# The Risk Sensitivity of Global Liquidity Flows

NBER Summer Institute IFM

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*The views expressed in this presentation and paper are those of the author and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

# International capital flows: a stylized recent history

- Obstfeld and Taylor (2005): a history of financial globalization from the 1850s to 2000
  1. Late 1800s through 1914: First era of financial globalization
  2. Interwar period collapse
  3. 1980 through 2000: Second era of financial globalization

- Goldberg (2024): 1980 to 2024 divides into three phases
  1. Cross-border bank lending expands to banks and non-bank borrowers
  2. Global banking expands, with hosted local branches and subsidiaries, and liquidity management using internal capital markets
  3. Activity migrates toward non-bank financial institutions, with rise of international debt securities

# Large post-GFC shifts in international financial intermediation

**Form and volumes of global liquidity evolve for AE and EME borrowers:**

**Lending sector:**

- from banks to NBFIs

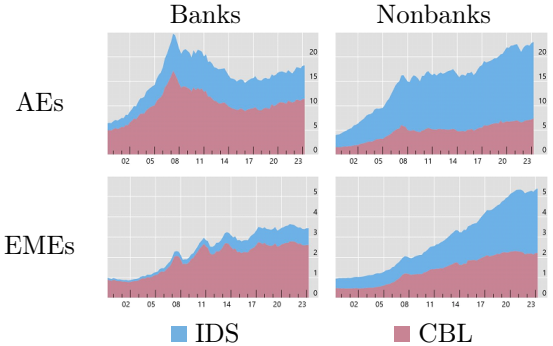
**Instrument:**

- from cross-border loans (CBL) to international debt securities (IDS)

**Borrowing sector:**

- from banks to non-banks

Figure 1: Composition of external debt flows (Amounts outstanding, USD Trillions)




Sources: BIS Locational Banking Statistics by residence and International Debt Securities Statistics.

# This paper: risk sensitivity of global liquidity flows

Global financial cycle is strong (Rey, 2015). Effects of monetary policy depend on: bank characteristics, degree of policy synchronization. (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020)

**Current paper** on magnitude and heterogeneity of **risk sensitivities** across

- borrowing countries (Other AEs vs. EMEs, *separate Safe Havens*)
- borrowing sectors (Banks vs. Non-banks)
- global liquidity components (Cross-border loans vs. international debt securities)

Provide and test conjectures about **drivers of evolving risk sensitivities**

- **financial frictions** from *source country* financial institution characteristics
- **risk migration**, as borrowers move between banks and nonbanks

# Preview of main findings

Time variation is a pervasive feature of post-GFC risk sensitivities.

- Declines strongest in cross-border bank lending
- International debt securities became more important AND some financing became less risk sensitive (especially for EMEs)

Important roles of financial institution balance-sheet constraints and risk migration:

- Better *source country* risk absorption capacity of financial institutions dampens flow sensitivity to risk events (higher bank capitalization, lower NBFI leverage)
- Under some initial conditions, borrower migration from banks to IDS has lowered aggregate sensitivity to risk.

# Related literature - 1

- **Drivers of international capital flows**
  - Extensive NBER IFM contributions on local and global factors (US monetary policy, risk conditions, growth, types of countries, channels for transmission)
- **Particular focus on global risk**
  - **A key driver of cross-border flows** (Bekaert, Engstrom, and Xu, 2022; Bruno and Shin, 2015a,b; Miranda-Agrippino and Rey, 2020; Chari, Dilts Stedman, and Lundblad, 2021)
  - **Post-GFC reduction in risk sensitivity** (Shin, 2016; Chari, Dilts Stedman, and Forbes, 2022; Chari, 2023)
- **Shift in financial intermediation from banks to NBFI**
  - **A feature of international credit supply**(Shin, 2014; Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020; Moreira and Savov, 2017; Fuster, Plosser, Schnabl, and Vickery, 2019; Irani, Iyer, Meisenzahl, and Peydró, 2020; CGFS, 2021; FSB, 2022)

# Related literature - 2

- **NBFI lenders are alternatively framed as shock absorbers or amplifiers**
  - **Financial frictions**: Portfolio compositions differ across investors (mutual funds, pension, insurance), along with risk and currency constraints Faia, Salomao, and Veghazy (2024).
  - **Shock absorbers**: Elliott, Meisenzahl, and Peydró (2024)
  - **Shock amplifiers**: Carney (2019); Bertaut, Bruno, and Shin (2021); Aldasoro, Doerr, and Zhou (2022)
- **Regulatory arbitrage explains some risk migration and NBFI growth**
  - Houston, Lin, and Ma (2012); Frame, Mihov, and Sanz (2020); Demirgüç-Kunt, Horváth, and Huizinga (2023); Goldberg (2024)

**Our paper connects these sometimes disparate literatures**.

# Empirical methodology

**Panel regressions over aggregate or components of global liquidity flows:**

$$GrRateY_t^j = \beta_1 \Delta USMP_t + \beta_2 X_t^j \Delta USMP_t + \beta_3 \mathbf{logVIX_t} + \beta_4 \mathbf{X_t^j logVIX_t} + \beta_5 \Delta logGlobalGDP_t + \beta_6 \Delta SovRating_t^j + \beta_7 ChinnIto_t^j + \beta_8 \Delta logGDP_t^j + \beta_9 X_t + \mu^j + \varepsilon_t^j \quad (1)$$

where $Y_t^j$ are volumes (CBL, IDS, AGL) for borrower j. Main global factors as drivers.
$X_t^j$ borrower type: Emerging Market Economies EMEs, Other Advanced Economies OAEs.
Additional splits for bank and nonbank borrowers.

