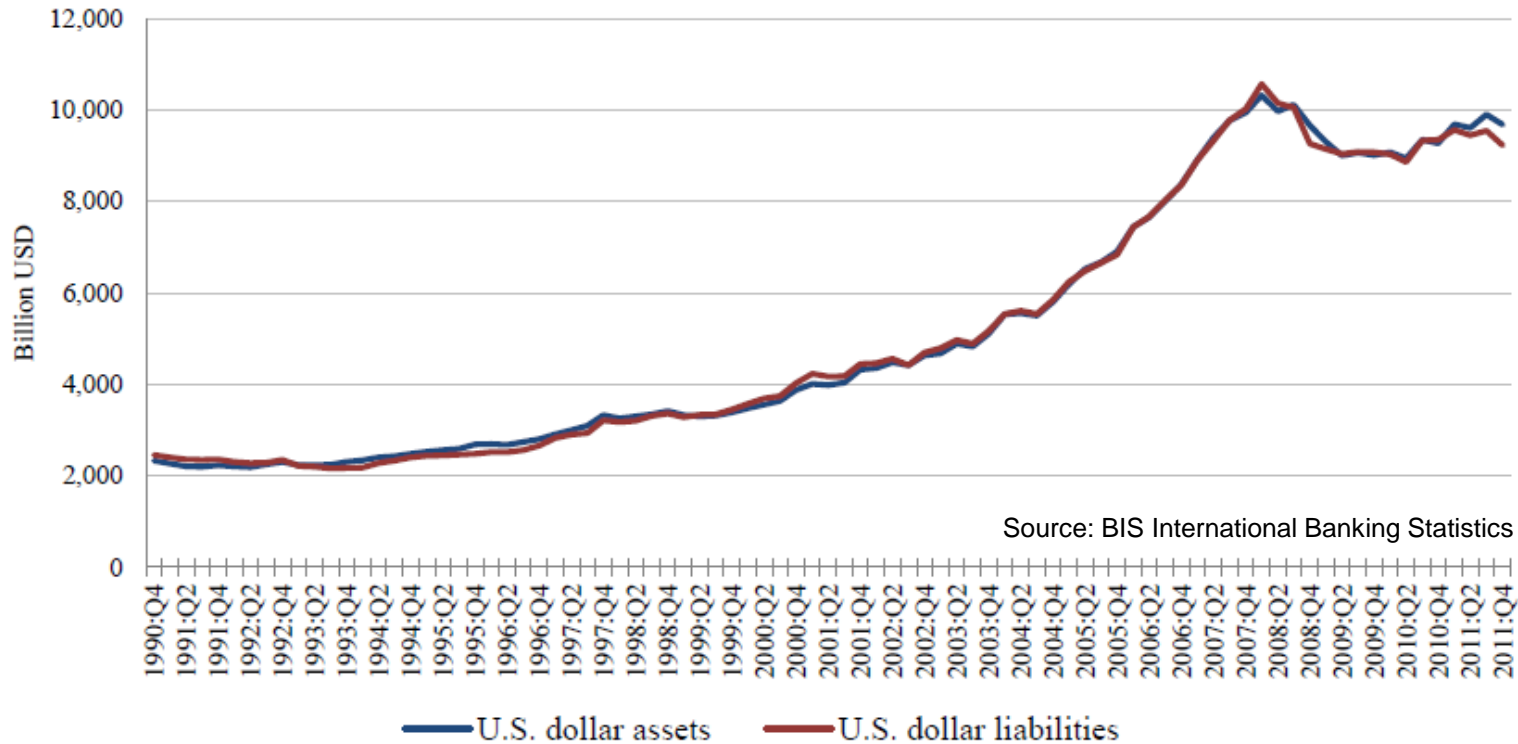

Dollar Funding and the Lending Behavior of Global Banks

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David Scharfstein
Jeremy Stein

Questions

- How do shocks to the ability of a foreign bank to raise dollar funding affect its lending
 - to dollar-based borrowers?
 - to euro-based borrowers?
- In the face of such shocks, why can't European banks tap more heavily into European funding sources, particularly depositors who may be less run-prone?
- If they can, does it mean that U.S. lending will be unaffected? Or does the source of the funding matter for where loans are made and in what currency?

USD-denominated Assets and Liabilities of Foreign Banks



- US dollar assets of foreign banks are:
 - very large
 - matched most of the time by dollar liabilities (deposits, MMFs, interbank loans etc.)

Syndicated Lending Around the World (2005-2007)

Paper: Table II

	Lending in the region	% of Total lending	Lending in Euro (billion USD)	Lending in USD (billion USD)	Lending in Euro (%)	Lending in USD (%)
<u>Eurozone banks:</u>						
Eurozone	1,036.15	45.5%	941.64	89.11	90.9%	8.6%
Rest of Europe	420.64	18.5%	124.04	127.12	29.5%	30.2%
U.S.	495.52	21.8%	4.30	490.53	0.9%	99.0%
Rest of North America	17.89	0.8%	0.00	14.47	0.0%	80.9%
Asia	139.44	6.1%	10.06	102.92	7.2%	73.8%
Latin America	81.09	3.6%	2.27	78.81	2.8%	97.2%
Middle East	63.25	2.8%	3.40	59.78	5.4%	94.5%
Africa	21.27	0.9%	1.74	17.65	8.2%	83.0%
Total:	2,275.25		1,087.46	980.39	47.8%	43.1%
<u>U.S. banks:</u>						
Eurozone	313.96	7.8%	252.06	60.53	80.3%	19.3%
Rest of Europe	234.74	5.8%	41.48	75.46	17.7%	32.1%
U.S.	3,269.47	80.8%	7.82	3,255.99	0.2%	99.6%
Rest of North America	56.83	1.4%	0.12	47.79	0.2%	84.1%
Asia	89.91	2.2%	5.56	60.11	6.2%	66.9%
Latin America	56.79	1.4%	0.41	56.38	0.7%	99.3%
Middle East	15.54	0.4%	0.16	15.38	1.0%	99.0%
Africa	10.24	0.3%	0.32	8.69	3.1%	84.9%
Total:	4,047.48		307.93	3,580.33	7.6%	88.5%

