The International Spillovers of Synchronous Monetary Tightening

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Motivation

- Central banks are tightening aggressively to reduce inflation.
- Risk
  - Larger spillovers due to synchronized tightening.
  - Global policy coordination needed to avoid severe global slowdown.
- Questions:
  - Are effects of synchronous tightening larger than sum of the parts?
  - If so, are there gains from coordinating monetary policies?

Our Contribution

- Synchronous tightening → large spillovers by straining global financial intermediaries' balance sheets.
- Strains on global intermediaries → worse monetary policy trade-offs, more scope for policy coordination.

1. Empirical Analysis:
   - Effects of contractionary monetary shocks larger during global tightening cycles.
   - Ampification larger for output than for inflation.
2. Model:
   - Leverage-constrained global financial intermediaries (GFIs).
   - Nonlinear effects of synchronous tightening through GFIs' balance sheet.
   - Financial amplification large for output, small for inflation.
3. Motives for monetary coordination in a global inflation surge:
   - Both countries' monetary policy affects GFIs' balance sheet.
   - Stronger GFIs' balance sheets improve trade-offs globally.

Empirical Background

Data: interest rates, GDP, inflation, credit spreads, bank equity prices, unemployment for 21 advanced economies 1980q1-2019q4.

Monetary policy shocks: $\varepsilon_{i,t}^{MP}$

$$R_{i,t} = \alpha_i + \boldsymbol{\beta}_i \mathbf{Z}_{i,t} + \varepsilon_{i,t}^{MP},$$

$\mathbf{Z}_{i,t}$: two lags of of interest rates, inflation, unemployment, exchange rate.

Two questions :

1. Are the GDP effects of synchronous contractionary shocks ($\varepsilon_{i,t}^{MP} > 0$) larger than the sum of their parts?
2. Are the effects of a sizable ($\varepsilon_{i,t}^{MP} > 25bps$) contractionary shock larger during historical episodes of global tightening?

1. Joint effects larger than sum of the parts...

1. The GDP effects of synchronous contractionary shocks are larger than the sum of their parts.

$$\Delta GDP_{i,t+8} = \beta_D \mathbb{D}_{i,t} + \beta_F \mathbb{F}_{i,t} + \beta_H \mathbb{DF}_{i,t} \times \mathbb{YH}_{i,t} + \beta_L \mathbb{DF}_{i,t} \times \mathbb{YL}_{i,t} + u_{i,t}$$

	(1) $\Delta GDP(t+8)$	(2) $\Delta GDP(t+8)$	(3) $\Delta GDP(t+8)$
Dummy: Own Tightening	-1.09***	-0.77***	-0.80***
$\mathbb{1}\{\varepsilon^{MP}_{i,t} > 0\}$	(-6.16)	(-3.61)	(-3.72)
Dummy: Foreign Tightening	-0.87***	-0.55**	-0.56**
$\mathbb{1}\left\{\sum_{j\neq i} w_{jt}\varepsilon^{MP}_{jt} > 0\right\}$	(-3.39)	(-2.23)	(-2.18)
Dummy: Own × Foreign Tightening		-0.65*	
$\mathbb{1}\left\{\varepsilon^{MP}_{i,t} > 0 \text{ and } \sum_{j\neq i} w_{jt}\varepsilon^{MP}_{jt} > 0\right\}$		(-1.93)	
Dummy: Own × Foreign Tightening, Hi Growth			-0.07
$\mathbb{1}\left\{\varepsilon^{MP}_{i,t} > 0 \text{ and } \sum_{j\neq i} w_{jt}\varepsilon^{MP}_{jt} > 0 \text{ and GDP Q4/Q4} > \text{median}\right\}$			(-0.24)
Dummy: Own × Foreign Tightening, Lo Growth			-1.53***
$\mathbb{1}\left\{\varepsilon^{MP}_{i,t} > 0 \text{ and } \sum_{j\neq i} w_{jt}\varepsilon^{MP}_{jt} > 0 \text{ and GDP Q4/Q4} < \text{median}\right\}$			(-4.95)
Observations	2,986	2,986	2,958
Fixed Effects	yes	yes	yes