Exclude Safe Havens US, Japan, Switzerland from OAEs (Goldberg Krogstrup JIE 2023).

# Data overview

Quarterly 2000 Q1 to 2024Q1. 61 borrowing countries.

**Global liquidity flows**

- Cross-border loans (CBL) – BIS International Banking Statistics (IBS)
- International debt securities (IDS)– BIS International Debt Statistics (IDS)

**Global drivers**

- Global risk (VIX). Robustness to MOVE, VSTOXX, BEX RA.
- US monetary policy – federal funds target rate (Wu-Xia shadow rate in ZLB periods)
- Global GDP growth

**Local (borrowing country) factors**

- GDP growth, Sovereign ratings, Financial openness (Chinn-Ito index)

(also financial institution health constructs, more later, with financing countries for characteristics: 44 BIS LBS, 31 CBS reporters.)

# Considerable variation in risk measures

- **Baseline specifications:** VIX implied volatility in S&P500
- **Alternative risk indices**:
  - SMOVEU1M: ICE BofAML Swap MOVE Index
  - VSTOXX: Euro STOXX 50 Index
  - BEX RA: Risk Aversion Index (Bekaert, Engstrom, and Xu, 2022)
- Strong comovements
  Differences in extreme values

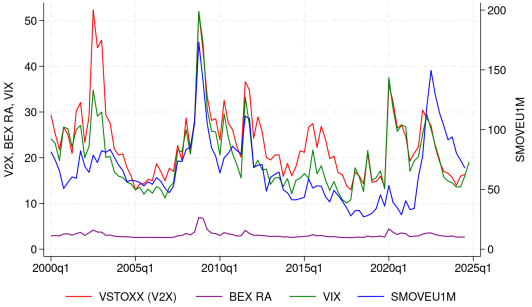



Figure 2: Measures of Risk Conditions

# Baseline results: global liquidity contracts with higher risk

Table 1: Sensitivities to Global Risk and Monetary Policy: Differences OAEs v. EMEs

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | all sectors | to banks | to non-banks | all borrowers | to banks | to non-banks | all sectors | to banks | to non-banks |
| Log(VIX) | -1.60*** | 0.59 | -3.56*** | -0.56 | -0.50 | -0.29 | -1.33*** | 0.87 | -1.70*** |
| Log(VIX) * EME | -0.85 | -2.99** | 1.26 | -2.76*** | -4.65*** | -2.65*** | -1.48** | -3.64*** | -0.80 |
| US MP | -0.40 | 0.44 | -1.53*** | -1.19*** | -0.58 | -1.59*** | -0.79*** | 0.11 | -1.75*** |
| US MP * EME | -1.04* | -1.66* | 0.15 | -0.0023 | -0.85 | 0.59 | -0.68* | -1.42* | 0.46 |
| Log(VIX) + Log(VIX) * EME | -2.45*** | -2.40*** | -2.29*** | -3.32*** | -5.16*** | -2.95*** | -2.81*** | -2.77*** | -2.50*** |
| US MP + US MP * EME | -1.44*** | -1.22** | -1.39*** | -1.19*** | -1.43** | -0.99*** | -1.47*** | -1.31** | -1.29*** |
| Observations | 5,088 | 5,088 | 5,088 | 5,101 | 4,632 | 5,100 | 5,101 | 5,100 | 5,101 |
| $R^2$ | 0.050 | 0.045 | 0.034 | 0.047 | 0.039 | 0.044 | 0.050 | 0.042 | 0.044 |

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# Post-GFC global risk sensitivities

Table 2: Time variation in global risk sensitivities by types of flows

| | Pre-GFC | | |
|---|---|---|---|
| | (1) CBL | (2) IDS | (3) AGL |
| Pre Log(VIX) | -4.18*** | 0.72 | -2.78*** |
| Pre Log(VIX) * EME | -0.80 | -4.38** | -1.58 |
| Pre Log(VIX) + Log(VIX) * EME | -4.98*** | -3.66*** | -4.36*** |
| | Post-GFC Until 2013 | | |
| Post Log(VIX) | -4.11*** | -0.91 | -3.84*** |
| Post Log(VIX) * EME | 1.63 | -4.35** | 0.58 |
| Post Log(VIX) + Log(VIX) * EME | -2.47* | -5.26*** | -3.26*** |
| | Post-GFC Until 2024 | | |
| Log(VIX) | -0.95 | 0.38 | -0.63 |
| Log(VIX) * EME | 0.89 | -2.84*** | -0.11 |
| Log(VIX) + Log(VIX) * EME | -0.06 | -2.47*** | -0.74 |