- Foreign banks play a major role around the world and in the U.S. market

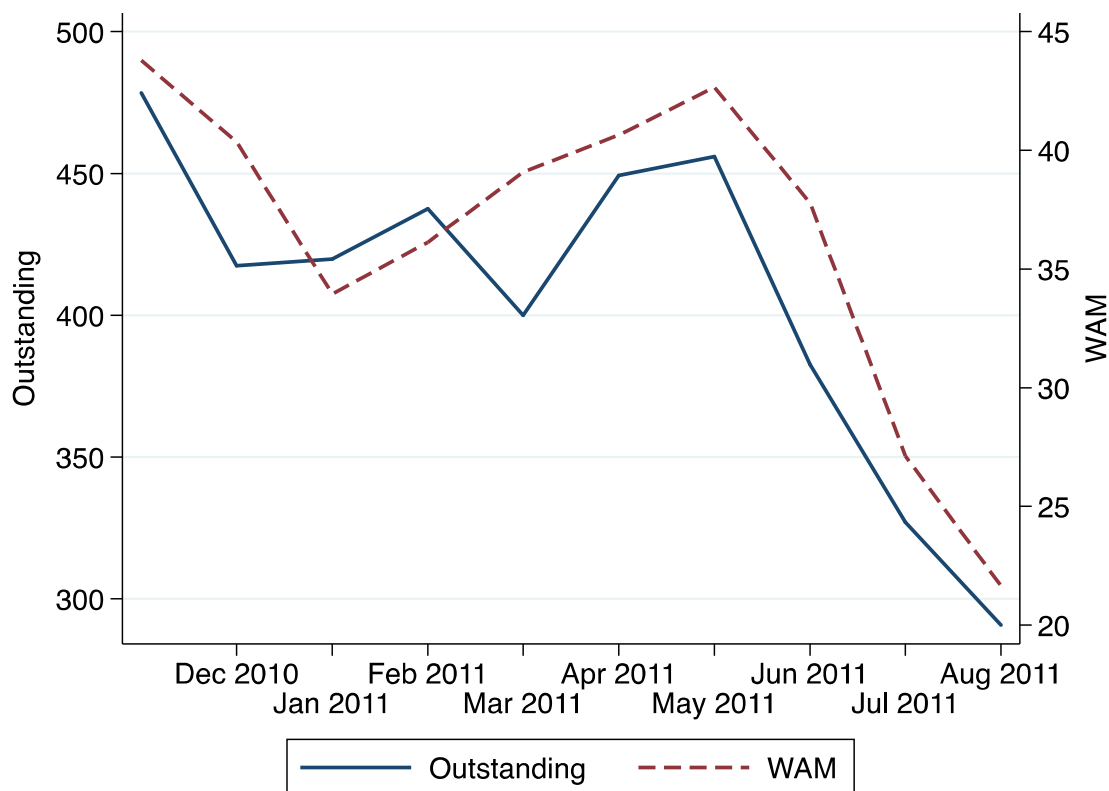
U.S. Prime Money Market Funds as a Dollar Funding Source

Bank	Country	MMF reliance as of April 2011
Eurozone:		
Deutsche Bank	Germany	7.65
Rabobank	Netherlands	7.63
Societe Generale	France	6.25
ING Bank	Netherlands	5.14
Natixis	France	5.06
Credit Agricole	France	4.28
BNP Paribas	France	4.25
Commerzbank	Germany	1.90
Banco Bilbao Vizcaya Argentaria	Spain	1.25
UniCredit	Italy	0.99
Banco Santander	Spain	0.78
Rest of Europe:		
Credit Suisse	Switzerland	4.92
Barclays Bank	UK	4.37
Lloyds TSB Bank	UK	3.97
UBS	Switzerland	3.32
RBS	UK	2.29
HSBC	UK	1.49

$$\text{MMF Reliance} = \text{MMF Holdings}_{\text{April 2011}} / (\text{Deposits} + \text{Short Term Debt})_{2010}$$

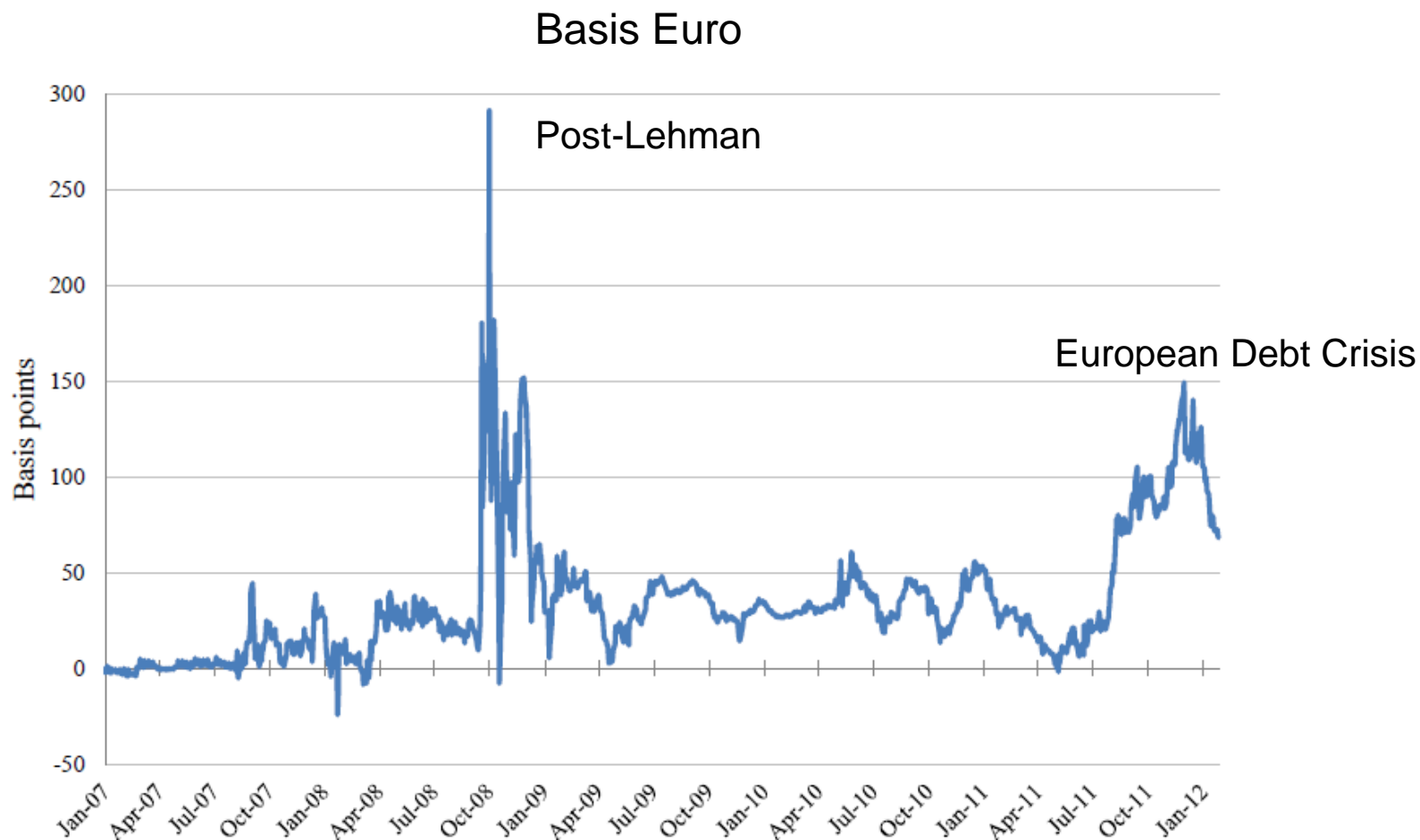
MMFs Reduce their Exposure to Eurozone Banks

