Monetary Policy and Global Banking

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Research Question:

- Foreign banks are central to economic activity:

    - BIS, Jun 2015: European banks' claims on US non-bank firms = $1.62 trillion

    - BIS, Jun 2015: Japanese banks' claims on US non-bank firms = $0.72 trillion

    - DealScan, 1990-2015, European and Japanese banks originate ~25% of large corporate loans

- International credit channel of monetary policy/What are the cross-border effects of monetary policy (through the balance sheets of global banks)?

International Credit Channel of Monetary Policy: Existing View

- Cetorelli and Goldberg (2012) study large U.S. banks:
    - Builds on Stein and Kashyap (2000)
    - Global internal capital markets insulate global banks from changes in a given country's monetary policy

In this Paper:

- While funds can be moved between markets, it is unlikely that they are in the same currency, and currency risk exposure is typically hedged by banks → Foreign banks rely heavily on FX swaps

  o E.g., in June 2016, synthetic dollar funding from Eurozone and Japanese banks was > $1.5 trillion

- Increased demand for FX swaps is amplified by banks' global management of liquidity (demand for high-yield reserve assets)

- Overall, there is an increased cost of synthetic dollar funding

  → Hedging costs drive wedge between marginal return of lending in dollars vs. foreign currency and, for capital-constraint banks, leads to contraction of dollar credit

Elements of the Model:
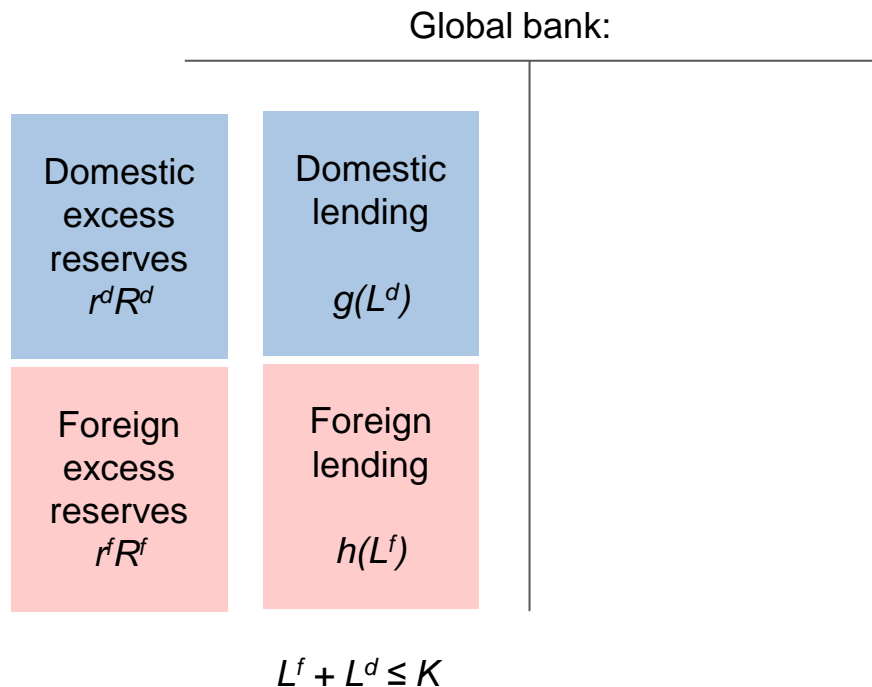
Global bank:

Domestic lending

$g(L^d)$

Foreign lending

$h(L^f)$

$L^f + L^d \leq K$

Elements of the Model:

Global bank:

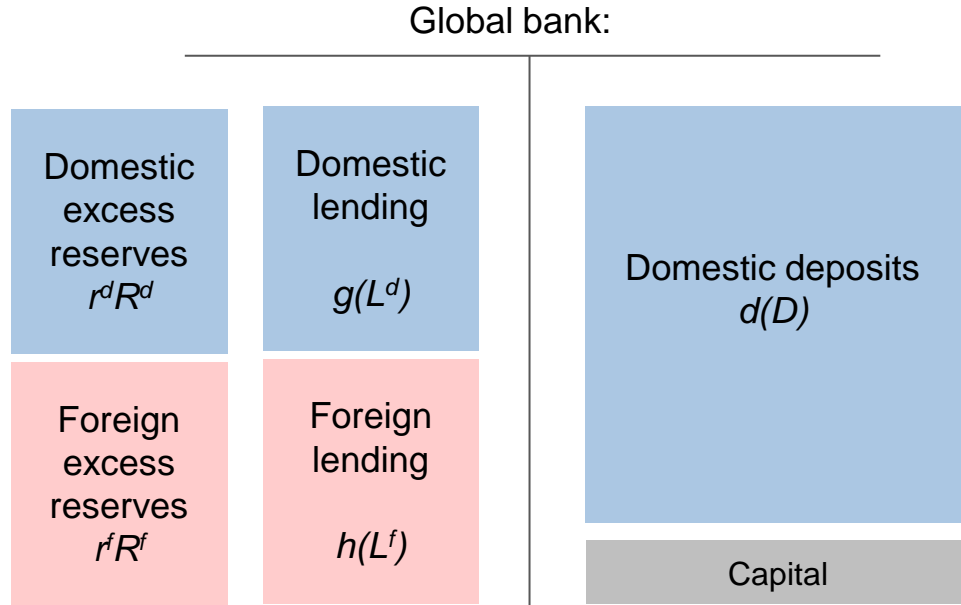| Domestic excess reserves $r^d R^d$	Domestic lending $g(L^d)$
Foreign excess reserves $r^f R^f$	Foreign lending $h(L^f)$

$$L^f + L^d \leq K$$

Reserve holdings are pinned down separately, and don't matter for lending: in each currency you accumulate reserves as long as your marginal cost of raising funding is below the IOER

Elements of the Model:

Global bank:

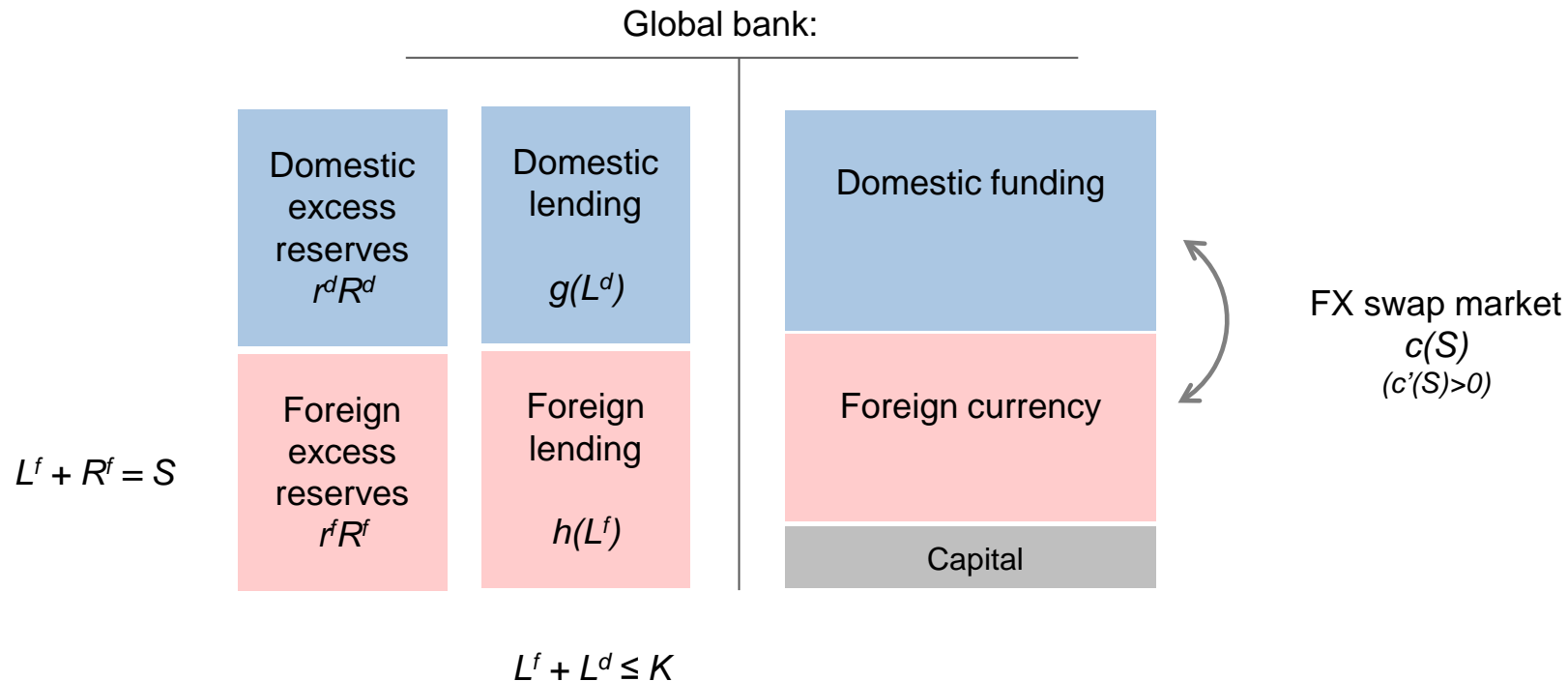|		
Domestic excess reserves $r^d R^d$	Domestic lending $g(L^d)$	Domestic deposits $d(D)$
Foreign excess reserves $r^f R^f$	Foreign lending $h(L^f)$	
		Capital