# Post-GFC global risk sensitivities

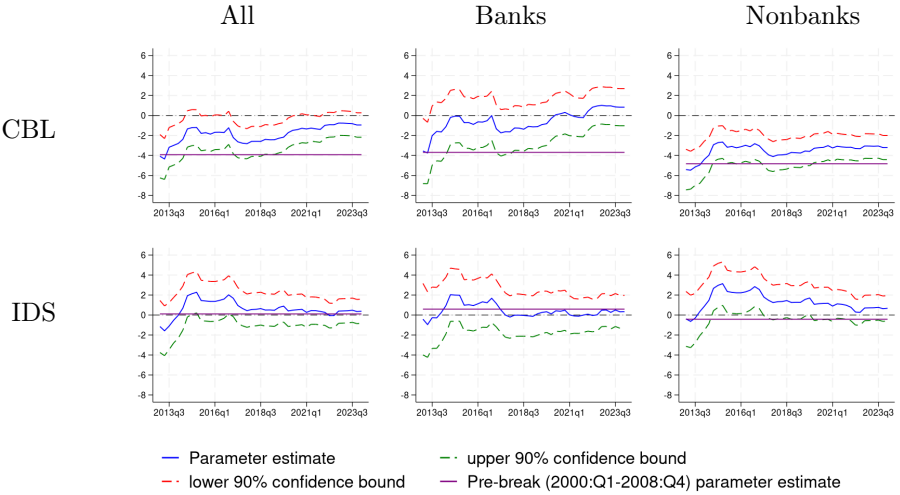
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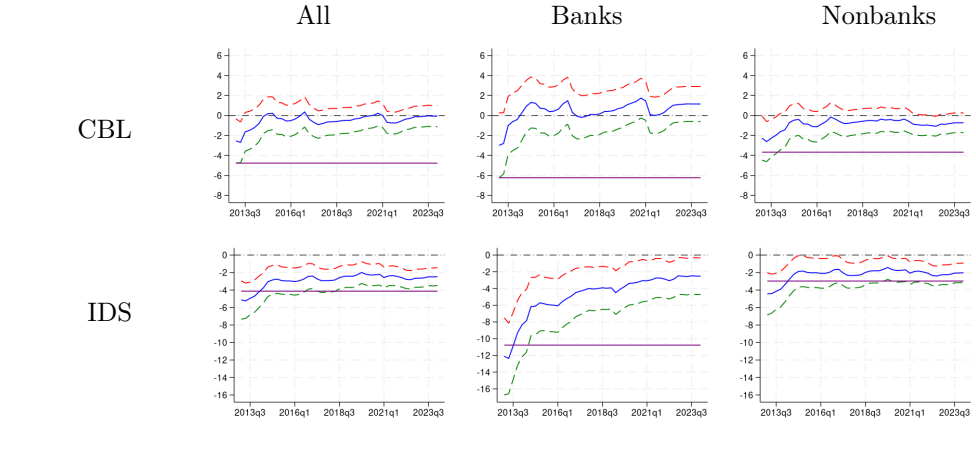
Is VIX dead?!

# Evolution of global liquidity risk sensitivities: OAEs

Equation 1



# Evolution of global liquidity risk sensitivities: EMEs



# What explains risk sensitivity evolution, from the borrower perspective?

- **Conjecture 1 - Financial Frictions**

  The risk sensitivity of global liquidity flows is stronger when funding is (in aggregate) provided by financial intermediaries that are facing greater balance sheet (capital and leverage) constraints.

- **Conjecture 2 - Risk Migration**

  As borrowers migrate from CBL to IDS markets, the global risk sensitivities of CBL and IDS flows should fall. This should result in a decline in the global risk sensitivity of AGL flows (compositional effect).

# Banks and NBFIs health, risk migration, as drivers of time variation

$$GrRateY_t^j = \beta_1 \Delta USMP_t + \beta_2 logVIX_t + \beta_3 H_t^j + \beta_4 logVIX_t * H_t^j + \beta_5 \Delta logGlobalGDP_t + \beta_6 \Delta SovRating_t^j + \beta_7 ChinnIto_t^j + \beta_8 \Delta logGDP_t^j + \beta_9 X_t + \mu^j \quad (2)$$

where $Y_t^j$ is CBL, IDS or total global liquidity. Regressions for different country samples (OAE. EME, All).

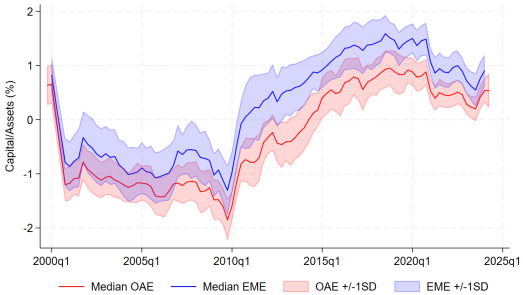
$H_t^j$ is a vector of bank or NBFI health metrics: bank capital and NBFI leverage.

*IDSshare* introduced as proxy for risk migration, banks to NBFIs. IDS Share Construction IDS Share Visual

- Tricky part! Take the perspective of the borrowers, via their exposure to health of financiers in their specific financing source countries over time.

# Bank capital ratios rose post GFC, with some recent slippage

Figure 3: Bank Capital Ratio Median & SD




Note: depicts median of the demeaned source bank capital ratio **as experienced across borrowing countries** 2000Q1-2024Q1. Bank Capital Construction

# NBFI leverage facing borrowers more difficult to quantify

- NBFIs are very diverse
- Balance sheets are far less transparent
- Less visibility into which ones are specifically involved in global liquidity flows
- Create a **novel measure** by working with Financial Stability Board information on NBFI economic function, leverage by economic function, and borrower country details on financing source countries.

# Types of NBFIs, as inputs into constructing novel leverage metric

| Economic function | Definition | Typical entity types |
|---|---|---|
| EF1 | Management of collective investment vehicles with features that make them susceptible to runs | MMFs, fixed income funds, mixed funds, credit hedge funds, real estate funds |
| EF2 | Loan provision that is dependent on short-term funding | Finance companies, leasing/factoring companies, consumer credit companies |
| EF3 | Intermediation of market activities that is dependent on short-term funding or on secured funding of client assets | Broker-dealers, securities finance companies |
| EF4 | Facilitation of credit creation | Credit insurance companies, financial guarantors, monolines |
| EF5 | Securitisation-based credit intermediation and funding of financial entities | Securitisation vehicles, structured finance vehicles, asset-backed securities |

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| EF5 | Securitisation-based credit intermediation and funding of financial entities | Securitisation vehicles, structured finance vehicles, asset-backed securities |

EF1 and EF5 have relatively low leverage, close to 1.

