

A Risk-Based Liquidity Theory of International Currency

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What drives **the US dollar's global dominance** of **international medium of exchange**?

- **40%** of international trades are settled by the US dollar
- ...but the US only accounts for **10%** of overall trades
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Existing general equilibrium models in international currency focus on **risk-neutral agents**

- quasi-linear utility in search-theoretic monetary models or log-linearized NK models
Lagos and Wright (2005); Zhang (2014); Muhkin (2023)
- this paper introduces **risk consideration** into monetary models
 1. **coexistence of multiple currencies and nominal exchange rate determinacy**
 2. **rationalize the global dominance of US dollar and local dominance of euro**

Empirical Analysis

Cross-Country Empirical Analysis

Time-series average data since 1995

- average trade invoicing share from [Boz et al. \(2022\)](#)
- average deposit dollar share from [Levy-Yayeti \(2006\)](#)

Independent/ dependent variable	deposit dollarization	import USD share	export USD share
Intercept	0.025	0.318***	0.217**
$\text{corr}(\Delta \log GDP_i, -\Delta \log \gamma_{us})$	-0.400***	-0.259**	-0.386**
$\text{corr}(\Delta \log GDP_i, -\Delta \log \gamma_i)$	0.175	0.084	0.074
Average inflation rate γ_i	2.00***	0.853	1.797**
US import share _i	-1.049	1.459***	-
US export share _i	1.2628*	-	1.634***
R-squared	0.4434	0.4822	0.4818
Adj. R-squared	0.3321	0.3922	0.3875

Hedging terms significantly predict the USD shares, even controlling for trade shares

Subsample Results: FTQ Effects Heightened the USD Invoicing After Crises

Independent/dependent variable	import USD share	export USD share
$corr(\Delta \log GDP_i, -\Delta \log \gamma_{us})$		
- Before 2013	-0.191	-0.211
- After 2013	-0.2596**	-0.3869**
$corr(\Delta \log GDP_i, -\Delta \log \gamma_i)$		
- Before 2013	0.015	-0.033
- After 2013	0.084	0.074

Table 1: Subsample results

The flight-to-quality to the USD invoicing after GFC and European Debt Crisis

Ito and Chin (2015); Maggiori et al. (2019)

Model

Three-Country Model Environment

The model environment is in spirit of [Lagos and Wright \(2005\)](#)

Three countries: the U.S., the eurozone, and the Latin America region (LM)

- three currencies: [dollar](#), [euro](#), and [peso](#)
- governments issue currencies and redistribute seigniorage revenue to domestic citizens.

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Agents: infinitely-lived agents

- a unit measure of atomistic buyers and of sellers in each country
- quasi-linear utility function with respect to labor supply
- uncertainty about counterparty type in trades, currency returns, and seller's income

Timing of Events (1)

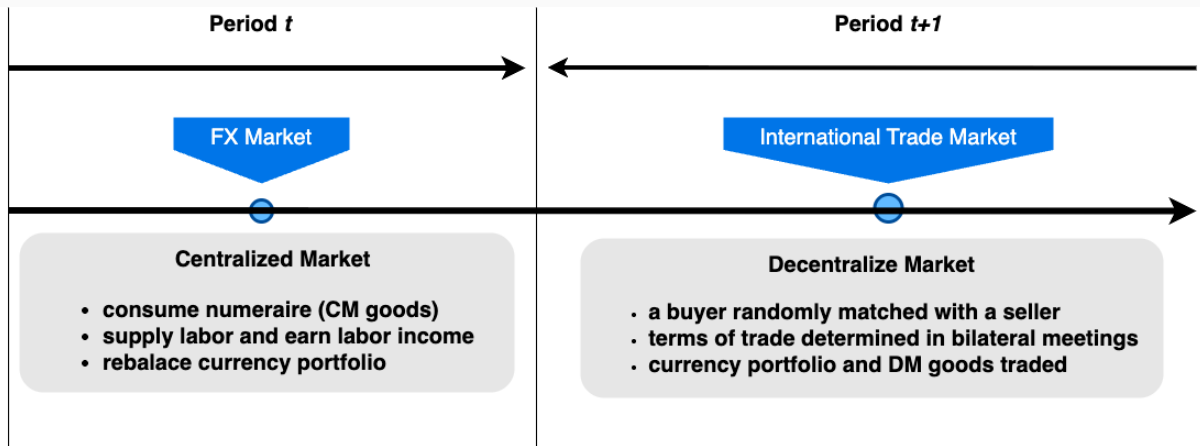


Figure 1: Representative period

Timing of Events (2)

