299)	(0.260)	(0.485)	(0.588)
Capital inflows	N	N	N	N
Risk premia	N	Y	N	Y
ToT	N	N	N	N
Political risk	N	N	N	N
Observations	1,137	1,103	955	906
R-squared	0.692	0.697	0.325	0.338

CYs and the Global Financial Cycle

Event studies

	Dep. var.: dollar CY			Dep. var.: domestic CY		
	(1)	(2)	(3)	(5)	(6)	(7)
Previous regressors	Y	Y	Y	Y	Y	Y
vix_{t-1}	-1.015***	-0.857***	-0.860***	0.744	0.508	0.562
	(0.299)	(0.260)	(0.255)	(0.485)	(0.588)	(0.579)
Capital inflows	N	N	Y	N	N	Y
Risk premia	N	Y	Y	N	Y	Y
ToT	N	N	N	N	N	N
Political risk	N	N	N	N	N	N
Observations	1,137	1,103	1,103	955	906	906
R-squared	0.692	0.697	0.705	0.325	0.338	0.352

CYs and the Global Financial Cycle

Event studies

	Dep. var.: dollar CY				Dep. var.: domestic CY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Previous regressors	Y	Y	Y	Y	Y	Y	Y	Y
vix_{t-1}	-1.015***	-0.857***	-0.860***	-1.123***	0.744	0.508	0.562	0.710
	(0.299)	(0.260)	(0.255)	(0.407)	(0.485)	(0.588)	(0.579)	(0.525)
Capital inflows	N	N	Y	N	N	N	Y	N
Risk premia	N	Y	Y	N	N	Y	Y	N
ToT	N	N	N	Y	N	N	N	Y
Political risk	N	N	N	Y	N	N	N	Y
Observations	1,137	1,103	1,103	1,012	955	906	906	871
R-squared	0.692	0.697	0.705	0.713	0.325	0.338	0.352	0.428

Analysis of Two Exogenous Shocks

- Gain insight by analyzing two arguably exogenous shocks to EMEs.

- Taper Tantrum: triggered by Bernanke's speech in May 2013 that signaled the end of LSAPs.
  - Reduction in the supply of dollar liquidity.
  - Hikes in interest rates.

- Covid-19: exogenous shock (at least for March-June 2020) that involved a **global flight to safety**.
  - Dash for cash.
  - Increase in price of short-term U.S. Treasury Bills.

Results for Taper Tantrum

Dep. var: $cy_{i,t}$	(1)	(2)	(3)	(4)
Non-interacted regressors	Yes	Yes	Yes	Yes
TT_{t-1}	4.875***	2.972		
	(1.348)	(2.778)		
$\text{MP rate}_{t-1} \times \text{TT}$		2.030***		
		(0.524)		
$\log(\frac{\text{US debt to GDP}}{\text{Local Debt to GDP}})_{t-1} \times \text{TT}$		0.682*		
		(0.366)		
$\text{vix}_{t-1} \times \text{TT}$		-0.783**		
		(0.379)		
$\text{slope}_{local,t-1} \times \text{TT}$		0.413		
		(1.551)		
Constant	46.92**	49.41***	47.11**	51.79**
	(18.32)	(18.55)	(18.60)	(19.70)
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Lagged dep. var.	Yes	Yes	Yes	Yes
Observations	1,091	1,091	1,091	1,091
R-squared	0.838	0.839	0.841	0.846

Results for Covid shock

Dep. var: $cy_{i,t}$	(1)	(2)	(3)	(4)
Non-interacted regressors	Yes	Yes	Yes	Yes
Covid-19$_{t-1}$			-18.92***	-21.84***
			(5.908)	(5.517)
MP rate$_{t-1}$ $\times$ Covid-19				-1.830
				(1.513)
$\log(\frac{\text{US debt to GDP}}{\text{Debt to GDP}})_{t-1}$ $\times$ Covid-19				-2.358***
				(0.601)
vix$_{t-1}$ $\times$ Covid-19				0.570*
				(0.288)
slope$_{local,t-1}$ $\times$ Covid-19				3.108
				(1.930)
Constant	46.92**	49.41***	47.11**	51.79**
	(18.32)	(18.55)	(18.60)	(19.70)
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Lagged dep. var.	Yes	Yes	Yes	Yes
Observations	1,091	1,091	1,091	1,091
R-squared	0.838	0.839	0.841	0.846

Recap

- Local-currency sovereign bonds in EMEs carry a convenience yield.
- This convenience yield comes from non-pecuniary services related to their safety or liquidity.
- For global investors, the convenience yield drops during episodes of high global uncertainty.
- This drop is not explained by the rise in credit risk or the rise in risk premia but by a switch in preferences towards global safe assets.

