

Dollar Illiquidity and Central Bank Swap Arrangements During the Global Financial Crisis

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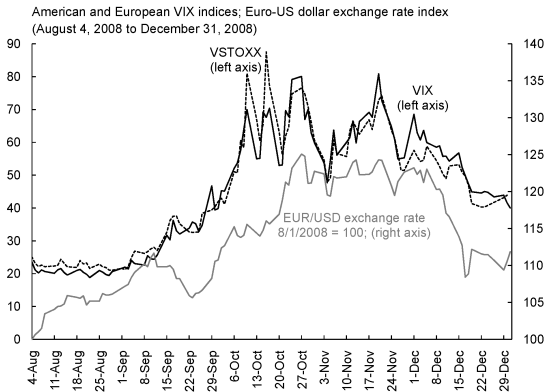
June 1, 2011

Note: The views expressed are those of the authors and do not necessarily represent those of the Federal Reserve Board of Governors or the Federal Reserve Bank of San Francisco.

Recent crisis originated and was centered in the United States

- \$8 trillion sell off in U.S. equity values 10/07-10/08
- Most anticipated that dollar depreciation would accompany adjustment process to undo global imbalances
- Instead, crisis currency appreciated!

Dollar appreciation coincided with increased volatility



Pattern suggests illiquidity in dollar assets

- Dollar enjoys unique roles as vehicle and reserve currencies
- Financial institutions faced particularly difficult issues
 - Short-term obligations that needed to be settled in dollars
 - Declines in dollar assets that resulted in currency mismatches
- Swap arrangements designed to meet these needs
- FRB December 12, 2007:
" ... measures designed to address elevated pressures in short-term funding markets"
- "... one of the most notable examples of central bank cooperation in history ..." (e.g. Obstfeld Shambaugh Taylor 2009)

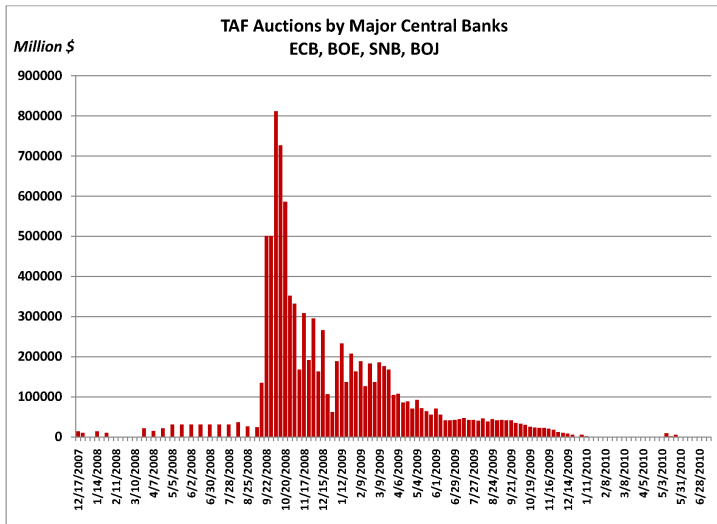
International swap arrangements

- First extended in December 2007.
 - Short-term loans to foreign central banks in dollars to be repaid *in dollars*
 - Foreign central banks issued funds to their national institutions
 - Usually in the form of auctions, such as ECB TAF auctions
 - No FRB exposure to foreign financial institutions
- Initially with ECB (\$20b) and SNB (\$4b)
 - As conditions deteriorated, program expanded
 - By October of 2008, "uncapped" for ECB, SNB, BOJ, and BOE.
- At height of program, draw downs around \$600 billion
 - \$291 billion at ECB, \$122 billion at BOJ, \$45 billion at BOE
- Terms were tough (100 bp above TAF), and positions were retired as conditions improved

Timeline of major swap announcements

Date	Announcement Type
12/12/2007	Swap lines introduced with ECB (\$20b) and SNB (\$4b)
9/18/2008	Swap lines introduced with BOJ (\$60b), BOE (\$40b), and Bank of Canada (\$10b). Funds increased for the ECB (\$110b) and SNB (\$27b).
9/24/2008	Swap lines introduced with Australia (\$10b), Sweden (\$10b), Denmark (\$5b), and Norway (\$5b).
10/13/2008	Unlimited swaps announced with ECB, BOE, and SNB.
10/14/2008	Unlimited Swaps announced with the BOJ
10/28/2008	Swap lines introduced with the Reserve Bank of New Zealand (\$15b).
10/29/2008	Swap Line Introduced with Brazil, Mexico, Korea, and Singapore (\$30b).