# NBFI variance decomposition

From the borrowing country perspective, NBFI leverage metric for IDS is constructed as:

$$L_t^i = \sum_{\text{all } j} \left( \sigma_t^{ij} \times \sum_{\text{all } \tau} (\sigma_t^{j,\tau} \times \tilde{l}_t^{\tau}) \right) \tag{3}$$

Changes in leverage of NBFI financiers facing a given borrowing country can stem from:

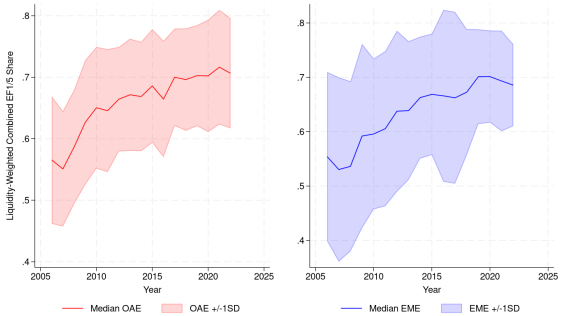
- changes in the country composition of its financiers ($\sigma_t^{ij}$)
- changes in the institutional composition types of its financiers ($\sigma_t^{j,\tau}$), and
- changes in the average leverage for each institution economic function type ($\tilde{l}_t^{\tau}$).

NBFI Leverage Construction

# Investment funds, plus securitized credit, dominate economic function

Lots of heterogeneity in implied NFBI lender composition.
Small changes to EF1+EF5 share lead to large changes in implied leverage.

Figure 4: Combined EF1/EF5 Share From Borrowing Countries' Perspective, OAE vs EME



# Higher bank capital and out-migration of (riskier) borrowers reduce CBL risk sensitivity

Table 3: CBL Sensitivities to Global Risk and US Monetary Policy

| | Other Advanced Economies | | | Emerging Market Economies | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Log(VIX) | -0.59 | -2.89*** | -0.72 | -3.15*** | -2.32*** | -2.92*** |
| Log(VIX) * Bank Capital | 4.57*** | | 4.60*** | 2.65*** | | 2.51*** |
| Log(VIX) * IDS Share | | 1.42* | -0.29 | | 2.05*** | 1.22** |
| Observations | 2,187 | 2,233 | 2,187 | 2,518 | 2,567 | 2,518 |
| $R^2$ | 0.107 | 0.087 | 0.126 | 0.086 | 0.079 | 0.096 |

# OAEs: IDS risk sensitivity reduced by lower NBFI leverage
# EMEs: higher IDS share reduces overall sensitivity

Table 4: IDS Sensitivities to Global Risk

| | Other Advanced Economies | | | Emerging Market Economies | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Log(VIX) | -1.84** | -0.69 | -1.92** | -3.29*** | -3.39*** | -3.25*** |
| Log(VIX) * NBFI Leverage | -2.16** | | -2.10** | -0.44 | | -0.53 |
| Log(VIX) * IDS Share | | -0.25 | 0.38 | | 2.18*** | 2.43** |
| Observations | 1,556 | 2,240 | 1,556 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.072 | 0.045 | 0.072 | 0.066 | 0.070 | 0.077 |

# Aggregate global liquidity: risk sensitivities respond to both financial institution constraints and funding mix

Table 5: Total Global Liquidity Sensitivities to Risk

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(VIX) | -1.01* | -2.67*** | -2.26*** | -2.39*** | -2.47*** | -3.43*** | -1.65*** | -3.61*** | -2.76*** | -3.50*** |
| Log(VIX) * Bank Capital | 3.70*** | | 3.05*** | | 2.90*** | 2.16*** | | 2.54*** | | 2.33*** |
| Log(VIX) * NBFI Leverage | | -2.58*** | -1.59*** | | -1.55*** | | -1.51*** | -1.02** | | -1.07** |
| Log(VIX) * IDS Share | | | | 1.78** | 0.59 | | | | 1.86*** | 0.72 |
| Observations | 2,194 | 1,556 | 1,556 | 2,240 | 1,556 | 2,523 | 1,607 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.144 | 0.079 | 0.101 | 0.081 | 0.102 | 0.091 | 0.080 | 0.103 | 0.079 | 0.104 |

▸ All Borrowing Countries

# Wrapping up - Conjecture 1 on financial frictions

- **Conjecture 1**: The risk sensitivity of global liquidity flows is stronger when funding is (in aggregate) provided by financial intermediaries that are facing greater balance sheet (capital and leverage) constraints.
  - Financial frictions arguments are supported and economically important.
  - Increasing the capitalization levels of lending banks by one std deviation:
    - fully offsets the negative impact of global risk on AGL flows to OAE borrowers
    - decreases the impact on EME borrowers by roughly two thirds.

# Wrapping up - Conjecture 2 on risk migration

- **Conjecture 2**: As borrowers migrate from CBL to IDS markets, the global risk sensitivities of CBL and IDS flows should fall. This should result in a decline in the global risk sensitivity of AGL flows (compositional effect).
  - Risk migration conjecture supported. Migration of riskier borrowers from banks reinforced reduced risk sensitivity of CBL.
  - IDS became less risk sensitive, suggesting a composition shift towards lower average risk borrowers.
  - Increasing the IDS share by one std deviation:
    - reduces the global risk sensitivities of AGL flows by about one quarter.