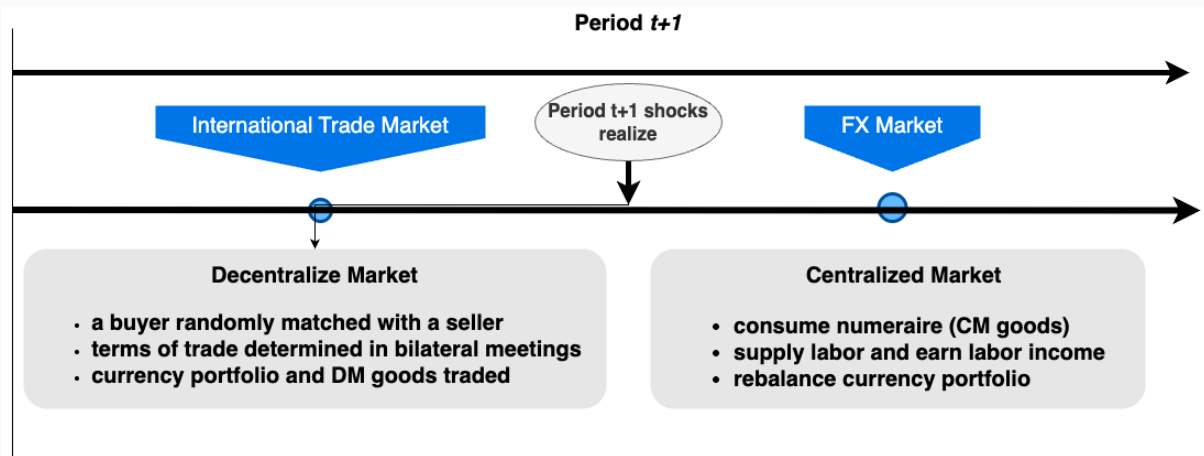


Figure 2: Representative period

Timing of Events: Decentralized Market Trading

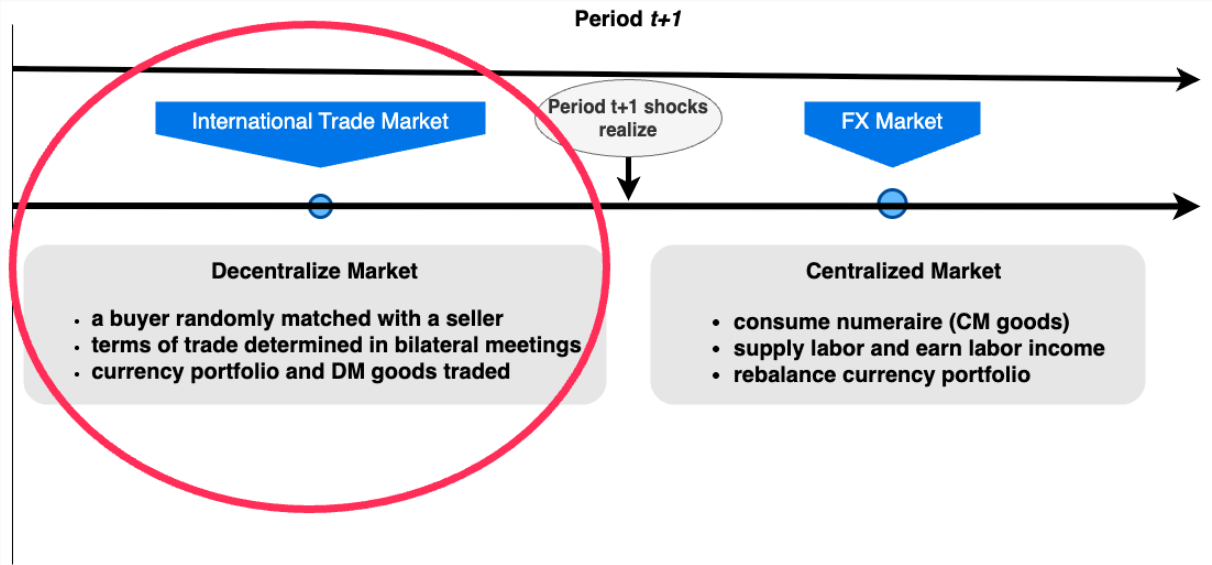


Figure 3: Representative period

Decentralized International Trade: Two-Currency Case

TIOLI offer from buyer to seller maximizes buyer's trade surplus

$$\max_{c_{t+1}, d_{\text{peso}, t+1}, d_{\text{dollar}, t+1}} \underbrace{u(c_{t+1}) - (v_{\text{peso}}^b d_{\text{peso}, t+1} + v_{\text{dollar}}^b d_{\text{dollar}, t+1})}_{\text{trade surplus}}$$