$$L^f + L^d \leq K$$

Assumption:
Convex cost of raising deposits; e.g., to expand deposits, a bank has to invest in advertising, promotions, and branches, and the more it expands in the short run the greater the marginal cost of adding deposits

Elements of the Model:

Global bank:

Domestic excess reserves
$r^d R^d$

Domestic lending
$g(L^d)$

Foreign excess reserves
$r^f R^f$

Foreign lending
$h(L^f)$

Domestic funding

Foreign currency

Capital

FX swap market
$c(S)$
$(c'(S)>0)$

$L^f + R^f = S$

$L^f + L^d \leq K$

Capital-constrained banks can lend in dollars and euros but they must hedge FX risk or borrow in the currency in which they lend

Elements of the Model:

$$c'(S) = r^f - r^d =: \Delta r$$

$$h'(L^f) = g'(L^d) + \Delta r$$

$$d'(D^d) = r^d$$

Elements of the Model:

$$\frac{\partial L^f}{\partial \Delta r} = \frac{1}{h''(L^f) + g''\left(K/\alpha - L^f\right)} < 0,$$

$$\frac{\partial L^d}{\partial \Delta r} = -\frac{1}{h''(K/\alpha - L^d) + g''(L^d)} > 0$$

$$\frac{\partial S}{\partial \Delta r} = \frac{1}{c''(S)} > 0$$

$$\frac{\partial R^f}{\partial \Delta r} > 0 \qquad \frac{\partial R^d}{\partial \Delta r} < 0$$

Empirical Findings: Roadmap

I.   Macro & bank-level analysis: Changes in reserves, cross-border fund movement, swapping activity and lending

- Call reports
- BIS data

II.   Micro loan-level analysis: Effects on lending

- DealScan

Sample period from 2000:Q1 to 2015:Q2 and focus on USD, EUR, GBP, JPY, CHF, CAD (and banks from the related currency areas)

There are large movements in <u>excess</u> reserves of foreign banks:
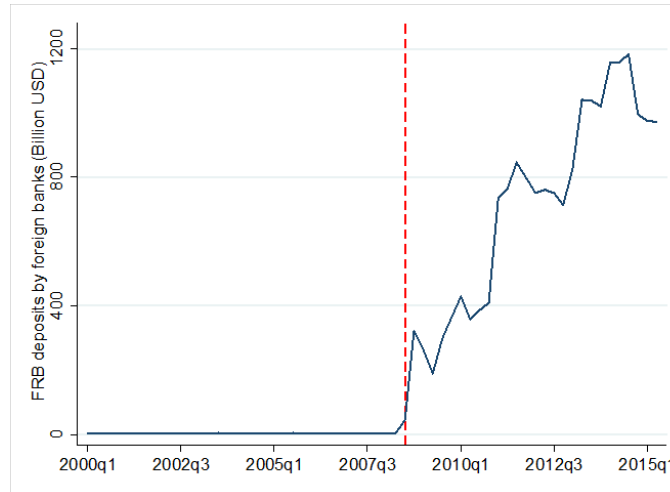
- U.S., 2015:Q2: reserves holdings of foreign banks are over 2x government claims and over 2x cross-border interbank claims