Model: Goal and Main Ingredients

Goal: characterize the effects of safety shocks on EME´s macroeconomic variables.

Ingredients:

1. SOE-limit of the 2-country model extended to include demand for safe assets (that serve as collateral).
2. Two safe assets available: local and foreign sovereign bonds.
3. Safety shock: increase in demand for safe assets (collateral) + higher collateral quality of U.S. sovereign bond.

Model: EME ($\in [0, n)$) and the US*($\in (n, 1]$)

$$\mathbb{U}_t = E_t \sum_{i=0}^{\infty} \beta^i \left(\frac{C_{t+i}^{1-\gamma}}{1-\gamma} - \frac{L_{t+i}^{\eta}}{\eta} \right)$$

$$C_t = \left[(1-\omega)^{\frac{1}{\theta}} C_{D,t}^{\frac{\theta-1}{\theta}} + \omega^{\frac{1}{\theta}} C_{F,t}^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

$$P_t = \left[(1-\omega) P_{D,t}^{1-\theta} + \omega P_{F,t}^{1-\theta} \right]^{\frac{1}{1-\theta}}$$

$$C_t + \frac{q_t^b}{\mathcal{E}_t} b_t + \frac{q_t^T}{\mathcal{E}_t} b_t^{g*} + p_t^b b_t^g \leq \frac{1}{\mathcal{E}_t} b_{t-1} + \frac{1}{\mathcal{E}_t} b_{t-1}^{g*} + b_{t-1}^g + w_t L_t$$

SOE limit: $\omega^* \to 1$ and $n \to 1$

Model: Demand for Safety

- Three bonds in this model: one that smoothes consumption and two sovereign bonds that serve as collateral.

- Households face an endogenous collateral constraint:

$$\frac{q_t^b}{\mathcal{E}_t} b_t \geq -(\kappa_t^* q_t^{UST} b_t^{g*} + \kappa_t p_t^{EME} b_t^g) \tag{7}$$

  where U.S. sovereign bond collateral quality, κ_t^*, follows exogenous processes.

- The expected excess returns are given by:

$$E[R_{t+1}^{EME} - (\mathcal{E}_t/\mathcal{E}_{t+1})R_{t+1}^{UST}] = R_{t+1}^{UST} \frac{cov(\lambda_{t+1}/\lambda_t, \mathcal{E}_t/\mathcal{E}_{t+1})}{E[\lambda_{t+1}/\lambda_t]} + \frac{\mu_t(\kappa_t^* - \kappa_t)}{E[\lambda_{t+1}/\lambda_t]} \tag{8}$$

$$E[(\mathcal{E}_t/\mathcal{E}_{t+1})R_{t+1} - R_{t+1}^{EME}] = -R_{t+1} \frac{cov(\lambda_{t+1}/\lambda_t, \mathcal{E}_t/\mathcal{E}_{t+1})}{E[\lambda_{t+1}/\lambda_t]} + \frac{\mu_t(\kappa_t - 1)}{E[\lambda_{t+1}/\lambda_t]} \tag{9}$$