Weekly Major Central Bank TAF Auction Volumes



Empirical evidence on success of liquidity injections unclear

- Taylor and Williams (2009): No impact on LIBOR spreads over OIS swaps
- McAndrews, et al (2008): Find impact on changes in spreads, but only 2 basis points
- Baba and Packer (2009): Fund lines significantly mitigated disruptions in FX markets after Lehman crisis (but not before)
- Aizenman and Pasricha (2010): Little impact on spreads in emerging market swap partners

Difficulties with time series-based evidence

- Implicitly ascribes all movements not covered by measured changes in counterparty risk to the policy action
- Central bank swap policies have been endogenous
 - Aizenman and Pasricha (2010): Emerging market economy granted swap arrangements have large outstanding US debt obligations.
- Swap announcements reveal information about crisis
- Difficult to separate direct impact from impact on expectations about fundamentals
- Desirable to identify restrictions in the cross section

Theoretical sources of heterogeneity in expected auction impacts

- Lagos and Wright (2005): Search-based model with bargaining in decentralized "night market" in two periods
 - "Day market": All goods and assets clear
 - "Night market": Bilateral matching and bargaining
 - Allows for tractable bargaining under illiquidity
 - Centralized market prices degenerate, allowing for easy bargaining solutions
- In companion paper, we generalize to international version

Overview of international version

- Two countries, US and ROW
- Four assets: Each economy has a domestic money supply, as well as a real asset
- Agents have perfect information about the value of *their* economy's money, which is in fixed supply
- Real assets yield a dividend in the centralized market the following period
 - There are good assets and bad real assets
 - Bad assets yield zero dividend, good assets yield a fixed positive dividend
- In each period, agents participate in two markets
 - Centralized global market: Frictionless, prices clear, law of one price holds
 - Decentralized market: Coincidence of wants problem, demand for money as medium of exchange

Centralized vs decentralized market

- All agents know asset values in centralized market and assets denominated in all currencies universally accepted
 - Results are Walrasian
- Decentralized market
 - Agents randomly paired into bilateral meetings
 - Only accept assets in home country currency
 - Only informed agents can distinguish good assets from bad
 - Uninformed agents unwilling to accept real assets in exchange
 - Simplifies the decision rule, as only need to consider two types of agents from each country, informed and uninformed

Probabilities of coincidences of wants

- Probability of landing in a meeting with coincidence of wants is exogenous function of two arguments:
 - Proportional to the share of output
 - Probability of coincidence of wants between two agents from the same country exceeds that of two agents from different countries
- Equilibrium defined as solution for asset holdings by agents from u and r , $(m_{u,u}, m_{u,r}, a_{u,u}, a_{u,r})$, and $(m_{r,u}, m_{r,r}, a_{r,u}, a_{r,r})$, asset prices $(\phi_u, \phi_r, \psi_u, \psi_r)$, terms of trade in decentralized markets, (p_k, q_k) ; $k = u, r$, leisure choices, (x_u, h_u) and (x_r, h_r) , bargaining solutions in DM, and market clearing in CM, which satisfy maximization conditions of each agent

Model results

- First solve for steady state
- Then compare across steady states by considering the implications of a once and for all change in the value of dividend on real asset of country u
- Results imply that decline in the payment stream of the risky asset from country u leads to appreciation in country u 's exchange rate
- Intuition is fall in dividend raises the value of liquidity services provided by country u currency, raising its value relative to country r currency

- Model capital injections from foreign central bank swaps as increase in $m_{r,u}$ in DM
- Benefits from increased dollar liquidity positively related to 3 characteristics:
- "exposure," probability of need to transact in dollars
 - Related to country size
 - Shared home country (home bias)
- "opaqueness," share of inadmissible assets
 - Related to prevalence of toxic dollar-denominated assets
- "illiquidity," expected shortfall of admissible cash in DM
 - Related to net debt position of country
 - Could also be specific to dollar debt position