FRB deposits of foreign banks and ΔIOER:

R-squared=0.635
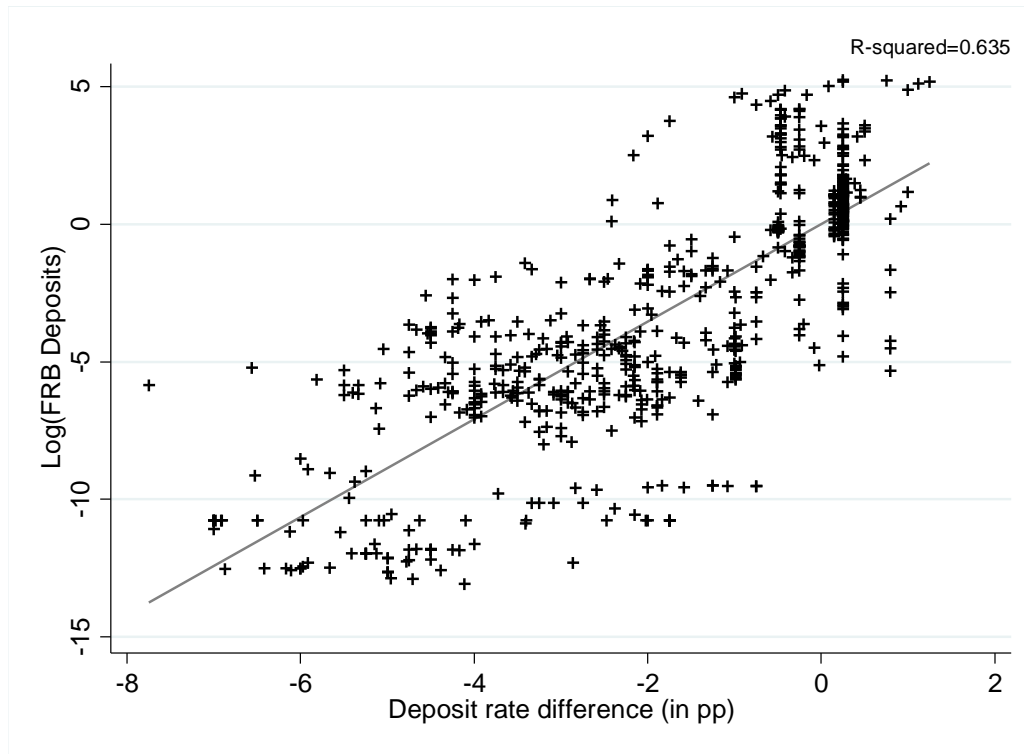
- 16 currency areas
- 2000:Q1 to 2015:Q2
- each observation corresponds to a foreign banking sector-quarter (e.g., total Japanese banks' deposits at FRB in a given quarter)

Results:

Table II (updated): Assets of Foreign Banks in the U.S. (Call Report Data)

Dependent Variable:	Reserve Assets	
	Log(Reserves)	Log(Treasuries)
	(1)	(2)
IOER Difference (pp)	0.634***	0.396***
	(4.18)	(3.17)
Fixed Effects:		
Bank	Yes	Yes
Quarter	Yes	Yes
R-sq.	0.80	0.84
Observations	1,763	767

1 pp increase in IOER
difference → 63% increase
in reserves by foreign banks

Results:

Table II (updated): Assets of Foreign Banks in the U.S. (Call Report Data)

Dependent Variable:	Reserve Assets		Lending in U.S.	
	Log(Reserves)	Log(Treasuries)	Log(C&I Loans)	Log(Loans and Leases)
	(1)	(2)	(3)	(4)
IOER Difference (pp)	0.634***	0.396***	-0.410**	-0.464***
	(4.18)	(3.17)	(-2.31)	(-3.24)
Fixed Effects:				
Bank	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
R-sq.	0.80	0.84	0.93	0.93
Observations	1,763	767	1,683	1,736

1 pp increase in IOER difference → 41% decrease in C&I loans by foreign banks

Results:

Table II (updated): Funding of Foreign Banks (Call Report Data) and FX Swaps (NY Fed FX Survey)

	Internal Capital Reallocation	
Dependent Variable:	Log(Internal Lending)	Log(Internal Borrowing)
	(1)	(2)
IOER Difference (pp)	-1.426***	0.514***
	(-4.83)	(3.40)
Fixed Effects:		
Bank	Yes	Yes
Quarter	Yes	Yes
R-sq.	0.674	0.79
Observations	770	1,247

Internal capital markets at work →
move funds from parent to US office

Results:

Table II (updated): Funding of Foreign Banks (Call Report Data) and FX Swaps (NY Fed FX Survey)

Dependent Variable:	Internal Capital Reallocation		U.S. Dollar Swapping Activity	
	Log(Internal Lending)	Log(Internal Borrowing)	Log(FX Swap)	Cost of FX Swap
	(1)	(2)	(3)	(4)
IOER Difference (pp)	-1.426***	0.514***	0.141***	0.609***
	(-4.83)	(3.40)	(5.15)	(6.99)
Fixed Effects:				
Bank / Currency	Yes	Yes	Yes	Yes
Quarter / Month	Yes	Yes	Yes	Yes
R-sq.	0.674	0.79	0.914	0.865
Observations	770	1,247	70	70

Cross-currency movements → synthetic dollar funding and rising cost of hedge

(data in columns 3-4 at currency-pair-month level)

Results:

Table III: Similar Pattern in Global Context using BIS data (US, GB, EA, JP, CH, CA)

Dependent Variable:	Log(Claims on Firms)		Log(Claims on Official Sector)		FX Swap Volume (USD bn)	
	(1)	(2)	(3)	(4)	(5)	(6)
IOER Difference (pp)	-0.101***	-0.131***	0.067***	0.159***	16.059***	11.832***
	(-9.74)	(-13.65)	(3.25)	(5.52)	(7.31)	(4.30)
Spot FX Rate (USD)	0.675***	--	0.640***	--	42.073***	--
	(10.98)		(2.91)		(3.15)	
Fixed Effects:						
Quarter *(t)*	Yes	--	Yes	--	Yes	--
Country *(j)*	Yes	--	Yes	--	Yes	--
Banking Sector *(i)*	Yes	Yes	Yes	Yes	Yes	Yes
Country*Quarter *(jt)*	--	Yes	--	Yes	--	Yes
Observations	1,023	1,023	1,019	1,019	848	848
R-squared	0.868	0.878	0.776	0.810	0.538	0.577

Micro Evidence:

- DealScan data on loan origination (syndicated loan sample)

- Lending in 6 currencies: USD, CAD, EUR, CHF, GBP, JPY

- All lenders and borrowers from these currency areas

- Key advantage: Better identification using loan origination in different currencies by *same bank* in *same quarter* + controlling for loan demand with borrower fixed effects

Results: Borrower-Lender-Level Regressions (Table VII)

Dependent variable: columns (1)-(4), dummy equal to 1 if the borrower got a loan from a foreign bank from a given currency area

| Dependent Variable:	Probability of Lending					Log(Amount)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IOER Difference (pp)	-0.136***	-0.147***	-0.083***	-0.097***	-0.101***	-0.005*	-0.011***	-0.024***	-0.128*	-0.122*
	(-15.34)	(-14.96)	(-4.89)	(-2.70)	(-3.00)	(-1.94)	(-4.13)	(-3.61)	(-1.88)	(-1.68)
Spot FX Rate (USD)	--	--	--	--	--	1.483***	1.330***	1.373***	1.755***	1.712***
						(20.90)	(19.25)	(18.51)	(4.21)	(4.31)
Fixed Effects:										
Bank (i)	Yes	Yes	--	--	--	Yes	Yes	--	--	--
Quarter (t)	Yes	Yes	--	--	--	Yes	Yes	--	--	--
Borrower (j)	Yes	Yes	Yes	--	--	Yes	Yes	Yes	--	--
Bank × Quarter (it)	--	--	Yes	Yes	Yes	--	--	Yes	Yes	Yes
Borrower × Quarter (jt)	--	--	--	Yes	Yes	--	--	--	Yes	Yes
Macro Controls	--	--	--	--	Yes	--	--	--	--	Yes
Observations	2,727,596	2,321,002	2,321,002	2,321,002	2,321,002	72,433	60,975	60,975	60,975	60,975
R-squared	0.013	0.013	0.018	0.651	0.652	0.760	0.794	0.805	0.974	0.974