Firms Gov Equilibrium

Model: Safety Shock

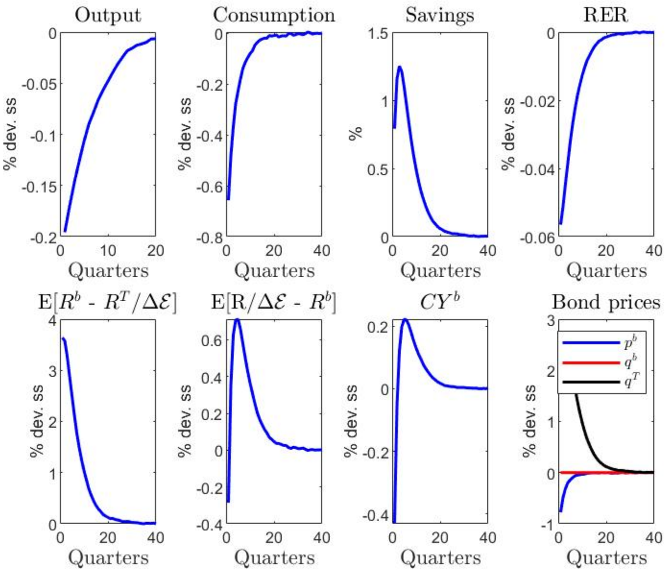
- A safety shock involves two things happening at the same time.
  - First, an increase in the demand for collateral and,
  - second, a particular preference for the foreign sovereign bond.
- In the model, the first is achieved through a negative productivity shock in the US, which reduces the supply of sovereign bonds by the US government and lowers the world interest rate.
- The second is captured by a concurrent increase in the collateral quality of the US sovereign bond, κ_t^*.
- In particular, this parameter follows an AR(1) process whose statistical moments are calibrated to match the empirical U.S. Treasury conv. yield,

$$\log \kappa_t = (1 - \rho^s) \log \kappa + \rho^s \log \kappa_{t-1} + \sigma^s \epsilon_t^s \tag{10}$$

Calibration

IRFs: Safety shock

Quant. analysis



Conclusions

- Estimated convenience yields of local-currency EME's sovereign bonds (from global and local investors).
- Unlike Advanced Economies, the global convenience yield responds negatively to global uncertainty. There is a switch in preferences away from EME bonds.
- Shocks to demand for safety have different effects than interest rate or risk premium shocks.
- Open questions remaining:
  - What feature exactly makes an asset "safe"?
  - Implications for fiscal policy...
  - ... and unconventional monetary policy.

Relevance

- **Relevance**: Local-currency now represents the lion's share of outstanding sovereign bonds in EMEs (Hofmann et al., 2020; Du and Schreger, 2022).

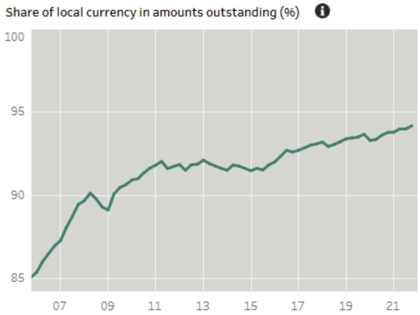
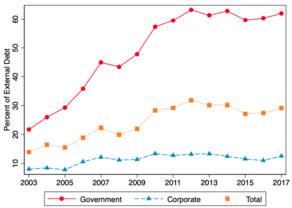


Figure 1: Average Share of External Debt in Local Currency



Notes: This figure plots the cross-country average of the share of external debt in local currency by sector. Each country is equally weighted. All data is by nationality.

- Foreign participation in local-currency debt has also grown in the past 20-years.

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Domestic Assets

Country	Asset
Chile	Nominal average interbank rate 360 days
Colombia	Time deposits of banks yield curve
Indonesia	Unsecured interbank loan
Mexico	Certificate of Deposits 9 month
South Africa	Interbank agreed rate 12 months
Turkey	Interbank unsecured loan