Empirical strategy

- Examine impact of TAF auctions and announcements of changes in swap programs
- Use differences in CDS spreads as indicator of changes in liquidity [Aizenman and Pasricha (2010)]
 - Requires a proxy for default risk to isolate liquidity changes
- Sample is weekly data, from December 10, 2007 to December 31, 2009
- 30 OECD and 38 non-OECD countries
- Foreign central bank auction data from Federal Reserve
- Condition on auction characteristics
 - Overall dollar value
 - Average tenor in length of contracts auctioned in days (1 to 95)

TAF Auctions by major central banks vary over sample in volume and tenor

Quarter	ECB		BOE		BOJ		SNB	
	Dollars Auctioned (Millions)	Average Tenor (Days)	Dollars Auctioned (Millions)	Average Tenor (Days)	Dollars Auctioned (Millions)	Average Tenor (Days)	Dollars Auctioned (Millions)	Average Tenor (Days)
2007q4	20000	31.5	-	-	-	-	4000	28.0
2008q1	35000	28.0	-	-	-	-	10000	28.0
2008q2	130000	28.0	-	-	-	-	30000	28.0
2008q3	589742	11.3	216044	2.1	29622	28.0	132139	11.8
2008q4	3608841	8.3	667737	9.7	205635	54.2	196948	11.3
2009q1	1937722	7.4	30956	50.6	106253	59.1	51702	20.0
2009q2	865642	9.5	3503	59.7	36243	49.4	41006	18.7
2009q3	542729	7.5	538	26.4	8100	31.5	18	28.0
2009q4	259478	7.5	52	7.0	1300	32.4	-	-
2010q1	6575	7.0	-	-	100	29.0	-	-

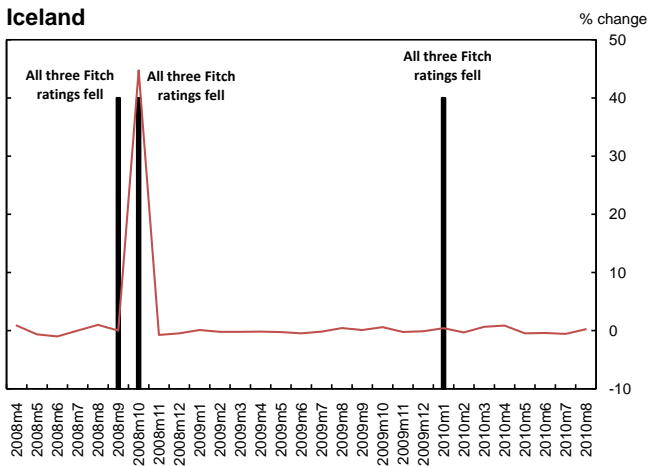
Proxy for default risk

- Need weekly indicator of default risk changes
 - Unavailable for large cross-section
- Use Google Insights for Search
 - Google search used by Choi and Varian (2009) to predict levels of economic activity for automobile sales and unemployment figures
 - Da, Engelberg, and Gao (2011): Increased search associated with temporary increases in equity values
 - Shown to be most useful in describing current conditions, rather than forecasting ("nowcasting")
- Measure changes in perceived sovereign risk as relative incidence of searches of default-related words combined with country name