subject to

$$\underbrace{v_{\text{peso}}^s d_{\text{peso}, t+1} + v_{\text{dollar}}^s d_{\text{dollar}, t+1}}_{\text{seller's valuations of currency transfer}} = c_{t+1}, \quad (\text{seller's incentive compatibility})$$

and for each currency $c \in \{1, 2\}$

$$0 \leq d_{c, t+1} \leq q_{c, t+1}^b \quad (\text{feasibility})$$

Buyer representing households without income shocks $\theta_{t+1}^b = 1$: $c \in \{dollar, peso\}$

$$v_c^b = \underbrace{\mathbb{E}_{t+1} \gamma_{c,t+1}^{-1}}_{\text{Expected currency return}} \times \mathbb{E}_{t+1} \theta_{t+1}^b$$

Currency Valuations

Buyer representing households without income shocks $\theta_{t+1}^b = 1$: $c \in \{\text{dollar}, \text{peso}\}$

$$v_c^b = \underbrace{\mathbb{E}_{t+1} \gamma_{c,t+1}^{-1}}_{\text{Expected currency return}} \times \mathbb{E}_{t+1} \theta_{t+1}^b$$

Seller representing firms, stochastic θ_{t+1}^s :

$$v_c^s = \mathbb{E}_{t+1} \gamma_{c,t+1}^{-1} \times \mathbb{E}_{t+1} \theta_{t+1}^s + \underbrace{\text{Cov}_{t+1}(\gamma_{c,t+1}^{-1}, \theta_{t+1}^s)}_{\text{Insurance}}$$

- entrepreneurs and firms are more exposed to aggregate risk Discussion

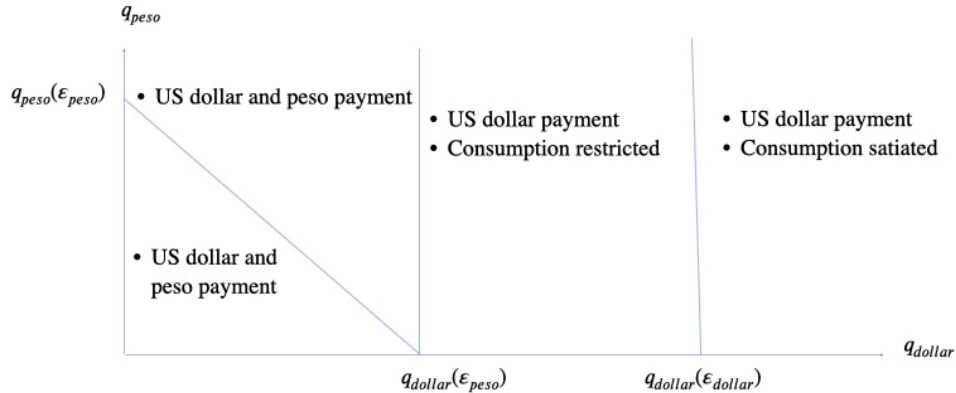
Heaton and Lucas (1996, 2000); Oskolkov and Sora (2023); Dalgic (2024)

Currency becomes more valued if it is a better hedge, $\text{Cov}_{t+1} > 0$.

Risk Exposure

Hedging Determines Endogenous Ranking of Medium of Exchange

Case: $\text{Cov}(\theta^S, \gamma_{dollar}^{-1}) > \text{Cov}(\theta^S, \gamma_{peso}^{-1}) \Rightarrow \epsilon_{dollar} < \epsilon_{peso}$