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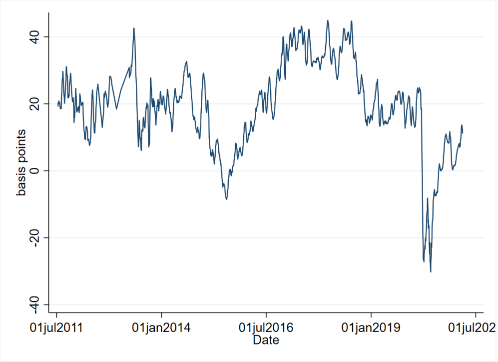
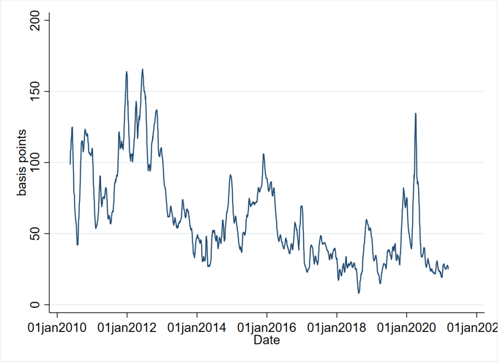
Domestic Convenience Yields: Examples

(a) Mexico



(b) Chile



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Domestic Convenience Yields: Stats by Country

Country	(1) Sample starts	(2) Mean	(3) Std
Brazil	n.a.	n.a.	n.a.
Chile	May 2010	60.63	33.42
Colombia	June 2005	53.72	64.76
Indonesia	February 2003	85.03	56.74
Mexico	July 2011	19.26	14.1
Peru	n.a.	n.a.	n.a.
Philippines	n.a.	n.a.	n.a.
South Africa	April 2000	66.6	47.24
Turkey	October 2006	73.45	101.17

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Covered Interest Parity deviation wrt to U.S. Treasuries

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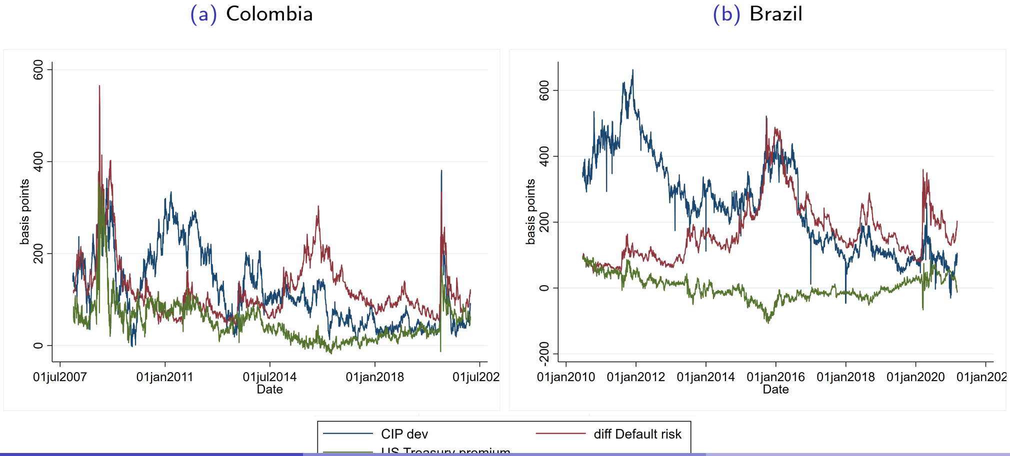
$$\underbrace{y_t^j - \rho_{j,t} - y_t^{UST}}_{\text{CIP deviation}} = \underbrace{(l_t^j - l_t^{UST})}_{\text{Diff. default risk}} + \underbrace{\lambda_t^{UST} - \lambda_t^{j,i}}_{\text{US Treasury premium}} + \underbrace{\text{Other}_t^j}_{\text{other}}$$



Summary statistics

Country	Sample starts	(1) mean	(2) std
Brazil	June 2010	62.83	28.76
Colombia	December 2007	24.09	25.99
Mexico	December 2007	40.63	23.72
Peru	December 2007	39.40	27.89
Turkey	December 2007	-3.42	25.32
Chile	April 2011	43.72	25.11
Indonesia	February 2015	29.06	15.1
Philippines	December 2007	34.55	27.71
South Africa	June 2014	23.62	36.63
US	February 2006	40.95	12.39

Notes: daily frequency. Sample ends on March 9, 2021.
Mean and std are calculated from 1/1/10 onwards.