2. Contractionary shocks in a Tightening Cycle

2. Sizable contractionary monetary shocks are amplified during a global tightening window (synchronous)

A global tightening window lasts two years and starts in quarter t when global interest rate R^* satisfies:

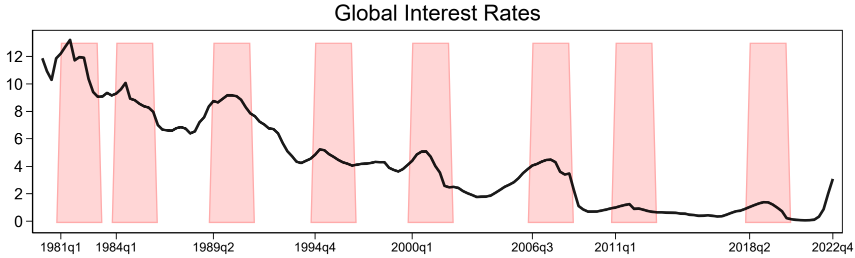
$$R^*_t - R^*_{t-4} > 0.25 \text{ and } R^*_t > R^*_{t+6}$$

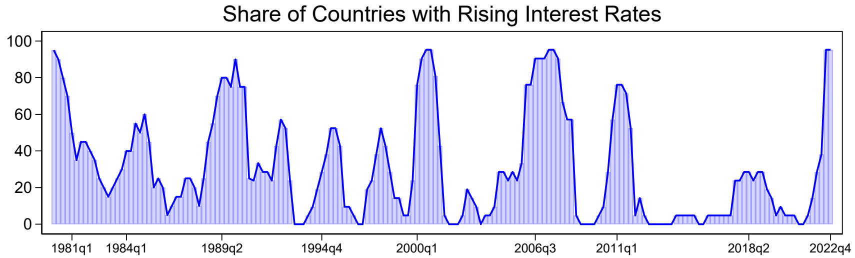
Define dummies for contractionary monetary shocks during and outside of global tightening windows:

$$\text{Synchronous} : \mathbb{DS}_{i,t} = 1 \quad \text{if } \varepsilon^{MP}_{i,t} > 0.25 \text{ and } t \in \text{ global window}$$

$$\text{Asynchronous} : \mathbb{DA}_{i,t} = 1 \quad \text{if } \varepsilon^{MP}_{i,t} > 0.25 \text{ and } t \notin \text{ global window}$$

Global Tightening Windows

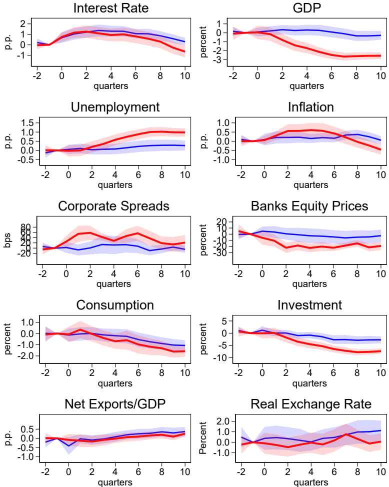




State-dependent responses to contractionary shocks

Event study analysis: Synchronous vs Asynchronous

$$y_{i,t} = \gamma_i + \sum_{\tau=-2}^{10} \sigma_\tau \mathbb{DS}_{i,t-\tau} + \sum_{\tau=-2}^{10} \alpha_\tau \mathbb{DA}_{i,t-\tau} + \varepsilon_{i,t},$$



A Model of Global Spillovers

- Two-country new-Keynesian DSGE model: U.S. (H) and ROW (F).
- Consumption habits and investment adjustment costs.
- Sticky prices for domestic and exported goods (LCP).
- Monetary policy follows Taylor rule that responds to inflation.
- Shocks: Country specific monetary shocks $\varepsilon^{m}_{i,t}$; Global markup shock ϵ^{μ}_{t}.
- Leveraged global financial institutions (GFIs) intermediate financing of firms by households
- Key calibration targets:
  - Regions size: United States 1/4; Foreign 3/4.
  - GFI asset exposure: United States 3/4; Foreign 1/4.