Timing of Events: Currency Portfolio Choice in CM

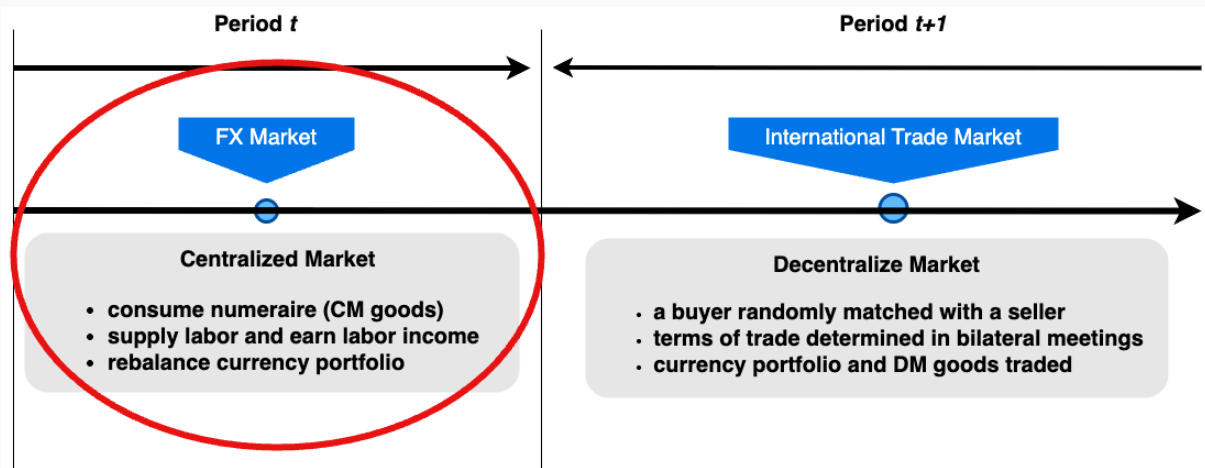


Figure 4: Representative period

Optimal currency choice:

$$1 \geq \beta v_c^b \times [1 + \lambda_{LM} \times l_{LM}^c(\mathbf{q}_t^b) + \lambda_{US} \times l_{US}^c(\mathbf{q}_t^b) + \lambda_{euro} \times l_{euro}^c(\mathbf{q}_t^b)].$$

Currency holdings are increasing in:

- expected holding return (inverse inflation): v_c^b
- meeting probabilities with sellers from country i : λ_i
- liquidity in DM: l_i^c , increasing in degree of hedging $\text{Cov}_{t+1-}(\theta_{t+1}^{S,i}, \gamma_{c,t+1}^{-1})$

Liquidity Premium

USD and euro have similar average gross holding returns: US dollar \sim euro \succ peso

- without hedging consideration, nominal exchange rate indeterminacy
Karaken and Wallace (1981)

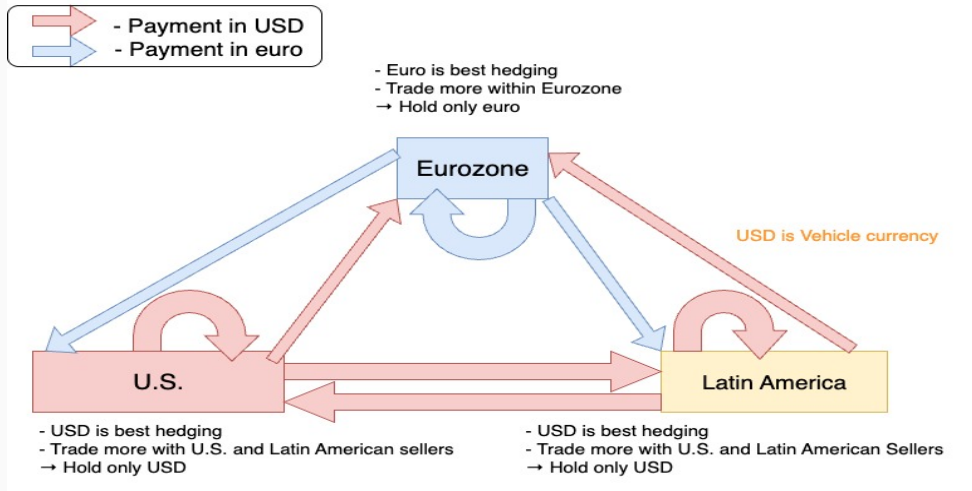
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Hedging properties determine portfolio choice and nominal exchange rate

- US seller's preferences: US dollar \succ euro \succ peso
- Euro seller's preferences: euro \succ US dollar \succ peso
- Latin American seller's preferences: US dollar \succ euro \succ peso