Results:

Firm-Level Regressions (quarter following a *positive* IOER differential shock) (Table VIII)

- Question: Can a firm substitute a reduction in lending by accessing other banks?

$$I(Loan^f)_{jt} = D_j + D_t + \beta Foreign\ Bank\ Reliance^f_{jt} + \varepsilon^f_{jt}$$

- *Foreign Bank Reliance:* We look at composition of firm's last syndicate before foreign rate cut (*positive* IOER differential shock)
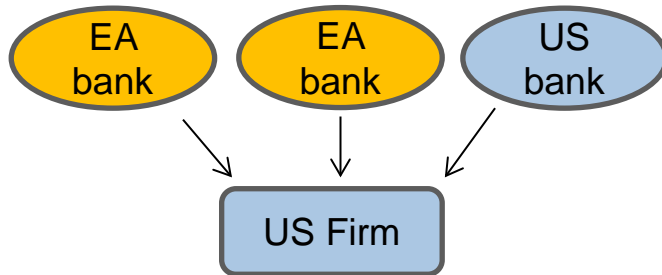
Example of RHS variable before foreign shock:

- If ECB cuts rate: *Foreign Bank Reliance*: 2/3
- If BOE cuts rate: *Foreign Bank Reliance* : 0

Results:

Table VIII: Firm-Level Regressions (quarter following a *positive* shock)

$$I(Loan^f)_{jt} = D_j + D_t + \beta Foreign\ Bank\ Reliance^f_{jt} + \varepsilon^f_{jt}$$

Dependent Variable:	Probability of Getting a Loan			ΔLog(Amount)		
	All Markets	All Markets r_d Shock	Foreign Market r_d Shock	All Markets	All Markets r_d Shock	Foreign Market r_d Shock
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Bank Reliance	-0.026***	-0.018***	-0.018***	-0.228***	-0.172**	-0.238***
	(-21.18)	(-12.97)	(-10.75)	(-3.17)	(-2.18)	(-2.67)
FX Spot (USD/Foreign Currency)	--	--	--	0.089	0.080	1.124**
				(0.81)	(0.56)	(1.99)
Fixed Effects:						
Firm (D_j)	Yes	Yes	Yes	Yes	Yes	Yes
Quarter (D_t)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,294,044	1,031,249	953,504	18,868	16,217	15,474
R-squared	0.052	0.060	0.064	0.230	0.241	0.241

2-std larger share of foreign banks from country that changes rates → probability of getting a loan drops by 13 percent and volume of loan drops by 8 percent

Further Results:

- The effects are stronger for banks with low capital (in line with theory)

- The effects are weaker for banks with better access to direct foreign funding (through subsidiaries or introduction of central bank swap lines)

- The effects are stronger for USD, but are not limited to USD

- Results are robust to alternative interest rate differentials (e.g., based on interbank overnight rate and government bond yields)

IOER Differential and Violations of Covered Interest Parity

Dependent Variable:	3M Basis (pp)		1Y Basis (pp)		5Y Basis (pp)	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔIOER Difference (pp)	0.098*	0.069*	0.151***	0.130***	0.125**	0.103***
	(1.91)	(1.69)	(4.11)	(5.52)	(2.57)	(3.17)
Fixed Effects						
Currency Pair (D_{fd})	--	Yes	--	Yes	--	Yes
Observations	312	312	312	312	312	312
R-squared	0.012	0.589	0.052	0.745	0.021	0.714

- Not formalized in model, but consistent with idea that monetary policy changes trigger large cross-currency movements that put pressure on FX swap markets

Final remarks:

- We provide a new insight into the operation of the international credit channel

    - Earlier view: Global banks' lending is defined solely by diversification

    - <u>Our view:</u> There are currency effects (due to liquidity management and due to use of internal capital markets) impact the relative attractiveness of lending abroad

- With increasing cost of FX swaps and capital constraints, cross-border implications of monetary policy go in the opposite direction