Global Financial Institutions

- Households can (1) directly and inefficiently finance firms' investment 1, or (2) save through global intermediaries (GFIs) 2
- GFIs combine home and foreign deposits and net worth to finance investment at home and abroad 3
- GFIs face occasionally binding leverage constraint which affects transmission of adverse shocks.
  - High net worth. Constraint is not binding. GFIs adjust debt issuance and assets so that K is efficiently allocated. No spread between lending rates and policy rates. Small trade spillovers.
  - Low net worth. Constraint is binding. GFIs fire-sale assets to households, credit spreads rise. Large trade and financial spillovers.

Financial spillovers of Tighter Monetary Policy

- Leverage constraint on GFIs:

$$\theta_H Q_{Ht} S_{Ht} + \theta_F Q_{Ft} S_{Ft} \leq N_t$$

- Joint tightening at home & abroad causes net worth losses:

$$\underbrace{N_t}_{\uparrow i_{Ht}, i_{Ft} \rightarrow N_t \downarrow} = \underbrace{R^s_{Ht} S_{Ht-1}}_{\uparrow i_{Ht} \rightarrow R^s_{Ht} \downarrow} + \underbrace{R^s_{Ft} S_{Ft-1}}_{\uparrow i_{Ft} \rightarrow R^s_{Ft} \downarrow} - R^d_{Ht-1} D_{t-1}$$

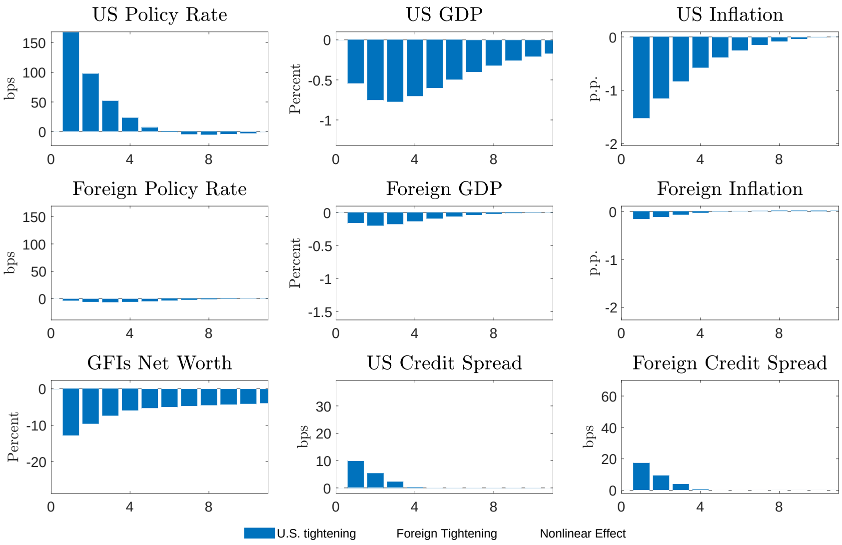
- If $N_t \downarrow$ small, GFIs leverage up, no change in spreads:

$$\mathbb{E}_t \Lambda_{t+1} \left(R^s_{Ht+1} - R^d_{Ht} \right) = \mathbb{E}_t \Lambda_{t+1} \left(R^s_{Ft+1} - R^d_{Ht} \right) = 0$$