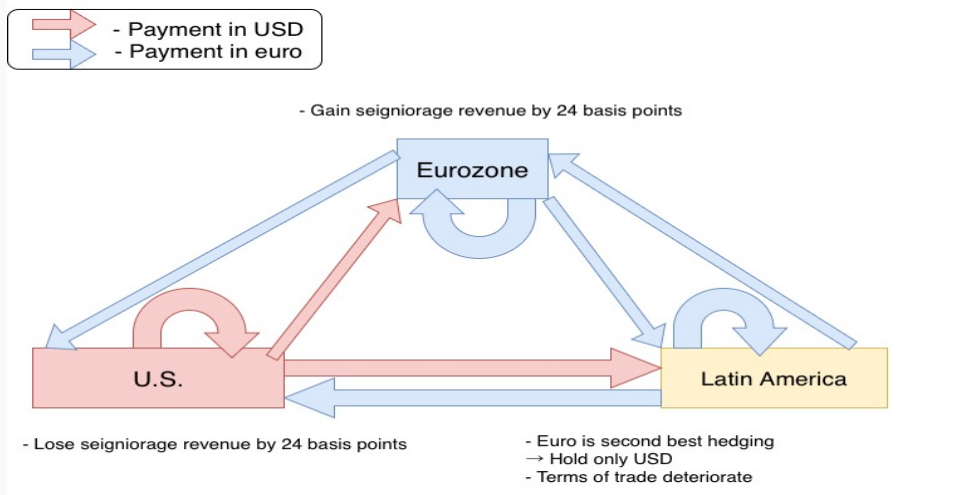
Model Replicates Key Empirical Patterns



Consistent with observed patterns in international trades

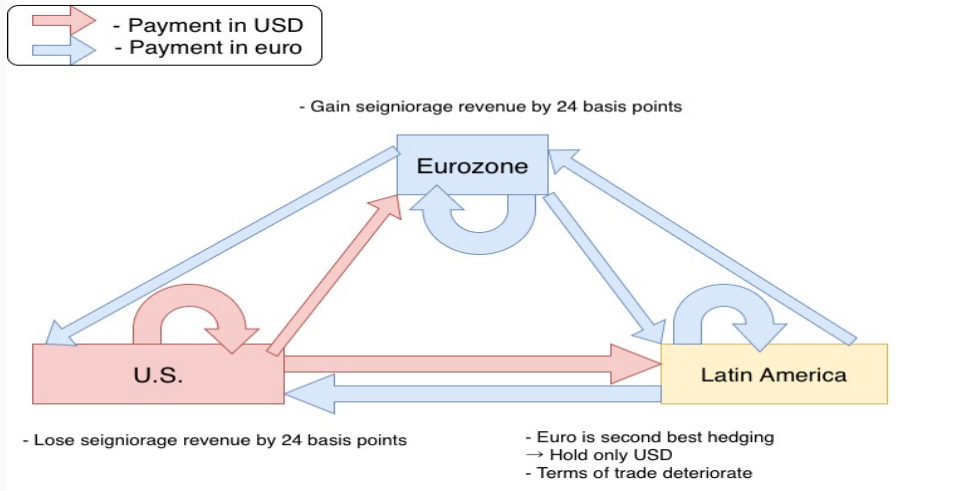
- global dominance of the US dollar as vehicle currency
- regional dominance of the euro within the eurozone

Welfare Implications of the USD invoicing dominance: Ban USD in Latin America



- baseline welfare loss incurred by Latin America = **6 basis points** in annual consumption

Welfare Implications of the USD invoicing dominance: Ban USD in Latin America



- baseline welfare loss incurred by Latin America = **6 basis points** in annual consumption
- heightened risk aversion ($\gamma = 2 \rightarrow 10$): flight to safety invoicing demand around crises
⇒ **30 basis points**

Incorporate risk into the discussion of international currency

- 2nd-order moments alter currency choice while preserving the tractability of search theory
- rationalize all the currency payment patterns: single currency and coexistence

Optimal monetary policy

- local governments' incentive to maximize the hedging property is consistent with the global planner