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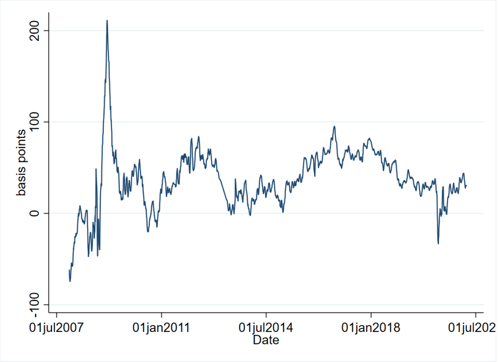
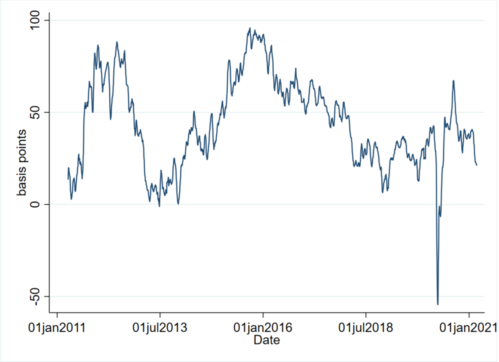
Convenience yields

(a) Mexico



(b) Chile



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Regulatory risk + covariances

- For the terms in red: The yield of an EME sovereign bond in dollars and issued in a foreign jurisdiction:

$$\hat{y}_t^T \approx y_{rf,t}^{US} - \hat{\lambda}_t^{T,f} + \hat{l}_t^T$$

- Consider the spread wrt the synthetic bond:

$$\begin{aligned}\Phi_t^{FC} &\equiv y_t^T - \rho_t - \hat{y}_t^T \\ &\approx (\hat{\lambda}_t^{T,f} - \lambda_t^{T,f}) + (l_t^T - \hat{l}_t^T - q_t^T) + (k_t - p_t) - \xi_t^{T,f} - \psi_t^{T,f}\end{aligned}$$

- which is equal to terms in red (except for the term $\xi_t^{US,f}$) provided $\hat{l}_t^T \approx l_t^T$ and $\hat{\lambda}_t^{T,f} \approx \lambda_t^{T,f}$

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Example: Brazil

Figure: Local vs. Foreign jurisdiction spread for Brazil

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Eurobonds

These bonds are governed under international law, settled in U.S. dollars, and therefore free of capital control, convertibility restrictions, and other regulatory risks imposed by the EME government.

Table: Share of total LC-bonds outstanding issued in international markets

Country	Mean	Max
Brazil	0.5%	0.9% (Dec. 2007)
Chile	2.4%	4.8% (Dec. 2021)
Colombia	3.6%	6.1% (Dec. 2007)
Peru	35.4%	47.5% (Dec. 2019)
Philippines	3.3%	4.3% (Dec. 2021)

Notes: annual frequency for 2004-2021. Share calculated with outstanding values at the end of each year. Column 3 shows the year in which the maximum share was achieved.

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Liquidity of Forward Contracts

The swapped local-currency bond carries a liquidity premium from shorting the swap contract, not from the actual bond.

Correction is calculated as half the bid-ask spread of cross-currency swaps minus the bid-ask spread of the local-currency sovereign bond.

Table: Correction (in bps) to dollar CYs due to illiquidity of forward markets

Country	Correction (bps)
Brazil	-26
Colombia	-7
Indonesia	-22
Mexico	2
Peru	-6
Philippines	-9
Turkey	1

Notes: data come from Du and Schreger (2016), Table IA.II.

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Market segmentation

Marginal investor in local currency bonds is a foreigner. Onen et al. (2023) show that most of the increase in foreign ownership has been through the *domestic* market.

Table: Share of total LC-bonds owned by foreigners

Country	$\frac{\text{LC owned by foreigners}}{\text{Total LC bonds}}$	$\frac{\text{LC owned by foreigners}}{\text{Total foreigners portfolio}}$
Brazil	8%	65%
Chile	9%	29%
Colombia	16%	36%
Indonesia	27%	49%
Mexico	24%	51%
Peru	40%	36%
South Africa	27%	71%
Turkey	16%	42%

Notes: quarterly frequency for 2005-2021. Data comes from the BIS and only considers bonds with one year or more maturity.