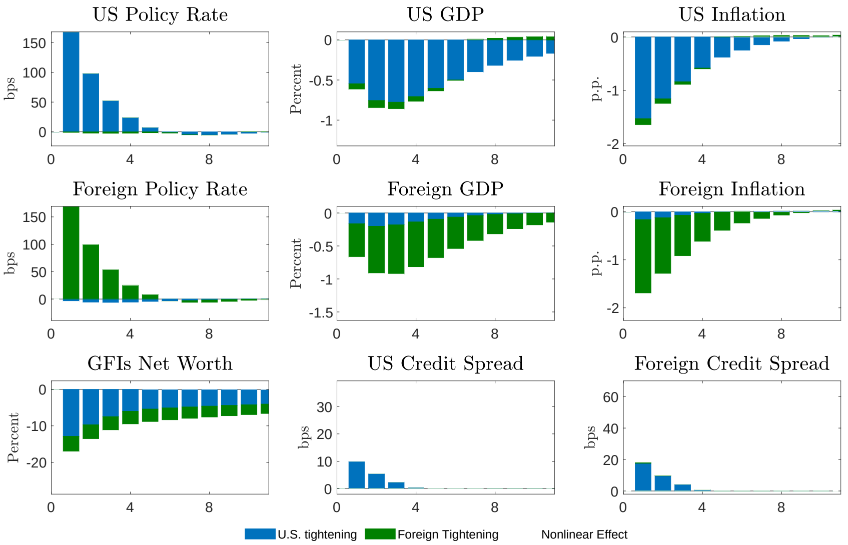
- If $N_t \downarrow$ large, leverage constraint binds, credit spreads up globally:

$$\mathbb{E}_t \Lambda_{t+1} \left(R^s_{Ht+1} - R^d_{Ht} \right) = \frac{\theta_H}{\theta_F} \mathbb{E}_t \Lambda_{t+1} \left(R^s_{Ft+1} - R^d_{Ht} \right) > 0$$

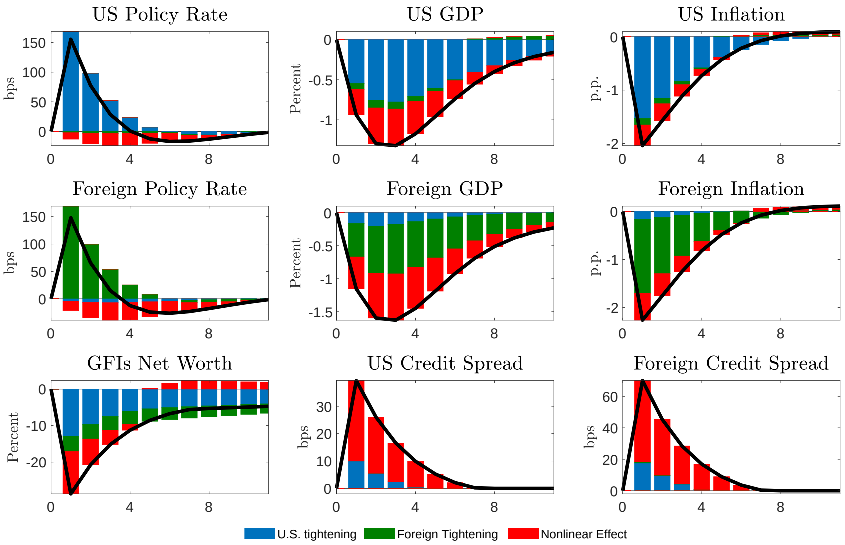
Synchronous vs Asynchronous Tightening



Synchronous vs Asynchronous Tightening



Synchronous vs Asynchronous Tightening



Policy Trade-offs

- Financial amplification larger on output than on inflation. (Christiano et al., 2015, Gilchrist et al., 2017)
- Intuition: Financial amplification affects mainly investment...

$$\downarrow y_t = c_t + \downarrow\downarrow i_t + nx_t$$

... while the associated drop in inflation π is smaller:

$$\pi_{it} = s\left[(1-\alpha)\, w_{it} + \alpha z_{it} - p_{iit}\right] + \beta \mathbb{E}_t \pi_{it+1} + \mu_t$$

  - lower future capital dampens drop in rental rate z.
  - smaller consumption drop dampens drop in w through smaller wealth effects on labor supply.