Welfare Decomposition

Proposition 1

Inflation rates in period $t + 1$, $\{\gamma_{c,t+1}\}_c$ affect the expected welfare of country j per capita through

$$\mathcal{W}_j = \underbrace{S_j(\mathbf{q}_{t+1}^{b,j})}_{\text{Gains from trade}} + \underbrace{\sum_{c \neq j} (\mathbb{E}_{t+1} - [\gamma_{c,t+1}^{-1}] - 1) q_{c,t+1}^{b,j}}_{\text{Foreign currency holding costs}} + \underbrace{\mathbb{E}_{t+1} - [1 - \gamma_{j,t+1}^{-1}] \sum_{c \neq j} q_{j,t+1}^{b,c}}_{\text{Seigniorage revenue from other countries}},$$

$$S_j(q_t^{b,j,t}) = \sum_i \lambda_{j,i} [u(c_{t+1}^{j,i}) - \sum_c v_c^{b,j} d_{c,t}^{j,i}].$$

The global welfare with country size $\{n_j\}_j$

$$\mathcal{W}_g = \sum_j n_j \mathcal{W}_j = \sum_j n_j S_j(q_t^{b,j,t}).$$

Global Planners' Problems

Ramsey-style optimal policy problem

- choosing the first and second-moments of currency returns $\{\gamma_{c,t+1}^{-1}\}$

Maximize the equally weighted sum of countries' welfare:

$$\mathcal{W}_g = \sum_j \mathcal{W}_j = \sum_j S_j(q_{t+1}^{b,j}).$$

This is independent of currency returns' variances.

Proposition 2: The global planner maximizes the second moments for all the currency returns and adopt the Friedman rule on average $\mathbb{E}(\gamma_{c,t+1}^{-1}) = 1/\beta$ for all c .

National Government Problems

A simple one-shot policy game played by national governments.

1. as first movers, governments simultaneously choose the first and second-moments of its own currency return
2. as second movers, private agents choose their actions

A national government j 's objective

$$\mathcal{W}_{j,t+1} = \underbrace{S_j(q_{t+1}^{b,j})}_{\text{Gains from trade}} + \underbrace{\theta^b \sum_{c \neq j} (\mathbb{E}[\gamma_{c,t+1}^{-1}] - 1) q_{c,t+1}^{b,j}}_{\text{Foreign currency holding costs}} + \underbrace{\theta^b \mathbb{E}[1 - \gamma_{j,t+1}^{-1}] \sum_{c \neq j} q_{j,t+1}^{b,c}}_{\text{Seigniorage revenue from other countries}},$$

Proposition 3: Each planner maximizes the second moments of its currency returns but might deviate from Friedman rule, $\mathbb{E}(\gamma_{c,t+1}^{-1}) < 1/\beta$

Better hedging property increases the global holdings of a national currency and seigniorage

- national government's incentive to provide hedges align with global planner
- but not with the Friedman rule, numerically

Search theory of international MoE

- theories without portfolio restrictions can determine nominal exchange rates
Nosal and Rocheteau (2011); Zhang (2014); Gormis-Porqueras et al. (2017)
- introduce unobservable characteristics and adjusting them to match the empirical patterns of MoE

This paper: model with observed hedging properties replicate empirical patterns of the USD dominance

- formally supports the views that hedging is critical input for currency choice in trade
Chinn and Ito (2015); Maggiori et al. (2019)
- superior hedging property of the USD in data can be rationalized as the globally and locally optimal policies

Insurance and distributive effects of currency choice in financial contracts

- domestic debt contracts denominated in USD could be an efficient risk sharing in emerging economies (EMEs)

Bocola and Lorenzoni (2020); Christiano and Dalgic (2022); Oskolkov and Sora (2023); Dalgic (2024)

- valuation effects in balance sheets: transfer from US to rest of the world in adverse states
Gourinchas et al. (2010); Obstfeld et al. (2010); Bernanke (2017); Maggiori (2017)

This paper: hedging effects also matter for the choice of MoE

- USD holding in EMEs could be used as the superior MoE with the best hedging
- this could lead to the efficient terms of trade
- an alternative complementary channel of currency choice

Further Extension (1): Feedback between Liquidity Demand and Hedging properties

So far, nominal exchange rate changes are proportional to inflation differentials.

- currency demands are constant and supplies follow stochastic money supply rules

Incorporate exogenous countercyclical increase in discount rate β (liquidity demand shock)

- increases currency demand and hence currency valuations in adverse states
- amplifies hedging properties
- further increases the liquidity premium and liquidity demand

Further Extension (2): Global Planners' Problems

Ramsey-style optimal policy problem in the baseline model

- choosing the first and second-moments of currency returns $\{\gamma_{c,t+1}^{-1}\}$

Maximize the equally weighted sum of countries' welfare:

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Incentive to increase the inflation tax paid by foreign agents.