

## How does international capital flow?

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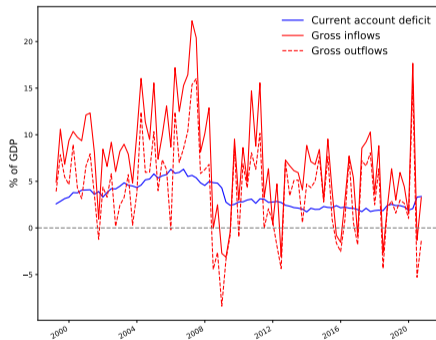
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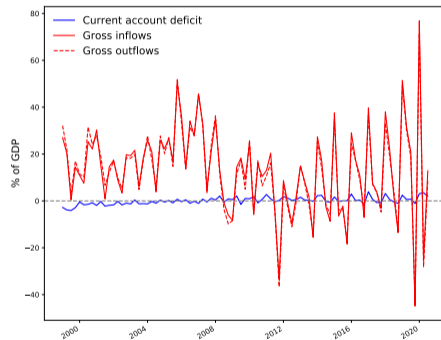
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# Net vs gross capital flows

United States



France

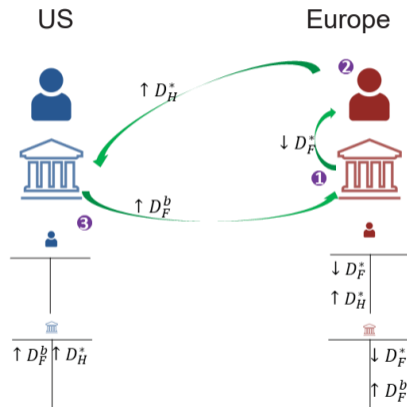


- Gross flows are extremely large relative to net flows (even in the US with its very large CA deficit)
- Gross flows are much more volatile than net flows
- Gross inflows and outflows are extremely highly correlated

# Paper in a nutshell

- Renewed interest in gross capital flows and stocks
- Empirical work can rely on much better data (BIS, IMF) and made a lot of progress
- Analytical frameworks (and thus policy discussions) lagging behind:
  - ▶ Still mostly rely on net capital flows models:
    - **Payment flows (goods against assets)** = tiny fraction of gross flows
- This paper:
  - ▶ Gross + net capital flows model (DSGE):
    - **Payment flows**
    - **Financial flows (assets against assets)** = vast majority of gross flows
  - ▶ Revisit several open-economy macro policy debates

# Example of a financial flow



1. Euro household deposits € check at US bank.
2. US bank does FX conversion.
3. US bank credits \$ to Euro household's account.
4. US bank collects check funds from Euro bank.
5. US bank credits its € nostro account with the Euro bank.
6. This reallocates existing purchasing power ("funds") among different currencies. It does not finance anything.
7. Gross inflow comes in a pair with gross outflow.
8. CA and "foreign saving" are unaffected.
9. No necessary connection of foreign inflow and foreign financing.

## Classic open-macro debates

- Global saving glut
  - ▶ Abundant EME (real) savings financed the US CA deficit (Bernanke, 2005)
- Current account deficits (or net flows) indicate financial vulnerability
  - ▶ Vulnerability to “sudden stops” (Calvo ,1998)
  - ▶ Synonymous with global imbalances (G20, 2011)
  - ▶ Unwinding CA deficit is a cure to crises (IMF, 2014)
- Triffin’s dilemma
  - ▶ US must run persistent CA deficit to provide ROW with enough \$
  - ▶ CA surpluses “fund” FX reserve accumulation
- “Puzzling” correlation between gross inflows and outflows
  - ▶ “When foreigners invest in a country, domestic agents invest abroad, and vice versa.” (Broner et al., 2013)

## Gross flows perspective on open-macro debates

- Global saving glut
  - ▶ CA deficits are not financed by foreign HHs' physical saving, but by domestic HHs' purchasing power, likely created for them by domestic banks rather than foreign ones
- Current account deficits and financial vulnerability
  - ▶ Creditors do not stop financing CAs, they stop financing debt
- Triffin's dilemma
  - ▶ *US\$* is created by bank credit extension, independently of US CA deficits
- Correlation between gross outflows and inflows
  - ▶ True by construction at the aggregate level, from double-entry bookkeeping