Policy coordination in a global inflation surge

- Central banks in H, F observe one-time global markup shock ϵ^{μ} and choose inflation response coefficient $\varphi_i \in (1, 10]$ in the Taylor rule.
- Loss function for country i given shock ϵ^{μ}:

$$\mathcal{L}_i(\varphi_H, \varphi_F) = \sum_{t=0}^{T} \beta^t (\lambda_\pi \pi_{it}^2 + y_{it}^2),$$

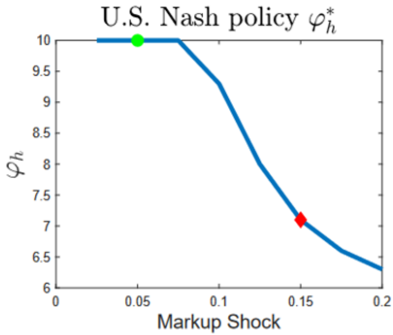
  with high weight on inflation λ_π.

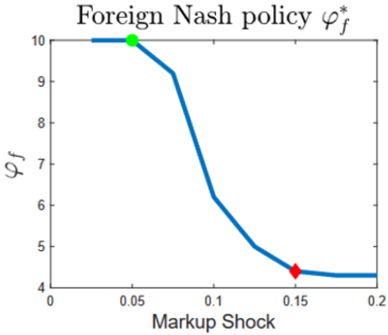
- Best response functions:

$$\varphi_i^{br}(\varphi_j) = \arg\min_{\varphi_i} \mathcal{L}_i(\varphi_i, \varphi_j).$$

- **Nash Equilibrium**: country policy responses to inflation are best responses to each other.

Nash Equilibrium: Large Shocks Change Trade-offs





- Small shock: large φ response to inflation
- Large shock: policy actions are substitutes: "smaller" φ; $\varphi_H > \varphi_F$

Cooperative policies

- World loss:

$$\bar{\mathcal{L}}\left(\varphi_H, \varphi_F\right) = \sigma_H \mathcal{L}_H\left(\varphi_H, \varphi_F\right) + (1-\sigma_H)\mathcal{L}_F\left(\varphi_H, \varphi_F\right)$$

with U.S. weight $\sigma_H = 1/4$

- **Two Cooperative Solutions**:

1: Cooperative Optimum
policies minimize world loss

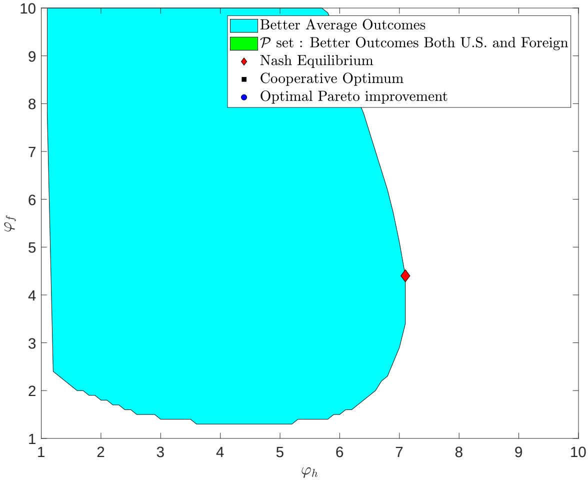
$$\left\{\varphi_H^{coop}, \varphi_F^{coop}\right\} = \arg\min_{\varphi_H, \varphi_F} \quad \bar{\mathcal{L}}\left(\varphi_H, \varphi_F\right)$$

2: Optimal Pareto Improvement
policies minimize world loss, s.t. improving relative to Nash

$$\left\{\varphi_H^{pi}, \varphi_F^{pi}\right\} = \arg\min_{(\varphi_H, \varphi_F)\in \boldsymbol{P}} \bar{\mathcal{L}}\left(\varphi_H, \varphi_F\right)$$