Methodology in constructing Google proxy

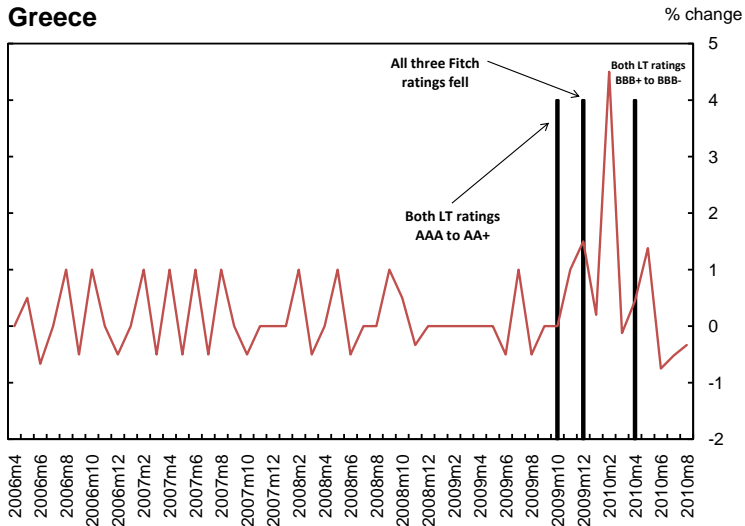
- Google does not provide responses when search volume falls below an unspecified threshold
 - We proxy as equivalent to lowest reported value (upper-bound)
- Google restricts number of searches per day, precluding examining all permutations of default-related terms
 - Begin with 33 default-related terms
 - First search with country names and each word
 - Regress on changes in Fitch ratings (monthly data)
 - 3 are significant: crisis, financial and freeze
- Then search over four word strings, adding each remaining word individually
 - 5 improve fit: credit ,debt, exposure, liability, recession, safety
 - Best with recession
- Addition of fifth word did not improve, so use crisis, financial, freeze, and recession

Iceland: Fitch Ratings changes and Google search volumes (2008-2010)



Greece: Fitch Ratings changes and Google search volumes (2007-2010)

Greece



Panel Regressions of Google searches and Fitch sovereign ratings (country and time FE included)

I. Full Sample: January 2004-September 2010

Rating	Coefficient	T-stat	# of Obs	# of Countries	R-squared
Local LT	-0.04**	-4.0	5360	100	0.07
Foreign LT	-0.01**	-5.15	5410	99	0.04
Foreign ST	-0.05**	-4.73	5363	98	0.09

II. Study Sample: December 2007-December 2009

Rating	Coefficient	T-stat	# of Obs	# of Countries	R-squared
Local LT	-0.04**	-9.7	2245	96	0.15
Foreign LT	-0.02**	-11.56	2270	96	0.08
Foreign ST	-0.06**	-10.81	2260	96	0.22

Initially examine specification with event dates

- Include auction events, weighted by volume and tenor $auction_{t-1}$
 - Time dummies excluded
- Also include 3 interactive terms main variables that are variables of interest
 - $Exposure_{it} \cdot auction_{t-1}$ (exposure),
 - $Transp_{it} \cdot auction_{t-1}$ (transparency),
 - and $Illiquid_{it} \cdot auction_{t-1}$ (illiquidity).
- Results disappointing
 - Variables of interest almost universally insignificant
 - Auction event variable usually insignificant as well
- Poor results likely attributable to endogeneity of auction timing
 - Largest auctions took place during episodes of increasing turbulence
 - May explain mixed results in literature
- Respond by including time dummies and dropping auction event variable

- Base Specification then satisfies:

$$\begin{aligned}\Delta CDS_{it} = & \alpha_i + \theta_t + \beta_1 Exposure_{it} \cdot SP500_t + \\ & \beta_2 Exposure_{it} \cdot auction_{t-1} + \beta_3 Transp_{it} \cdot auction_{t-1} + \\ & \beta_4 Illiquid_{it} \cdot auction_{t-1} + \beta_5 \Delta Default_{it} + \beta_6 \epsilon_{it}\end{aligned}$$

- Where 3 main variables of interest are interactive terms
 - $Exposure_{it} \cdot auction_{t-1}$ (exposure),
 - $Transp_{it} \cdot auction_{t-1}$ (transparency),
 - and $Illiquid_{it} \cdot auction_{t-1}$ (illiquidity).