Results for credit risk on the left-hand side

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Table: Determinants of Credit Risk (5-Year Sovereign Bond)

Dep. var: $cds_{i,t}$	(1)	(2)	(3)	(4)	(5)
MP rate_{t-1}	11.94***	11.48***	11.65***	11.70***	6.214***
	(1.410)	(1.377)	(1.404)	(1.413)	(1.924)
$\log(\frac{\text{US debt to GDP}}{\text{Debt to GDP}})_{t-1}$	-8.027	-4.336	-8.776	-9.849	-30.78**
	(16.09)	(14.86)	(16.37)	(16.47)	(12.11)
US fed funds_{t-1}	-14.66**	-11.31	-13.86*	-14.09*	-11.77
	(7.115)	(7.349)	(7.149)	(7.177)	(7.894)
vix_{t-1}	4.575***	4.352***	4.429***	4.339***	4.271***
	(0.420)	(0.456)	(0.421)	(0.442)	(0.520)
$(\frac{DebtInfl}{GDP})_{t-1}$		-26.84***			-21.75***
		(6.746)			(7.064)
$(\frac{EqtInfl}{GDP})_{t-1}$		-30.39*			-13.49
		(15.58)			(14.77)
$(\frac{GovdebtInfl}{GDP})_{t-1}$			-6.065*	-6.690**	
			(3.167)	(3.198)	
$(\frac{BankdebtInfl}{GDP})_{t-1}$			-8.105**	-7.921**	
			(3.154)	(3.151)	
$(\frac{CorpdebtInfl}{GDP})_{t-1}$			-3.961*	-3.982*	
			(2.142)	(2.121)	
Terms of Trade				-241.4	-196.4
				(189.7)	(165.3)
Diff. Inflation					8.440***
					(2.229)
Democratic risk					-1.152
					(7.117)
Constant	-1.286	-28.20	-7.972	1,110	1,058
	(88.08)	(86.53)	(91.53)	(875.5)	(746.5)
Observations	1,338	1,338	1,338	1,338	1,213

Event studies

- Use event studies to circumvent possible endogeneity.
- Estimate regression of the form (see Hanson and Stein, 2015):

$$\Delta cy_{i,t} = c_i + \tau_t + \gamma \times MPM_t^i + \beta \times MPM_t^{US} + \delta \times RP_t + \epsilon_{i,t} \quad (11)$$

where

- MPM_t^{US} is the change in the 2-year U.S. Treasury yield between the closing of the business day before and the day after each monetary policy meeting of the U.S. Federal Reserve.
- MPM_t^i is the analogous variable for local monetary policy.
- RP_t is a global risk-on event (VIX has a daily variation larger than two standard deviations).

Event studies

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Table: Determinants of Conv. yields - Event studies

$\Delta cy_{i,t}$	(1)	(2)	(3)	(4)
MPM_t^i	0.185***	0.183***	0.184***	0.167**
	(0.0585)	(0.0576)	(0.0576)	(0.0694)
MPM_t^{US}	0.401*	0.403*	0.403*	0.423*
	(0.212)	(0.210)	(0.210)	(0.219)
RP_t	-1.055***	-1.074***	-1.074***	-0.280
	(0.293)	(0.286)	(0.286)	(0.252)
Constant	-1.497	-2.409	-2.313	-1.541
	(1.506)	(1.558)	(1.568)	(1.505)
Currency FE	Y	N	Y	Y
Year FE	Y	Y	Y	Y
Month FE	N	Y	Y	N
Observations	22,695	22,695	22,695	20,309
R-squared	0.007	0.009	0.009	0.004

Notes: Standard errors are double-clustered by country and year. Data are at daily frequency. Column 4 excludes crises (January 2010-December 2019). MPM^i stands for local central banks' meetings, MPM^{US} stands for US Fed's FOMC meetings. RP_t are risk-on events measured by the VIX intraday variation. *** p<0.01, ** p<0.05, * p<0.1

Model: Firms

Firms in each country choose production to maximize their total value to shareholders. In particular, a representative US firm solves

$$\max_{D^*_{t+i}} \mathbb{E}_t \sum_{i=0}^{\infty} \beta^i \frac{\lambda^*_{t+i}}{\lambda^*_t} \frac{D^*_{t+i}}{P^*_{t+i}} \tag{12}$$

s.t.