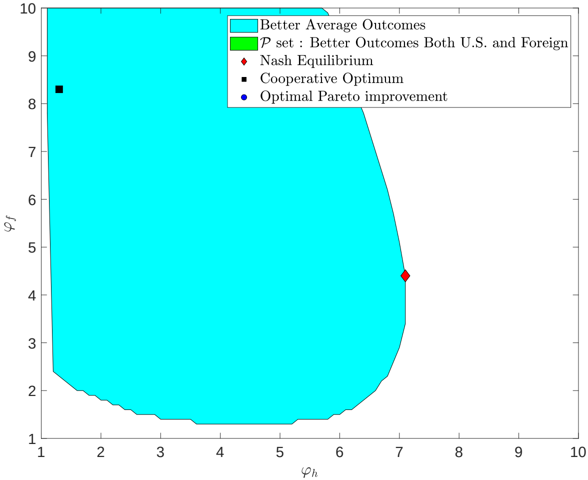
where $P = \left\{(\varphi_H, \varphi_F) \;\middle|\; \mathcal{L}_i\left(\varphi_H, \varphi_F\right) \leq \mathcal{L}_i^{NASH} \text{ for } i = H, F\right\}.$

Cooperative Policies



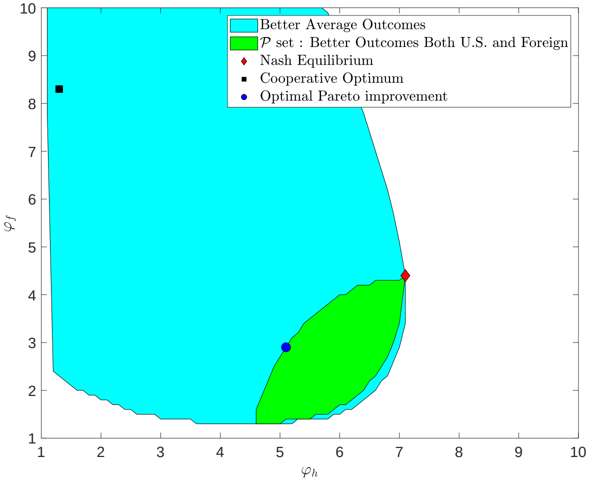
- Large set of policies with better avg outcomes relative to Nash
- These policies feature less aggressive U.S. response φ_H

Cooperative Optimum



- Cooperative optimum features small φ_H relative to φ_F
- Small φ_H eases fin.conditions allowing large φ_F, but home worse off!

Optimal Pareto Improvement



- Policies that improve over Nash feature smaller φ_H and φ_F

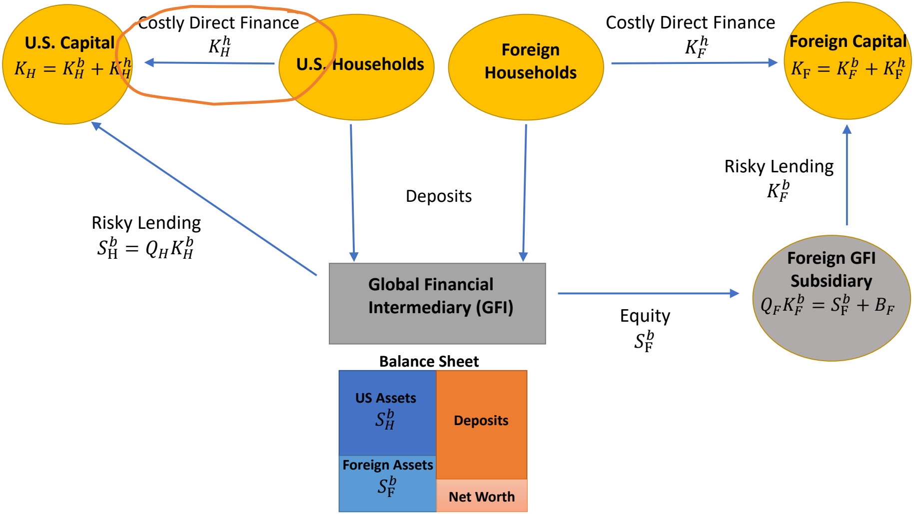
Optimal Policy: Takeaways

- With constrained GFIs, less-aggressive policy at home eases trade-offs abroad, and viceversa.
- Pareto-improving cooperation exploits this, leading to easier policy globally $\rightarrow$ smaller GDP declines with similar inflation.
- When not requiring a Pareto improvement, cooperation entails easier policy in the U.S. and more aggressive abroad.
  - U.S. has small weight in loss and large influence on GFI balance sheets.
  - RoW much better off (smaller output decline and smaller inflation increase), at expense of the U.S.