Base Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
Exposure*auction	-2.87*	-2.56**	-3.14**	-0.64**	-0.01	-0.66**	-0.68**
	(-2.15)	(-4.94)	(-2.95)	(-3.99)	(-1.42)	(-3.50)	(-3.62)
Transp*auction	-0.58*	-0.61*	-0.54*	-0.58*	-0.54*	-0.74**	-0.75**
	(-2.10)	(-2.65)	(-2.14)	(-2.43)	(-2.19)	(-3.26)	(-3.27)
Illiquid*auction	1.64	0.68	0.81	0.94	0.51	0.89	0.94
	(1.04)	(1.25)	(1.22)	(1.80)	(0.66)	(1.46)	(1.53)
Exposure*SP500	-6.97**	-6.05**	-8.16**	-1.85**	-0.03**	-2.00**	-1.98**
	(-5.20)	(-4.58)	(-6.20)	(-21.05)	(-4.87)	(-15.37)	(-14.61)
Δ Default	0.36	0.48	0.28	0.61	1.51*	0.66	0.67
	(0.52)	(0.76)	(0.43)	(0.85)	(2.11)	(0.91)	(0.93)
Num of Obs	4005	4005	4005	4005	3607	4005	4005
R^2	0.200	0.200	0.212	0.240	0.209	0.217	0.216

Base specification results

- *Exposure* variable consistently negative and significant for both trade and asset exposure
- *Transp* variable significant with unexpected negative sign
- *Illiquid* variable insignificant throughout
- Nuisance parameters
 - $Exposure_{it} \cdot SP500_t$ variable significant with predicted negative sign
 - $\Delta Default_{it}$ is insignificant, except Model 5

- 3 alternative measures of illiquidity
 - ST debt as a share of GDP
 - Ratio of ST debt to international reserves
 - "Greenspan-Guidotti" measure of illiquidity, ratio of ST debt minus intl reserves to intl reserves
- Divide into OCED and non-OECD sub-samples
- Look at announcement effects
- Look for extra sensitivity for swap partners

Alternative Illiquidity Measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
I. Illiquidity proxied by ST Debt/GDP							
Exposure*auction	-2.66* (-2.42)	-2.57** (-4.90)	-3.19** (-2.88)	-0.63** (-3.96)	-0.01 (-1.45)	-0.64** (-3.55)	-0.66** (-3.66)
Transp*auction	-0.57* (-2.08)	-0.59* (-2.62)	-0.52* (-2.06)	-0.56* (-2.39)	-0.53* (-2.14)	-0.72** (-3.24)	-0.72** (-3.25)
ill_gdp*auction	0.59 (1.16)	0.32 (1.20)	0.56 (1.46)	0.35 (1.14)	0.32 (0.91)	0.26 (1.00)	0.23 (0.88)
II. Illiquidity proxied by ST Debt/Reserves							
Exposure*auction	-2.60* (-2.51)	-2.55** (-4.94)	-3.14** (-2.92)	-0.62** (-3.91)	-0.01 (-1.46)	-0.64** (-3.52)	-0.66** (-3.63)
Transp*auction	-0.58* (-2.12)	-0.59* (-2.66)	-0.53* (-2.09)	-0.57* (-2.42)	-0.54* (-2.18)	-0.73** (-3.27)	-0.73** (-3.28)
ill_res*auction	0.09 (0.85)	0.02 (0.22)	0.09 (0.95)	0.00 (0.02)	0.04 (0.44)	-0.00 (-0.02)	-0.01 (-0.12)
III. Illiquidity proxied by Greenspan-Guidotti measure							
Exposure*auction	-2.18* (-2.13)	-2.09** (-4.04)	-2.49* (-2.23)	-0.44* (-2.16)	-0.01 (-1.03)	-0.35 (-1.19)	-0.39 (-1.40)
Transp*auction	-0.18 (-0.57)	-0.24 (-0.74)	-0.20 (-0.65)	-0.26 (-0.72)	-0.18 (-0.51)	-0.20 (-0.43)	-0.24 (-0.54)
ill_GG*auction	0.32 (1.75)	0.30 (1.51)	0.29 (1.51)	0.28 (1.14)	0.31 (1.46)	0.40 (1.27)	0.37 (1.23)