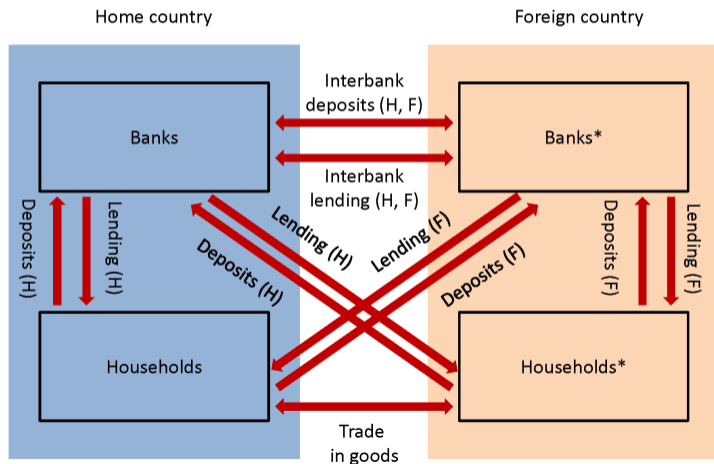
## The Model

# Key features

- 2-country New Keynesian DSGE model
- With bank *financing*
  - ▶ Banks issue loans, thus creating deposits
  - ▶ Deposit creation limited by regulatory and monitoring costs
  - ▶ Deposits are demanded because they lower transaction costs
- And cross-border gross positions
  - ▶ Banks create own-currency loans and deposits
  - ▶ HHs demand deposits in both currencies (imperfect substitutes)
  - ▶ Settlement through nostro/vostro interbank accounts



## Physical and financial flows



# Banking system

- Wholesale banks

- ▶ Choose balance sheet size and asset composition to maximise net worth
  - Loans to HH, HH\*, and Banks\* + FX deposits at Banks\*
  - Liabilities are demand-determined
- ▶ Subject to
  - 1 Minimum capital adequacy regulation (MCAR)
  - 2 FX mismatch rule (FXMR)
  - 3 Cost of maintaining exposures to foreign HH (MONFX)

- Retail banks

- ▶ Set terms of retail deposit and loan contracts
  - Deposits: mark-down on risk-free rate
  - Loans: pricing reflects default risk (land as collateral; BGG mechanism)

## FXMR constraint

- Foreign exchange mismatch rule (FXMR) limits net FX exposure

$$\underbrace{E_t \left( D_{F,t}^b - L_{F,t}^b \right)}_{\text{Exposure to foreign banks}} = \phi_{fxmr} \underbrace{\left( D_{H,t}^f - L_{H,t}^f \right)}_{\text{Exp. to foreign HHs}}$$

- $\phi_{fxmr} = 1$ 
  - Banks accommodate private flows by acting as the counterparty
  - Banks take on FX mismatch risk
  - Implies  $NFA = 0$  if symmetric
  - Accurate description of instantaneous balance sheet adjustments to a x-border transaction
- $\phi_{fxmr} = 0$ 
  - Banks exactly match interbank positions and hedge FX risks
  - Prices and quantities adjust instead
- Intermediate, asymmetric cases etc.

## Monetary UIP condition

- Monetary UIP spread  $u_t$  arises from imperfect substitutability between Home and Foreign currencies:

$$\mathbb{E}_t \left( \ln r_{t+1} - \ln r_{t+1}^* - \ln \varepsilon_{t+1}^{real} \right) = \mathbb{E}_t u_t$$

$$\mathbb{E}_t u_t = \mathbb{E}_t \Xi_{t+1} \left( \left( \frac{1 - S_t^{mm}}{S_t^{mm}} \frac{d_{H,t}^h}{e_t d_{F,t}^h} \right)^{\frac{1}{\theta_d}} - 1 \right)$$