Total Outstanding (\$Billions) and
Weighted Average Maturity (Days)
Held by Prime MMFs



Source: Chernenko, S. and A. Sunderam (2012), "The Quiet Run of 2011: Money Market Funds and the European Debt Crisis"

Deviations from Covered Interest Parity (CIP)



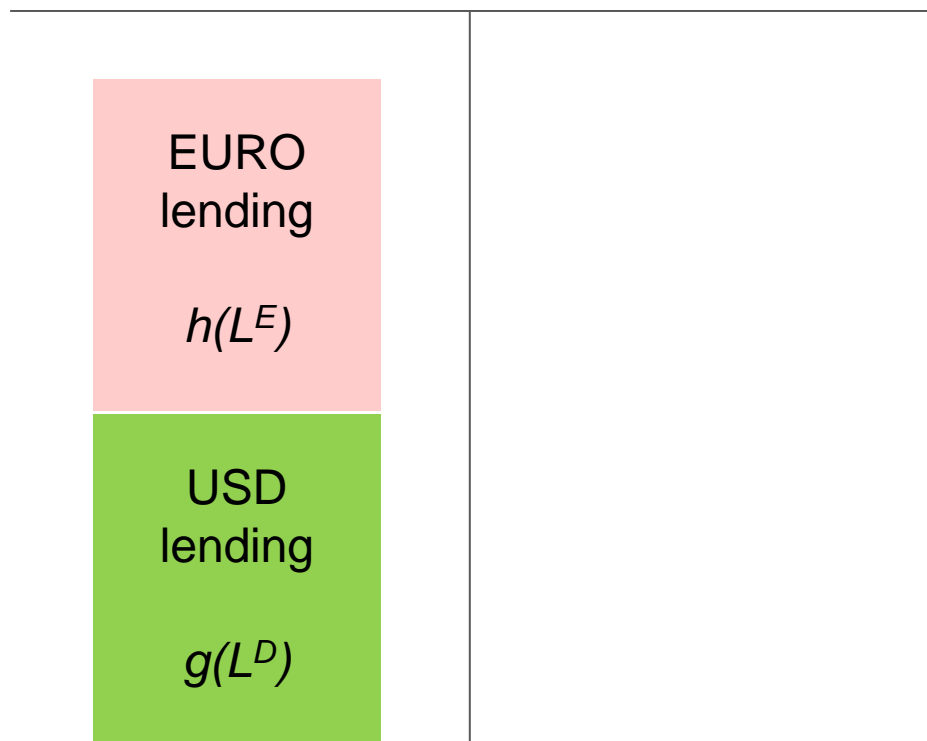
FX swaps are the primary means through which global banks manage the currency mismatch between their assets and liabilities (e.g., Fender and McGuire, 2010)

Related Literature

- Banking literature focuses almost entirely on bank capital as the relevant constraint on lending
 - Bernanke and Gertler (1989)
 - Hölmstrom and Tirole (1997)
- Focus of global banking literature is on how shocks to *capital* affect lending around the world
 - Peek and Rosengren (2000)
 - Schnabl (2012)
 - Cetorelli and Goldberg (2011, 2012)
- Recent financial crises have highlighted the importance of funding issues, but there is much less theory and empirical work on funding constraints domestically and globally
 - Chernenko and Sunderam (2011)
 - Acharya, Afonso, and Kovner (2012)