Conclusions

- Monetary policy actions can have large effects on asset valuations & funding capacity of global intermediaries.
- With interconnected financial network, financial turbulence can spread across countries.
- Large financial spillovers imply coordination matters.

Model: International Financial Flows



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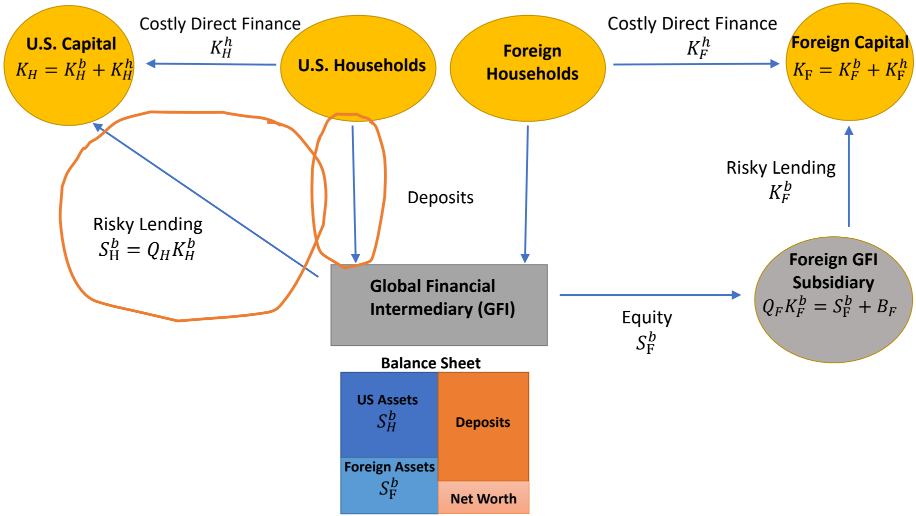
Model: International Financial Flows



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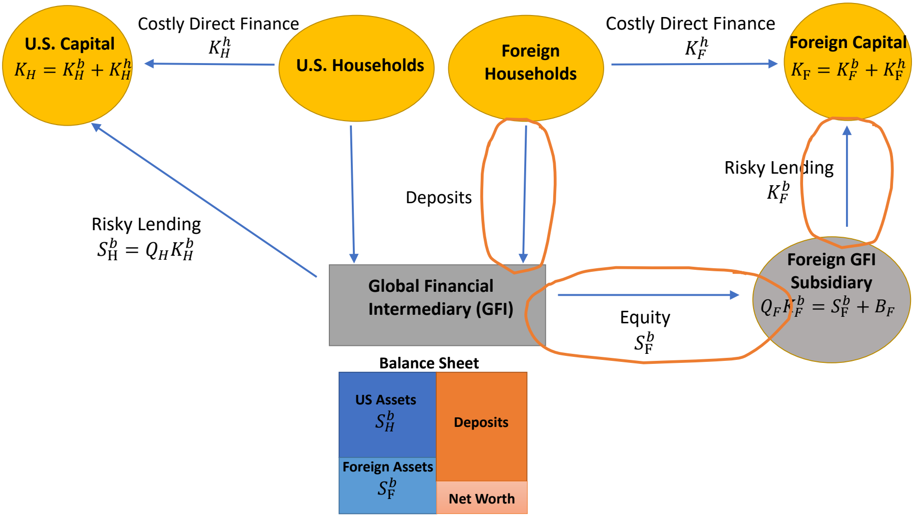

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Calibration & Solution Method

- Key calibration targets:
  - Regions size: United States 1/4; Foreign 3/4.
  - GFI asset exposure: United States 3/4; Foreign 1/4. (BIS data)
  - Leverage of GFIs = 4.75.
  - Global spreads rise 60bps with synchronous tightening. (Event Study Analysis)
- Leverage constraint not binding in steady state.
- Model solution: piece-wise linear with occasionally binding constraint (OccBin).

Details