- Higher supply of H currency  $d_H$  lowers its relative convenience yield
- This means H currency must pay a financial premium  $\rightarrow$  expected appreciation, i.e. depreciation on impact
- Similarly, higher demand for H currency (a 'home bias' shock) raises its relative convenience yield and leads to an impact appreciation, followed by depreciation
- $u_t$  and exchange rate more volatile for lower substitutability  $\theta_d$

## Rest of the model

- Manufacturers
  - ▶ Combine labour and land to produce differentiated goods  $\therefore$  sticky prices
  - ▶ 2 NK Phillips curves (PCP baseline)
- Unions
  - ▶ Buy services from households and sell differentiated labour to manufacturers  $\therefore$  sticky wages
  - ▶ Wage Phillips curve
- Monetary policy
  - ▶ Standard Taylor rule
  - ▶  $r$ -star also depends on banks' market power, steady-state deposit velocity and how elastic transaction costs are w.r.t velocity

# Calibration

- Standard macro parameters
- Financial sector - based on data and empirical evidence
  - ▶ CAR 10.5%; SS ratio 15.5%; breach frequency 2.5%; borrower bankruptcy rate 1.5%
  - ▶ Zero risk weight for interbank claims → 25 bps spread (16bps in data)
  - ▶ Wholesale & retail lending rate spreads 66 and 167 bps (AAA CP and avg. non-bank firms)
  - ▶ Interbank and retail deposit spreads -10 and -150 bps (LIBID & avg. bank spread)

## Bank balance sheet

|         |     |         |    |
|---------|-----|---------|----|
| $L_H^h$ | 100 | $D_H^h$ | 80 |
| $L_H^f$ | 20  | $D_H^f$ | 20 |
| $L_H^b$ | 10  | $D_H^b$ | 10 |
| $D_F^b$ | 10  | $L_F^b$ | 10 |
|         |     | $NW$    | 20 |

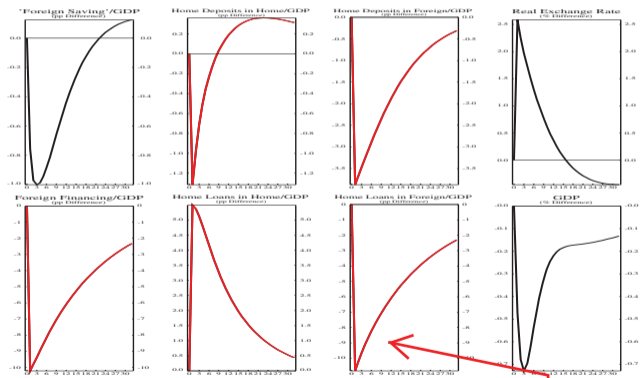
# Simulations

## Current accounts and financial vulnerability

- Literature: CA deficit sufficient statistic for financial vulnerability
- Shock to *Foreign* banks' willingness to lend to home households
- Insight:
  - ▶ In a financial crisis creditors do not stop financing (net) CAs, they stop financing (gross) debt
  - ▶ CAs can only make a minimal contribution to the required balance sheet adjustments