Elements of the Model

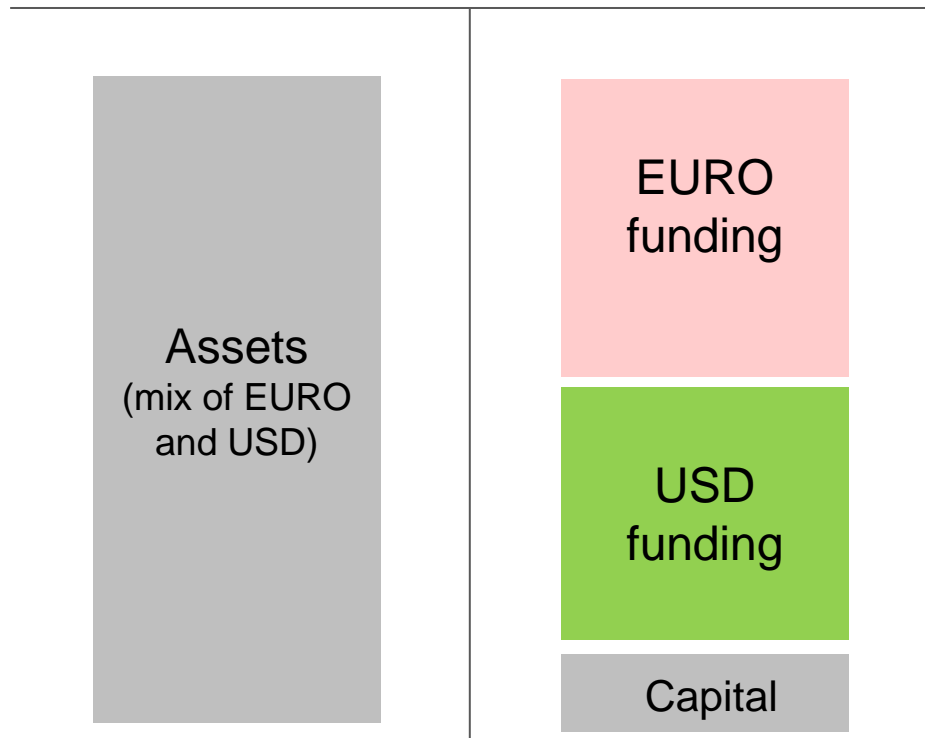
Eurozone bank:



$$L^E + L^D \leq K$$

Elements of the Model

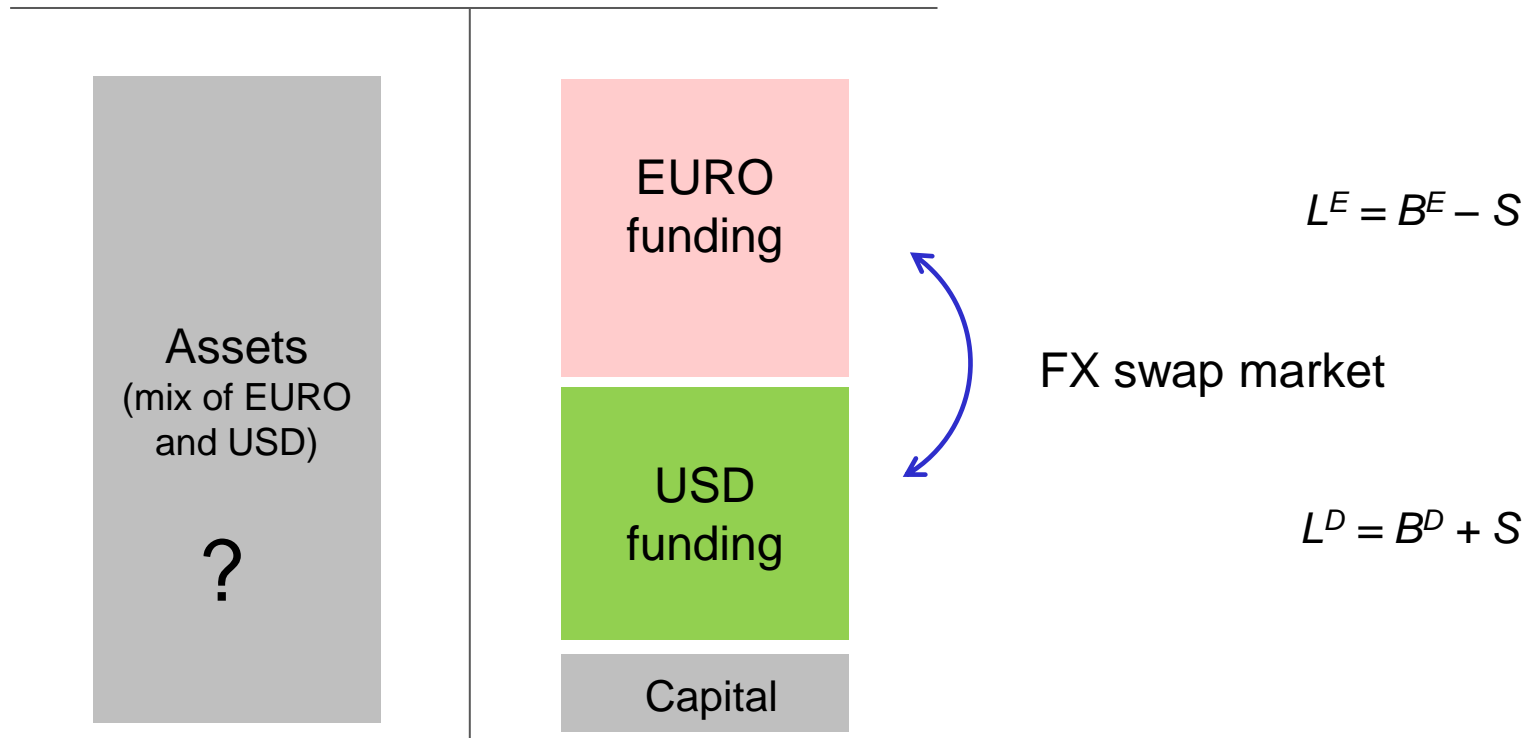
Eurozone bank:



- 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

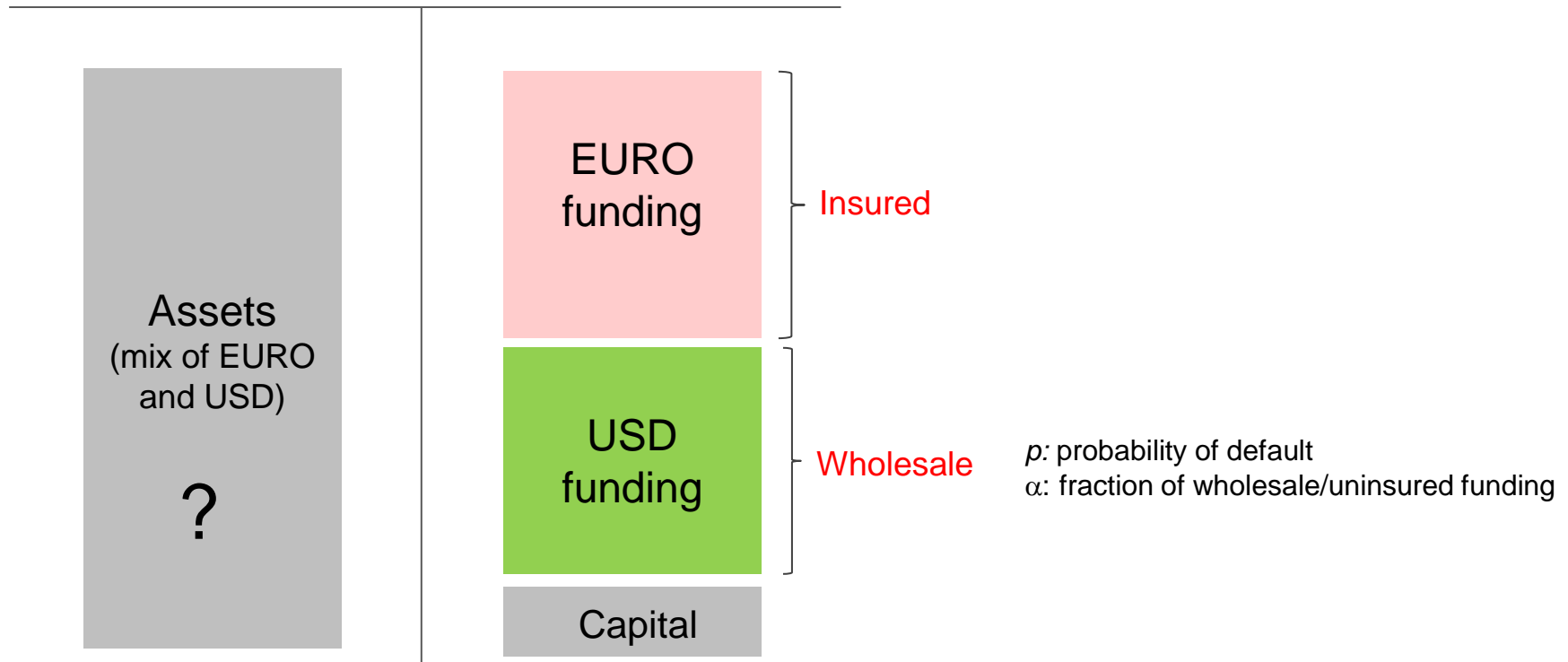
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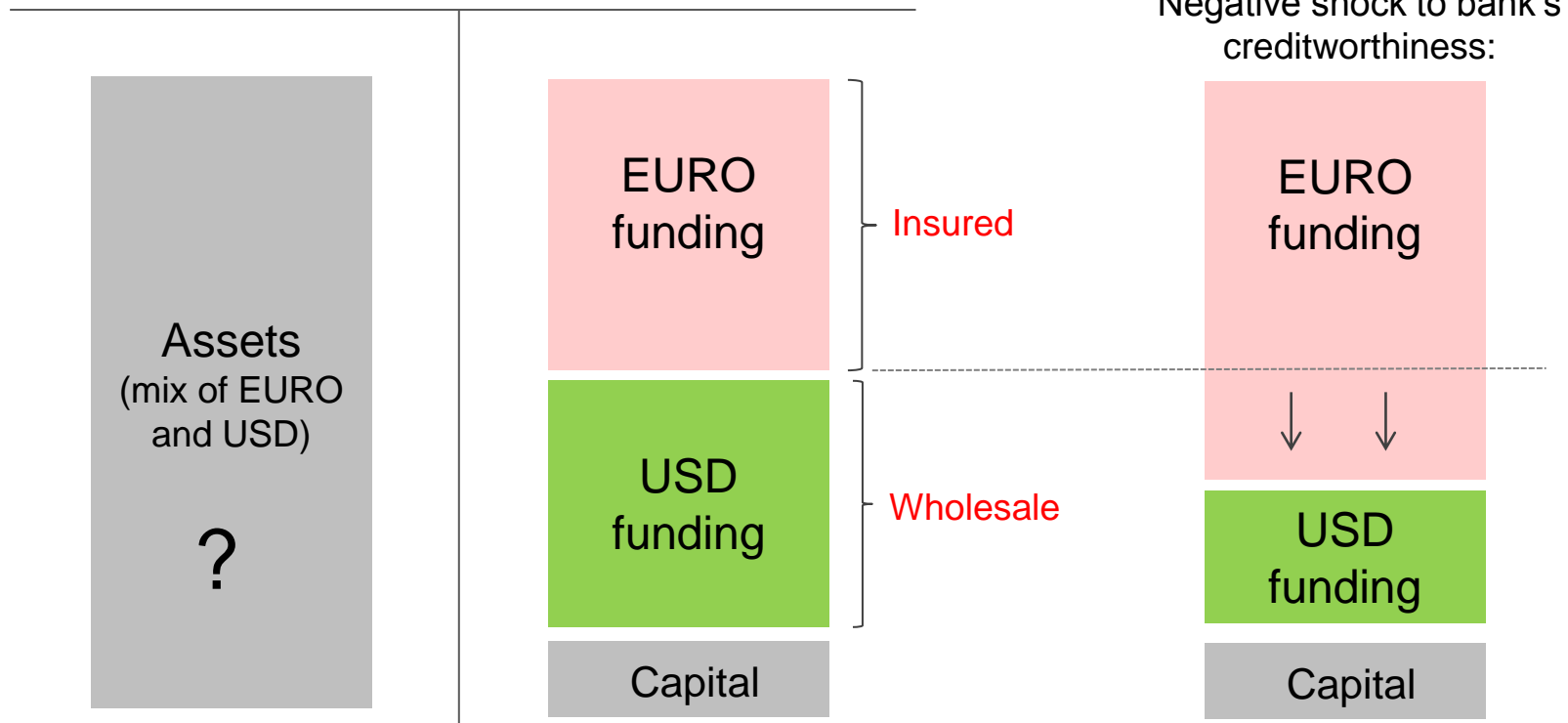
Elements of the Model