$$D^*_t = P^*_{D,t} F(A^*_t, L^*_t) - W^*_t L^*_t \tag{13}$$

where λ^*_t is the stochastic discount factor of the firms' shareholders. The firms' shareholders are US households, so $\lambda^*_t = C_t^{*-\gamma}$.
The problem of a representative firm can be rewritten in real terms as

$$\max_{L^*_{t+i}} \mathbb{E}_t \sum_{i=0}^{\infty} \beta^i \frac{\lambda^*_{t+i}}{\lambda^*_t} \left\{ p^*_{D,t+i} F(A^*_{t+i}, L^*_{t+i}) - w^*_{t+i} L^*_{t+i} \right\} \tag{14}$$

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Model: Government

- The government in each country collects lump-sum taxes and borrows from households.
- This borrowing determines the supply of sovereign bonds (for simplicity, 1-period maturity).
- I assume the government aims to keep the ratio of debt to GDP constant at some level $b^g_{ss} = b^g_t / Y_t$ ($b^{*g}_{ss} = b^{*g}_t / Y^*_t$) at all times.
- As explained in Bohn (1995), this is an example of a simple policy that stabilizes the debt-GDP ratio over time, which I consider to be representative of both countries.
- The tax rate will vary to satisfy the following budget constraints:

$$\tau_t + p^b_t b^g_{t+1} = b^g_t \tag{15}$$

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Model: Equilibrium

A sequential competitive equilibrium consists of stochastic sequences of allocations,

$$\{C^*_{D,t}, C^*_{F,t}, \chi^*_t, b^*_t, L^*_t, C_{D,t}, C_{F,t}, \chi_t, b_t, L_t\}$$

and prices,

$$\{p^*_{D,t}, p^*_{F,t}, q^T_t, q^b_t, p^b_t, p_{D,t}, p_{F,t}, q_t, \mathcal{E}_t\}$$

such that the allocations solve households' and firms' optimization problems and markets clear. Market clearing in the two goods markets requires that

$$Y^*_t = A^*_t L^{*1-\alpha}_t = C^*_{D,t} + \frac{n}{1-n} C_{F,t} \tag{16}$$

and

$$Y_t = A_t L^{1-\alpha}_t = C_{D,t} + \frac{1-n}{n} C^*_{F,t} \tag{17}$$

The non-sovereign bonds are in zero net supply, so $0 = b_t + b^*_t$.

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Calibration

Table: Externally Set Parameters

Parameter	Description	Value
β	Discount factor	0.98
γ	Risk aversion	2
η	Labor elasticity	1.846
$1-\omega$	Home bias	0.7
θ	Consumption elasticity	5
$1-\alpha$	Labor share	0.64
ρ	Productivity persistence	0.82
σ	Productivity volatility	0.0196
κ^*	Foreign collateral	1.4
κ	Local collateral	1.05
ρ^s	Safety persistence	0.4
σ^s	Safety volatility	0.29

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Quantitative analysis

- Shock to **foreign** convenience yield has a distinct effect on interest rates:

$$\text{Foreign bond: } R_t - R_t^{\$}\downarrow = CY_t^{\$}\uparrow$$

$$\text{Local bond: } R_t - R_t^{b}\uparrow = CY_t^{b}\downarrow$$

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Quantitative analysis

- Shock to **foreign** convenience yield has a distinct effect on interest rates:

$$\text{Foreign bond: } R_t - R_t^{\$}\downarrow = CY_t^{\$}\uparrow$$

$$\text{Local bond: } R_t - R_t^{b}\uparrow = CY_t^{b}\downarrow$$

- Quantitatively:

Table: Output and local interest rate volatility

	Model	No safety shocks	$\kappa = 0$
σ_Y	3.65	3.6	3.69
σ_C	1.8	1.63	2.03
σ_{R^b}	3.76	1.96	3.26

Notes: based on the simulation of 50,000 periods, dropping the first 10,000 as burn in.

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