# Which results hold up outside of high stress periods?

Extant literature, as in Forbes and Warnock (2012, 2021) and Chari, Dilts Stedman, and Lundblad (2021, 2022), show particular dynamics of flows in high stress periods.

- **High stress:** Drop the top 10% from VIX.

▸ Table 1 Excluding High Risk ▸ Table 5 Excluding High Risk

  - OAEs: risk sensitivities quantitatively weaker outside of high stress periods. Some categories of flows show weakly positive coefficients on risk sensitivity (CBL to banks and IDS to nonbanks).
  - EME: risk sensitivities smaller, but qualitatively similar.
  - Effects of bank capitalization and NBFI leverage statistically important for OAEs.
  - Moderating effects for EMEs most significant when high stress periods are included.

# Robustness

- **To alternative risk measures**: Baseline specifications proxy global risk conditions using the VIX index of implied volatility in S&P500 stock index option prices. Robustness checks utilize alternative risk measures:
  - MOVE index, Euro VSTOXX index, BEX RA measure of risk sentiment
- Re-estimated Table 1 (baseline) and Table 5 (on financial institution health metrics as contributors to global risk sensitivity) show robustness to using alternative risk indices.

▸ Table 1 MOVE ▸ Table 1 VSTOXX ▸ Table 1 BEX RA
▸ Table 5 MOVE ▸ Table 5 VSTOXX ▸ Table 5 BEX RA

- **Monetary policy**: Robust to using the Wu-Xia for the full sample period, rather than only using at zero lower bound. ▸ Table 1 Wu-Xia ▸ Table 5 Wu-Xia
- **IDS variable:** Use triple interaction terms between the IDSshare variable and the respective bank and NBFI health metrics (bank capital and NBFI leverage). Robust.

# Concluding remarks

- Post GFC, the volatility of CBL looks tamed, and some IDS risk sensitivities are dampened.
- Risk sensitivities of OAEs and EMEs are now more similar.
- Time variation in risk sensitivities and heterogeneity are pervasive in global liquidity.
- **Sensitivity experienced by borrowers** to risk shocks evolves with **tightness of financiers'** balance sheet constraints and **riskiness of borrowers served**.
  - Be careful with "NBFIs" as a block, as these represent vastly different economic functions, with distinct constraints.
- **The VIX and other risk measures are not dead.** "Tamed" sensitivities could relapse.

Thank you!

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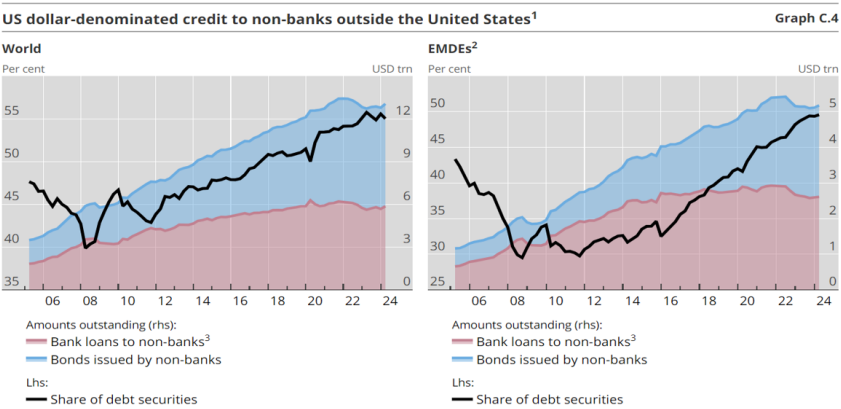
# Supplementary slides

# Descriptive Statistics of Global Liquidity and Institutions

Table A.1: Descriptive Statistics of Global Liquidity and Institutions

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Min | Max | Obs. | Mean | SD | Min | Max | Obs |
| IDS (Total) | 2.88 | 13.86 | -80.51 | 373.56 | 2,522 | 3.27 | 15.34 | -76.47 | 323.87 | 3,227 |
| IDS (Banks) | 5.80 | 74.26 | -62.65 | 3,191.63 | 2,232 | 7.54 | 1,333.86 | -100.00 | 6,783.48 | 2,912 |
| IDS (Nonbanks) | 2.97 | 17.15 | -80.51 | 458.00 | 2,522 | 3.66 | 30.94 | -82.71 | 1,500.00 | 3,302 |
| CBL (Total) | 1.65 | 9.53 | -75.79 | 76.87 | 2,496 | 2.04 | 12.18 | -87.88 | 212.50 | 3,332 |
| CBL (Banks) | 2.07 | 14.14 | -92.63 | 133.77 | 2,496 | 2.96 | 27.38 | -72.75 | 1,100.00 | 3,323 |
| CBL (Nonbanks) | 1.96 | 11.26 | -54.92 | 176.94 | 2,496 | 2.35 | 13.23 | -51.02 | 285.21 | 3,332 |
| Bank Capital Ratio | 4.92 | 0.98 | 3.61 | 6.88 | 2,496 | 5.46 | 1.08 | 2.27 | 8.37 | 3,333 |
| NBFI Leverage | 2.04 | 0.64 | 1.12 | 4.46 | 1,744 | 2.55 | 0.83 | 1.12 | 5.46 | 1,884 |
| IDS Share | 51.46 | 19.57 | 0.73 | 93.21 | 2,583 | 44.10 | 22.90 | 0.00 | 90.63 | 3,359 |
| Log(VIX) | 2.93 | 0.33 | 2.31 | 3.95 | 2,610 | 2.94 | 0.33 | 2.31 | 3.95 | 3,368 |
| Bank Capital Ratio (Demeaned) | -0.27 | 0.92 | -2.40 | 1.67 | 2,532 | 0.21 | 1.01 | -2.73 | 2.93 | 3,295 |
| NBFI Leverage (Demeaned) | -0.35 | 0.82 | -1.53 | 2.79 | 1,744 | 0.32 | 1.08 | -1.54 | 4.08 | 1,884 |
| IDS Ratio (Demeaned) | 0.24 | 0.89 | -2.05 | 2.13 | 2,583 | -0.09 | 1.04 | -2.09 | 2.01 | 3,359 |

# Post-GFC shift in international financial intermediation: Loans to Bonds




Source: BIS Global Liquidity Indicators

Note: dollar denominated component shown (50+ percent of total). Trend most pronounced post 2012.