Eurozone bank:



Elements of the Model

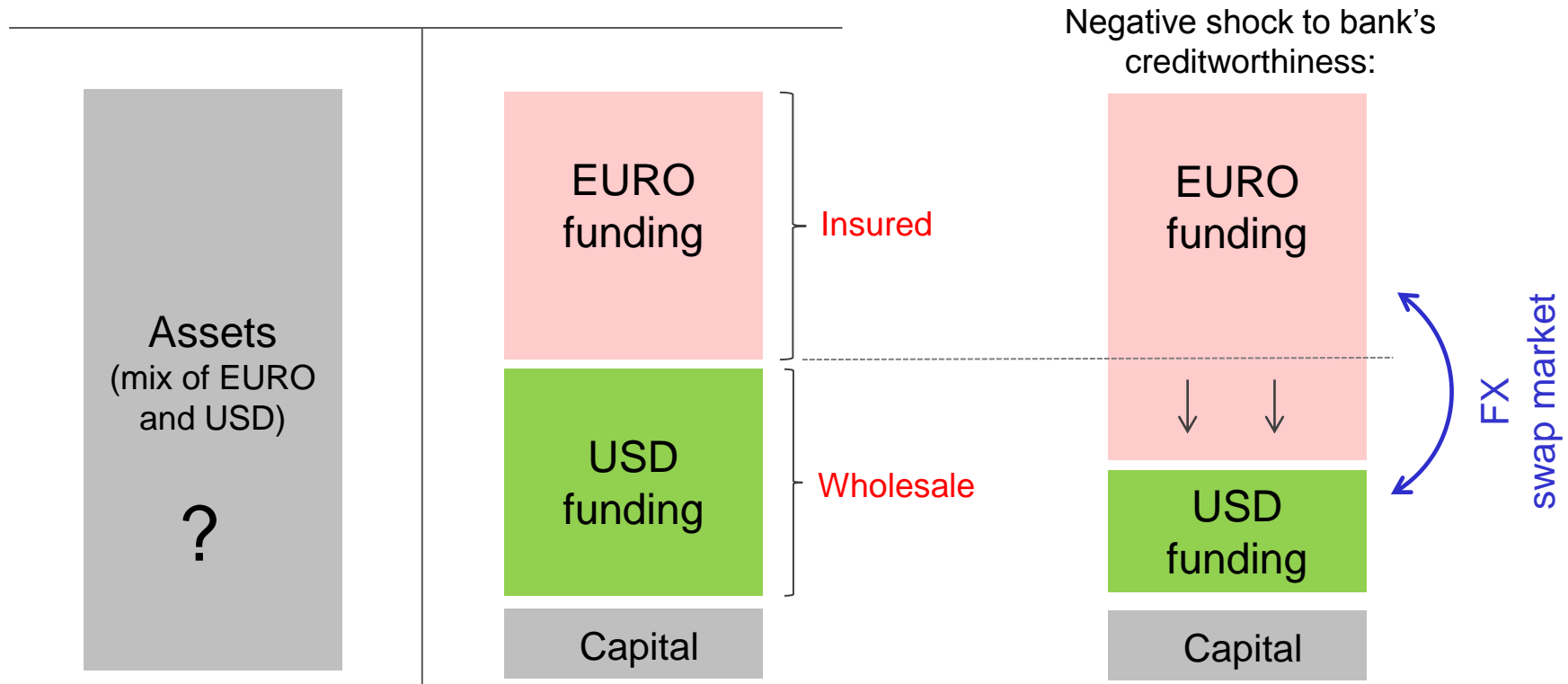
Eurozone bank:



- Borrowing in the home (euro) country is cheaper because of a too-big-to-fail subsidy
- Increase in concerns about bank solvency increases the costs of dollar relative to euro funding

Elements of the Model

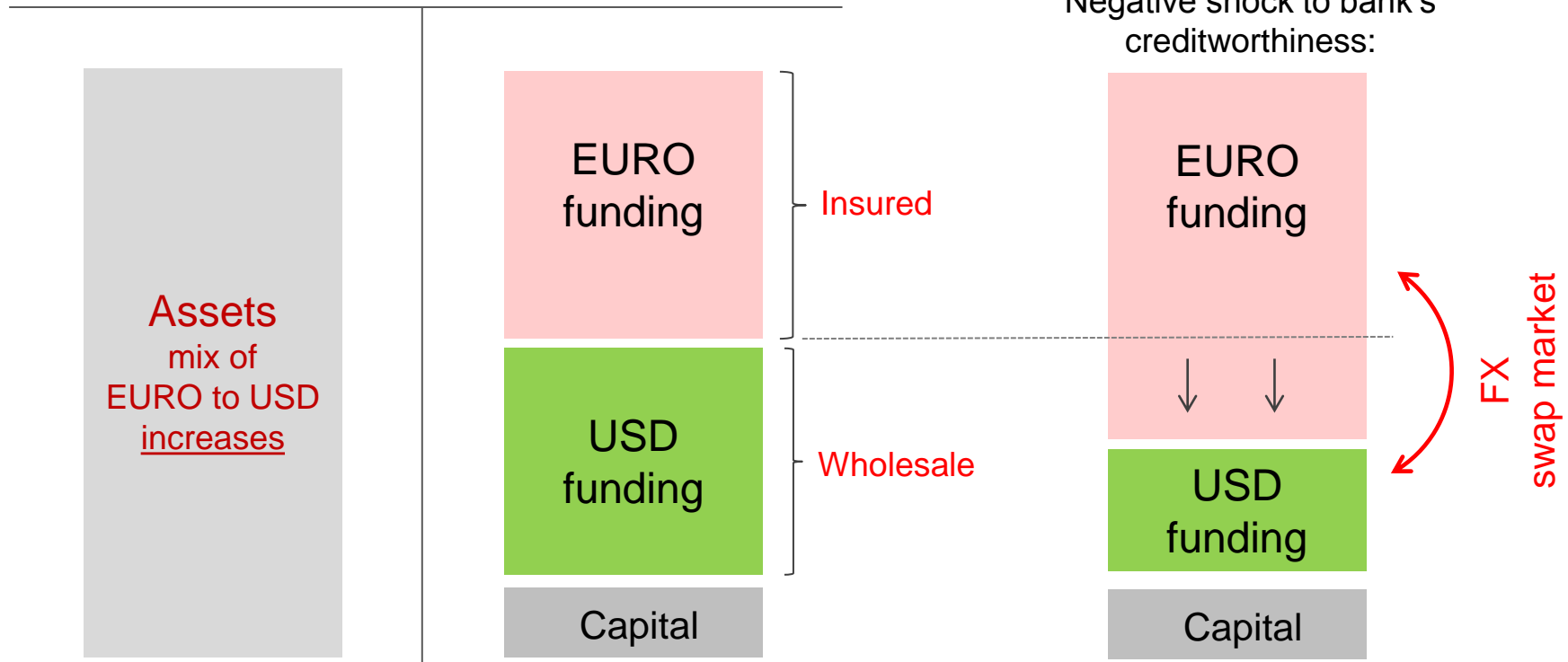
Eurozone bank:



- In absence of a breakdown in FX market, shock to USD funding affect the currency blend of the funding, but not of the assets

Elements of the Model

Eurozone bank:



- Increase in bank solvency risk
 - increase in the costs of USD funding relative to euro funding
 - increase in demand for borrowing in euros and swapping into dollars
 - capital-constrained arbitrageurs need to earn higher returns on the swap
- Increase in bank solvency risk makes it more expensive to make dollar loans

Characteristics of the Equilibrium

1. Swap Supply: Arbitrageurs equate the expected swap return, Δ , to the expected return on alternative investment opportunity
 - $\Delta > 0$ implies violation of Covered Interest Parity (CIP)
2. Swap Demand: Bank swaps euro borrowing into dollars such that the expected endogenous cost of the swap, Δ , equals the relative subsidy to euro borrowing, αp
 - The subsidy is increasing in the probability of default, p , and the extent to which the bank depends on wholesale funding in USD, α
3. Dollar and Euro Lending: Banks equate the marginal value of euro lending, h' , to the marginal value of dollar lending, g' , net of the cost of swaps, Δ :

$$\begin{aligned}h'(L^E) &= g'(L^D) - \Delta \\ &= g'(L^D) - \alpha p\end{aligned}$$

Euro lending relative to dollar lending is increasing in the subsidy to euro borrowing (high α and high p)

Key Empirical Implications

- An increase in perceived riskiness (p) of Eurozone banks, as in the recent MMF crisis, leads to:
 - i. decreased lending in dollars;
 - ii. increased lending in euros;
 - iii. increased swap activity;
 - iv. larger deviations of CIP basis.
- Given that the MMF funding shock was also associated with concerns about Eurozone bank capital (K) we would expect to see a decrease in dollar and euro lending but a decrease in the share of loans that are made in dollars
 - As noted before, a capital shock alone (a decrease in K) would not generally predict an decrease in the dollar loan share
- Main empirical prediction is that Eurozone banks will decrease their dollar loan share, while there should be no effect for banks with limited European sovereign debt exposure
- The model also predicts that there should be a bigger impact of increase in p on the lending behavior of banks that receive more dollar wholesale funding (as proxied by dependence on U.S. MMFs)
 - More MMF dependent banks should experience bigger drop in dollar loan share

Data

- Empirical analysis uses loan data in U.S. and Eurozone from Thomson Reuters *DealScan* database
 - Loan issuance at origination
- *DealScan* primarily covers syndicated loans
 - Syndicated loan is typically originated by one bank but funded by a group of lenders (syndicate participants)
- Syndicated lending is an important part of the overall lending volume
 - In 2011, global syndicated loan issuance was \$3.75 trillion USD
 - \$1.9 trillion in the U.S. market (46% investment grade)
 - \$1 trillion in the European market
- Loan size in 2011, U.S. borrowers: 1st pct. -- \$10 million, median -- \$215 million
- Overall:
 - Downside of using *DealScan* is that It misses small loans
 - Upside is access to loan issuance data (vs. loans outstanding on bank balance sheets)

	Market:	Share of Eurozone lending		Market share U.S.	
		Lead	All lenders	Lead	All lenders
Europe, "GIIPS":					
UniCredit	Italy	3.02	3.21	0.05	0.31
Banco Bilbao Vizcaya Argentaria	Spain	2.33	2.23	0.06	0.43
Intesa Sanpaolo	Italy	1.91	2.14	0.04	0.26
Banco Santander	Spain	2.37	2.32	0.10	0.44
Mediobanca	Italy	0.99	1.07	--	--
Banco Financiero y de Ahorros	Spain	0.90	1.00	0.01	0.04
La Caja de Barcelona	Spain	0.78	0.77	--	--
Banco de Sabadell	Spain	0.32	0.35	--	--
Bank of Ireland Group	Ireland	0.30	0.45	0.05	0.24
ICO [Instituto de Credito Oficial]	Spain	0.23	0.26	--	--
France:					
BNP Paribas	France	6.70	5.07	2.31	2.36
Credit Agricole	France	4.91	4.29	1.03	1.25
Societe Generale	France	4.57	3.64	0.48	1.02
Natixis SA	France	3.01	3.22	0.09	0.47
CM-CIC	France	1.32	1.72	0.00	0.06
BeNeLux:					
ING Group	Netherlands	2.72	2.47	0.33	0.81
Fortis Bank	Belgium	1.71	1.89	0.38	0.66
Rabobank	Netherlands	0.78	0.96	0.30	0.41
KBC Group	Belgium	0.47	0.74	0.02	0.28
Dexia Bank	Belgium	0.46	0.65	0.02	0.06
Rest of Eurozone:					
Commerzbank	Germany	4.92	4.74	0.50	0.90
Deutsche Bank	Germany	4.74	3.50	4.47	3.25
WestLB	Germany	1.32	1.41	0.14	0.29
BayernLB	Germany	1.13	1.22	0.07	0.23
Landesbank Baden-Wurtemberg	Germany	0.98	1.14	0.01	0.04
Landesbank Hessen-Thuringen [Helaba]	Germany	0.42	0.62	0.04	0.08
DZ Bank	Germany	0.42	0.56	0.01	0.10
KfW Bankengruppe	Germany	0.41	0.68	0.00	0.01
HSH Nordbank	Germany	0.38	0.38	0.06	0.09
NordLB Group	Germany	0.24	0.31	0.03	0.08
Total Eurozone:		54.77	53.00	10.61	14.15