# Current accounts and financial vulnerability



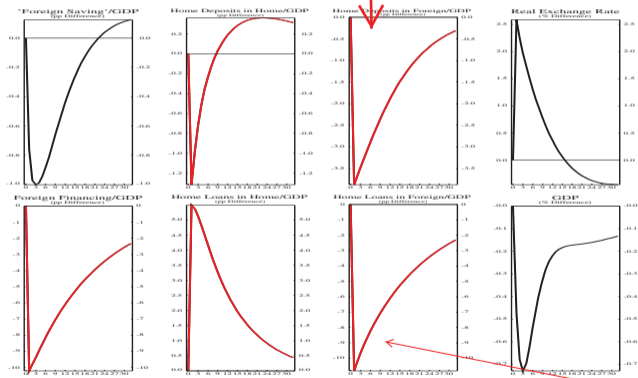
black = real variables

red = financial variables

**1. Shock: Large drop in Foreign lending to Home households**

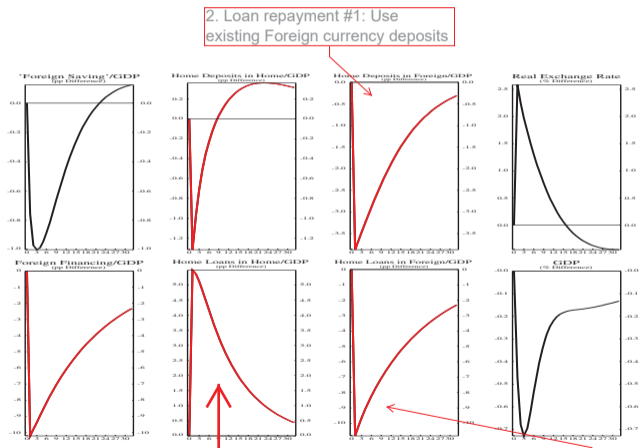
# Current accounts and financial vulnerability

**2. Loan repayment #1: Use existing Foreign currency deposits**

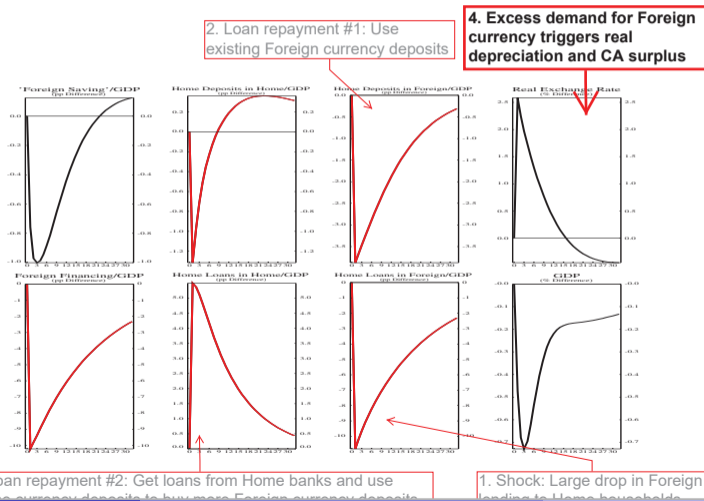


**1. Shock: Large drop in Foreign lending to Home households**

# Current accounts and financial vulnerability



# Current accounts and financial vulnerability

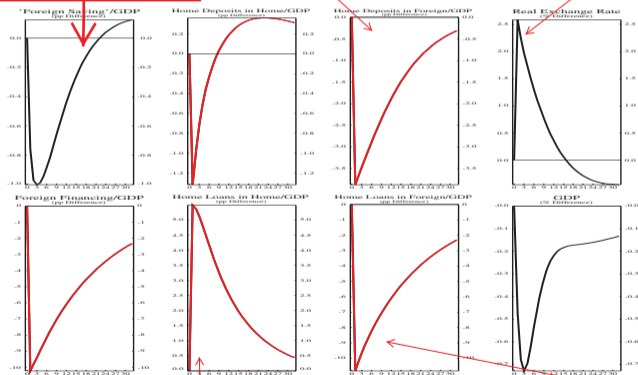


# Current accounts and financial vulnerability

5. But CA surplus (a flow) makes NO contribution to the loan repayment (an instantaneous stock change)

2. Loan repayment #1: Use existing Foreign currency deposits

4. Excess demand for Foreign currency triggers real depreciation and CA surplus



3. Loan repayment #2: Get loans from Home banks and use Home currency deposits to buy more Foreign currency deposits

1. Shock: Large drop in Foreign lending to Home households

# Summary

- We show how to incorporate gross flows into an open-economy DSGE model, tracking key gross positions
- The model illustrates the importance of financial shocks for macroeconomic and financial stability through their impact on gross flows
- New perspectives on classic open-macro debates
  - ▶ CA deficit can arise as a byproduct of financial shocks rather than a saving shock; US credit glut rather than global saving glut
  - ▶ Gross positions and their composition, rather than CA deficits, determine financial vulnerability
  - ▶ No Triffin's CA dilemma; It is banks that produce reserve currency
  - ▶ Gross outflow-inflow correlation is automatic