# Bank Capital Construction

Back to main slides

- Bank Capital = CE / TA
  - Bank-level data aggregate to the country level by using TA-weighted averages of bank-level ratios
  - CE = Common Equity (obtained from Fitch)
  - TA = Total Assets (obtained from Fitch)

# NBFI Leverage Construction

Back to main slides

- NBFI Leverage = TFA / Equity
  - NBFI-level data aggregate to the country level by using TA-weighted averages of NBFI-level ratios
  - TFA = Total Financial Assets (obtained from the FSB Non-Bank Financial Intermediation (NBFI) Database )
  - Equity = (obtained from the FSB Non-Bank Financial Intermediation (NBFI) Database)

# IDS Share Construction

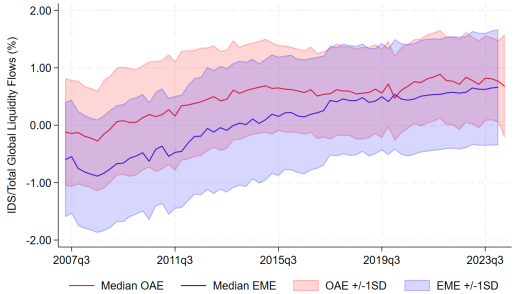
Back to main slides

- IDS share = IDS / (IDS + CBL)
  - IDS = International debt securities issued by borrowers (from all sectors) in a given country (obtained from the BIS International Debt Securities Statistics)
  - CBL = Cross-border loans to borrowers (from all sectors) in a given country (obtained from the BIS Locational Banking Statistics)

# "Risk migration" away from banks, IDS share in global liquidity, has risen more for EMEs, with large country variation

Back to main slides

Figure A.1: IDS Share, Median & SD




Notes: Median share of the demeaned international debt security share in total global liquidity flows over all borrowing countries in our sample over the period 2000Q1-2024Q1.

# Drivers of risk sensitivities: aggregate global liquidity, All Countries

Back to main slides

Table A.2: Sensitivities to Global Risk

| | All Borrowing Countries | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Log(VIX) | -2.52*** | -1.91*** | -2.72*** | -2.52*** | -2.86*** |
| Log(VIX) * Bank Capital | 2.48*** | | 2.44*** | | 2.25*** |
| Log(VIX) * NBFI Leverage | | -2.07*** | -1.78*** | | -1.73*** |
| Log(VIX) * IDS Share | | | | 2.03*** | 0.94** |
| Observations | 4,717 | 3,163 | 3,163 | 4,812 | 3,163 |
| $R^2$ | 0.095 | 0.076 | 0.096 | 0.071 | 0.098 |

# Alternative Risk Indices, MOVE

Back to main slides

Table A.3: Sensitivities to global risk (MOVE) and US monetary policy

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) all sectors | (2) to banks | (3) to non-banks | (4) all borrowers | (5) to banks | (6) to non-banks | (7) all sectors | (8) to banks | (9) to non-banks |
| Log(MOVE) | 0.11 | 1.39* | -0.79* | 1.10*** | 1.18* | 1.25*** | 0.090 | 1.26** | 0.21 |
| Log(MOVE) * EME | -0.19 | -1.21 | 0.57 | -2.67*** | -2.49** | -2.75*** | -1.12** | -1.47* | -1.28*** |
| US MP | -0.16 | 0.24 | -0.89** | -1.18*** | -0.69 | -1.62*** | -0.61** | -0.16 | -1.48*** |
| US MP * EME | -0.88* | -1.00 | -0.17 | 0.59 | 0.18 | 1.17** | -0.36 | -0.61 | 0.61 |
| Log(MOVE) + Log(MOVE) * EME | -0.08 | 0.18 | -0.22 | -1.57*** | -1.31* | -1.51*** | -1.03*** | -0.22 | -1.08*** |
| US MP + US MP * EME | -1.03*** | -0.77 | -1.06*** | -0.59** | -0.51 | -0.45 | -0.97*** | -0.77 | -0.86*** |
| Observations | 5,088 | 5,088 | 5,088 | 5,101 | 4,632 | 5,100 | 5,101 | 5,100 | 5,101 |
| $R^2$ | 0.045 | 0.044 | 0.026 | 0.043 | 0.035 | 0.042 | 0.042 | 0.040 | 0.038 |