Dollar Loan Share of Eurozone Banks Falls after Shock

- The dependent variable is the fraction of loans originated by bank's i in month t that is denominated in U.S. dollars (S_{it}); denominator is euro- and U.S. dollars- denominated loans. Sample period: 2005-2011

$$S_{it} = D_i + \beta POST.$$

vs. mean 16.8%

Banks:	Eurozone banks			
	Europe and U.S.		Europe	
Market:	(1)	(2)	(3)	(4)
POST (05/2011-12/2011)	-0.0333 ** [0.0124]	-0.0422 *** [0.0128]	-0.0348 *** [0.0123]	-0.0438 *** [0.0127]
EUROBANK*POST	--	--	--	--
USD/Euro spot exchange rate	--	0.1995 *** [0.0523]	--	0.2034 *** [0.0532]
Fixed effects:				
Bank (D_i)	Yes	Yes	Yes	Yes
Month (D_t)	No	No	No	No
Obs.	924	924	924	924
Clusters	22	22	22	22
Adj. R-squared	0.05	0.06	0.05	0.06

Dollar Loan Share of Eurozone Banks Falls after Shock

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$$S_{it} = D_i + D_t + \beta \text{EUROBANK}_i * \text{POST}$$

Banks:	Eurozone and U.S. banks (diff-in-diff)		
Market:	Europe and U.S.		
	(5)	(6)	(7)
POST (05/2011-12/2011)	-0.0017 [0.0124]	-0.0093 [0.0126]	--
EUROBANK*POST	-0.0316 * [0.0174]	-0.0316 * [0.0174]	-0.0316 * [0.0180]
USD/Euro spot exchange rate	--	0.1713 ** [0.0430]	--
Fixed effects:			
Bank (D_i)	Yes	Yes	Yes
Month (D_t)	No	No	Yes
Obs.	1,428	1,428	1,428
Clusters	34	34	34
Adj. R-squared	0.81	0.81	0.83

Are Results Driven by Differential Loan Demand?

- Borrowers from Eurozone banks in U.S. syndicated loan market are U.S. firms, not U.S. subsidiaries of European firms
- U.S. borrowers from Eurozone banks tend to be larger than U.S. borrowers from U.S. banks
 - If anything, suggests that demand for loans from Eurozone banks in U.S. should fall by less than loan demand from U.S. banks
 - Eurozone borrowers from Eurozone banks are also smaller, suggesting that loan demand in Eurozone should fall by more
 - Makes it more difficult to observe the patterns we document
- Econometric evidence from firm fixed-effects regressions

Firm-Level Fixed-Effect Regressions

- The dependent variable is $EUROBANK\ SHARE_{i,t}$, a variable between 0 and 1 equal to fraction of lead banks on the loan headquartered in the Eurozone.
- Sample: 2000-2011; each observation is a separate loan (i)

Market:	Europe and U.S.		Europe	
	(1)	(2)	(3)	(4)
DOLLAR LOAN	-0.0581 *	-0.0548 *	-0.0166	-0.0236
	[0.031]	[0.030]	[0.033]	[0.031]
DOLLAR LOAN*POST	-0.0655 ***	-0.0651 ***	-0.0956 **	-0.1055 **
	[0.018]	[0.018]	[0.047]	[0.048]
Ln(Loan amount)	--	-0.0043	--	-0.0484 ***
		[0.003]		[0.009]
Fixed effects:				
→ Borrower(D_j)	Yes	Yes	Yes	Yes
Month (D_t)	Yes	Yes	Yes	Yes
Obs.	34,107	34,088	5,859	5,842
Clusters	13,728	13,719	2,916	2,908
Adj. R-squared	0.84	0.84	0.78	0.79

Regressions: Dollar Loan Share and MMF Dependence

- The dependent variable is the fraction of loans originated by bank's i in month t that is denominated in U.S. dollars (S_{it}); denominator is euro- and U.S. dollars- denominated loans
- Sample: 2005-2011
- POST is a dummy = 1 for May – December 2011

Banks:	Eurozone banks	
Market:	Europe and U.S.	Europe
	(1)	(2)
MMF*POST	-0.0105 ** [0.0039]	-0.0101 ** [0.0039]
Fixed effects:		
Bank (D_i)	Yes	Yes
Month (D_t)	Yes	Yes
Obs.	924	924
Clusters	22	22
Adj. R -squared	0.15	0.15

25th % MMF dependence – 1.25%

75th % MMF dependence – 6.25%

Conclusion

- Eurozone banks are a key source of funding for U.S. firms and households
- We present a model that helps to explain this phenomenon
 - Greater government subsidies on euro borrowing relative to wholesale dollar funding
 - Creates incentives for banks to increase euro borrowing and swap into dollars to fund dollar loans
 - But limited arbitrage capital in FX swap market induces violations of Covered Interest Parity and reduces incentive of banks to swap euros into dollars
 - Banks cut dollar lending relative to euro lending
- One of the consequences of the European sovereign debt crisis was that Eurozone banks contracted their dollar lending relative to euro lending despite the fact that European economies were more threatened by the debt crisis
 - Banks that were more dependent on wholesale dollar funding (MMFs) cut their dollar loan share by more