# Alternative Risk Indices, VSTOXX

Back to main slides

Table A.4: Sensitivities to global risk (VSTOXX) and US monetary policy

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) all sectors | (2) to banks | (3) to non-banks | (4) all borrowers | (5) to banks | (6) to non-banks | (7) all sectors | (8) to banks | (9) to non-banks |
| Log(VSTOXX) | -1.79*** | 0.18 | -3.71*** | -0.26 | -0.59 | 0.20 | -1.13** | 0.78 | -1.32*** |
| Log(VSTOXX) * EME | -0.62 | -2.72** | 1.55* | -2.04*** | -3.29** | -2.19*** | -1.23* | -3.29*** | -0.69 |
| US MP | -0.38 | 0.33 | -1.43*** | -1.18*** | -0.66 | -1.55*** | -0.74** | 0.026 | -1.65*** |
| US MP * EME | -0.96* | -1.46* | 0.13 | 0.25 | -0.38 | 0.80 | -0.56 | -1.18 | 0.51 |
| Log(VSTOXX) + Log(VSTOXX) * EME | -2.41*** | -2.54*** | -2.16*** | -2.30*** | -3.88*** | -1.99*** | -2.36*** | -2.52*** | -2.01*** |
| US MP + US MP * EME | -1.35*** | -1.13** | -1.30*** | -0.92*** | -1.03* | -0.75** | -1.31*** | -1.15** | -1.14*** |
| Observations | 5,088 | 5,088 | 5,088 | 5,101 | 4,632 | 5,100 | 5,101 | 5,100 | 5,101 |
| $R^2$ | 0.050 | 0.045 | 0.033 | 0.042 | 0.037 | 0.040 | 0.047 | 0.041 | 0.040 |

# Alternative Risk Indices, BEX RA

Back to main slides

Table A.5: Sensitivities to global risk (BEX RA) and US monetary policy

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) all sectors | (2) to banks | (3) to non-banks | (4) all borrowers | (5) to banks | (6) to non-banks | (7) all sectors | (8) to banks | (9) to non-banks |
| BEX RA | -1.41*** | -0.94** | -1.70*** | -0.94*** | -0.96* | -0.52 | -1.39*** | -0.86** | -1.03*** |
| BEX RA * EME | -0.16 | -1.14** | 0.45 | -0.84** | -1.47** | -1.09*** | -0.32 | -1.23** | -0.37 |
| US MP | -0.56 | 0.050 | -1.41*** | -1.39*** | -0.81 | -1.69*** | -0.99*** | -0.32 | -1.75*** |
| US MP * EME | -0.91* | -1.45* | 0.055 | 0.27 | -0.44 | 0.72 | -0.47 | -1.10 | 0.48 |
| BEX RA + BEX RA * EME | -1.58*** | -2.08*** | -1.24*** | -1.77*** | -2.42*** | -1.61*** | -1.71*** | -2.09*** | -1.40*** |
| US MP + US MP * EME | -1.47*** | -1.40** | -1.36*** | -1.12*** | -1.25** | -0.96*** | -1.46*** | -1.42*** | -1.26*** |
| Observations | 5,088 | 5,088 | 5,088 | 5,101 | 4,632 | 5,100 | 5,101 | 5,100 | 5,101 |
| $R^2$ | 0.055 | 0.049 | 0.034 | 0.050 | 0.039 | 0.045 | 0.059 | 0.045 | 0.048 |

# Alternative Risk Indices, MOVE

Back to main slides

Table A.6: Impact of bank and NBFI health metrics on global risk (MOVE) sensitivity of aggregate global liquidity

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(MOVE) | -2.81*** | -1.53*** | -2.17*** | -1.56** | -2.48*** | -3.06*** | -0.45* | -3.20*** | -1.28*** | -3.24*** |
| Log(MOVE) * Bank Capital | 2.56*** | | 3.08*** | | 2.93*** | 1.68*** | | 2.54*** | | 2.66*** |
| Log(MOVE) * NBFI Leverage | | -1.99*** | -1.33*** | | -1.24** | | -1.56*** | -1.23*** | | -1.24*** |
| Log(MOVE) * IDS Share | | | | 1.99*** | 0.79 | | | | 0.53 | -0.36 |
| Observations | 2,194 | 1,556 | 1,556 | 2,240 | 1,556 | 2,523 | 1,607 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.134 | 0.069 | 0.092 | 0.077 | 0.094 | 0.076 | 0.076 | 0.096 | 0.059 | 0.097 |

# Alternative Risk Indices, VSTOXX

Back to main slides

Table A.7: Impact of bank and NBFI health metrics on global risk (VSTOXX) sensitivity of aggregate global liquidity

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(VSTOXX) | -1.44** | -4.80*** | -5.19*** | -2.06*** | -5.37*** | -2.88*** | -2.41*** | -5.67*** | -2.47*** | -5.62*** |
| Log(VSTOXX) * Bank Capital | 2.70*** | | 4.27*** | | 4.14*** | 1.63*** | | 3.74*** | | 3.47*** |
| Log(VSTOXX) * NBFI Leverage | | -2.39*** | -1.05* | | -1.01 | | -1.21** | -0.47 | | -0.43 |
| Log(VSTOXX) * IDS Share | | | | 1.07 | 0.51 | | | | 1.82*** | 0.97 |
| Observations | 2,194 | 1,556 | 1,556 | 2,240 | 1,556 | 2,523 | 1,607 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.130 | 0.093 | 0.128 | 0.076 | 0.129 | 0.079 | 0.078 | 0.111 | 0.073 | 0.113 |

# Alternative Risk Indices, BEX RA

Back to main slides

Table A.8: Impact of bank and NBFI health metrics on global risk (BEX RA) sensitivity of aggregate global liquidity

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| BEX RA | -1.20*** | -1.91*** | -1.59*** | -1.75*** | -1.62*** | -1.64*** | -1.42*** | -1.63*** | -1.57*** | -1.54*** |
| BEX RA * Bank Capital | 1.09*** | | 0.58*** | | 0.55*** | 0.63*** | | 0.58** | | 0.51*** |
| BEX RA * NBFI Leverage | | -0.66*** | -0.48** | | -0.48** | | -0.38** | -0.26* | | -0.31** |
| BEX RA * IDS Share | | | | 0.57** | 0.23 | | | | 0.55** | 0.30 |
| Observations | 2,194 | 1,556 | 1,556 | 2,240 | 1,556 | 2,523 | 1,607 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.152 | 0.105 | 0.112 | 0.094 | 0.113 | 0.093 | 0.099 | 0.112 | 0.081 | 0.113 |

# Alternative US monetary policy, Wu-Xia

Back to main slides

Table A.9: Baseline Regressions: Wu-Xia over full sample period

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | all sectors | to banks | to non-banks | all borrowers | to banks | to non-banks | all sectors | to banks | to non-banks |
| Log(VIX) | -1.77*** | 0.48 | -3.50*** | -0.65 | -0.29 | -0.37 | -1.41*** | 0.90 | -1.65*** |
| Log(VIX) * EME | -0.50 | -2.66** | 1.25 | -2.75*** | -5.00*** | -2.66*** | -1.35** | -3.51*** | -0.93 |
| US MP | -0.55 | 0.36 | -1.23*** | -1.18*** | 0.0081 | -1.56*** | -0.77*** | 0.31 | -1.45*** |
| US MP * EME | -0.41 | -1.09 | 0.14 | 0.024 | -1.52* | 0.61 | -0.44 | -1.22* | 0.25 |
| Log(VIX) + Log(VIX) * EME | -2.27*** | -2.17** | -2.25*** | -3.40*** | -5.29*** | -3.04*** | -2.76*** | -2.61*** | -2.58*** |
| US MP + US MP * EME | -0.95*** | -0.73 | -1.09*** | -1.16*** | -1.51** | -0.95*** | -1.22*** | -0.91 | -1.20*** |
| Observations | 5,088 | 5,088 | 5,088 | 5,101 | 4,632 | 5,100 | 5,101 | 5,100 | 5,101 |
| $R^2$ | 0.048 | 0.045 | 0.032 | 0.047 | 0.039 | 0.044 | 0.049 | 0.041 | 0.043 |

# Alternative US monetary policy, Wu-Xia

Back to main slides

Table A.10: Financial institution health metrics and global risk sensitivity: Wu-Xia over full sample period

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(VIX) | -1.14* | -2.93*** | -2.53*** | -2.46*** | -2.74*** | -3.45*** | -1.82*** | -3.85*** | -2.76*** | -3.75*** |
| Log(VIX) * Bank Capital | 3.75*** | | 3.11*** | | 2.96*** | 2.01*** | | 2.55*** | | 2.37*** |
| Log(VIX) * NBFI Leverage | | -2.64*** | -1.66*** | | -1.61*** | | -1.50*** | -1.01** | | -1.03** |
| Log(VIX) * IDS Share | | | | 1.77** | 0.58 | | | | 1.82*** | 0.66 |
| Observations | 2,194 | 1,556 | 1,556 | 2,240 | 1,556 | 2,523 | 1,607 | 1,607 | 2,572 | 1,607 |
| $R^2$ | 0.146 | 0.089 | 0.112 | 0.082 | 0.113 | 0.088 | 0.083 | 0.106 | 0.076 | 0.107 |

# High stress v. status quo: comparing sensitivities to global risk

Back to main slides

Table A.11: Sensitivities to Risk: All observations v. excluding high risk

| | Cross Border Loans | | | International Debt Securities | | | Global Liquidity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) all sectors | (2) to banks | (3) to non-banks | (4) all borrowers | (5) to banks | (6) to non-banks | (7) all sectors | (8) to banks | (9) to non-banks |
| Log(VIX) | -1.60*** | 0.59 | -3.56*** | -0.56 | -0.50 | -0.29 | -1.33*** | 0.87 | -1.70*** |
| Log(VIX) + Log(VIX) * EME | -2.45*** | -2.40*** | -2.29*** | -3.32*** | -5.16*** | -2.95*** | -2.81*** | -2.77*** | -2.50*** |
| | | | | | Excluding High Risk | | | | |
| Log(VIX) | -0.74 | 2.16* | -3.81*** | -0.19 | -0.62 | -0.29 | -0.51 | 2.23** | -1.79*** |
| Log(VIX) + Log(VIX) * EME | -1.46** | -0.22 | -1.84*** | -2.82*** | -4.59*** | -2.46*** | -1.85*** | -0.88 | -1.80*** |

# High stress v. status quo: comparing sensitivity drivers

Back to main slides

Table A.12: Sensitivity Drivers:All observations v. excluding high risk

| | Other Advanced Economies | | | | | Emerging Market Economies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(VIX) * Bank Capital | 3.70*** | | 3.05*** | | 2.90*** | 2.16*** | | 2.54*** | | 2.33*** |
| Log(VIX) * NBFI Leverage | | -2.58*** | -1.59*** | | -1.55*** | | -1.51*** | -1.02** | | -1.07** |
| Log(VIX) * IDS Share | | | | 1.78** | 0.59 | | | | 1.86*** | 0.72 |
| | Excluding High Risk | | | | | | | | | |
| Log(VIX) * Bank Capital | 4.36*** | | 3.21*** | | 3.17*** | 2.16*** | | 1.22 | | 1.37 |
| Log(VIX) * NBFI Leverage | | -1.81*** | -1.17* | | -1.15* | | -1.10* | -0.94 | | -0.87 |
| Log(VIX) * IDS Share | | | | 1.89** | 0.21 | | | | 1.61** | -0.29 |

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