OECD Country Sub-sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
Exposure*auction	-6.53*	-2.42**	-4.87**	-0.96**	-0.01*	-1.00**	-0.93**
	(-2.76)	(-3.19)	(-3.44)	(-3.63)	(-2.08)	(-4.09)	(-3.83)
Transp*auction	-0.01	-0.22	-0.05	-0.12	-0.07	-0.31	-0.33
	(-0.04)	(-0.75)	(-0.16)	(-0.48)	(-0.33)	(-1.12)	(-1.18)
Illiquid*auction	5.20	1.14	3.45*	1.45	1.55	0.76	0.50
	(2.02)	(1.05)	(2.43)	(1.60)	(1.15)	(0.77)	(0.49)
Exposure*SP500	-10.98**	-4.79**	-8.75**	-2.05**	-0.04**	-2.32**	-2.08**
	(-5.07)	(-3.72)	(-5.78)	(-8.34)	(-5.58)	(-5.37)	(-4.91)
Δ Default	2.60**	2.56**	2.53**	2.93**	2.66**	2.79**	2.80**
	(4.00)	(4.15)	(4.04)	(5.06)	(4.31)	(4.58)	(4.59)
Num of Obs	2220	2220	2220	2220	2220	2220	2220
R^2	0.188	0.184	0.195	0.197	0.200	0.186	0.182

Non-OECD Country Sub-sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
Exposure*auction	-3.11* (-2.21)	-2.66** (-3.34)	-2.64 (-1.91)	-0.64* (-2.70)	-0.00 (-0.52)	-0.68** (-2.89)	-0.72** (-3.00)
Transp*auction	-0.81 (-1.86)	-1.06** (-3.31)	-0.96* (-2.47)	-0.93* (-2.18)	-1.18* (-2.66)	-1.19** (-3.69)	-1.19** (-3.69)
Illiquid*auction	2.48 (1.63)	1.27 (1.74)	1.08 (1.44)	1.56 (1.92)	1.03 (1.19)	1.85* (2.40)	1.93* (2.46)
Exposure*SP500	-6.51** (-4.60)	-8.17** (-5.63)	-8.15** (-4.30)	-1.95** (-20.52)	-0.03** (-3.20)	-2.06** (-14.82)	-2.10** (-15.33)
Δ Default	-0.63* (-2.47)	-0.56* (-2.63)	-0.71** (-3.04)	-0.44 (-1.77)	0.04 (0.07)	-0.30 (-1.02)	-0.30 (-0.98)
Num of Obs	1785	1785	1785	1785	1387	1785	1785
R^2	0.283	0.282	0.289	0.389	0.283	0.333	0.337

Impact of "major" central bank announcements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
<u>I. Dec 12 '07: Lines introduced with ECB and SNB</u>							
Exposure	-14.76 (-1.62)	5.18 (0.66)	-3.48 (-0.37)	-2.69 (-0.87)	0.01 (0.25)	-0.56 (-0.19)	-0.91 (-0.30)
Transp	18.21** (3.33)	14.85** (2.85)	15.46** (2.89)	17.52** (3.30)	14.30* (2.56)	17.83** (3.47)	18.14** (3.49)
Illiquid	-33.20 (-1.52)	-22.12* (-2.02)	-23.45 (-1.91)	-27.81 (-1.49)	-30.93** (-3.05)	-41.52* (-2.60)	-39.76* (-2.39)
<u>II. Sep 18 '08: Lines introduced with BOJ, BOE, and Bank of Canada</u>							
Exposure	-3.40 (-0.10)	-25.09 (-1.36)	-18.37 (-0.61)	-8.66 (-1.74)	-0.12 (-1.06)	-7.65 (-1.29)	-8.33 (-1.41)
Transp	-14.05* (-2.34)	-11.44* (-2.12)	-11.02 (-1.92)	-6.54 (-0.99)	-9.07 (-1.40)	-10.62 (-1.78)	-10.72 (-1.81)
Illiquid	-50.36 (-0.91)	-55.20 (-1.76)	-51.05 (-1.62)	-24.06 (-0.59)	-35.95 (-0.94)	-19.98 (-0.43)	-18.84 (-0.39)
<u>III. Oct 13 '08: Unlimited swaps with ECB, BOE, BOJ, and SNB</u>							
Exposure	-85.29** (-4.50)	-80.45** (-5.04)	-102.39** (-5.56)	-14.05* (-2.22)	-0.05 (-0.13)	-17.45* (-2.51)	-17.99* (-2.64)
Transp	-25.29** (-3.15)	-24.10** (-3.13)	-21.22** (-2.70)	-31.06** (-3.84)	-30.52* (-2.57)	-37.98** (-4.89)	-38.17** (-4.92)
Illiquid	65.14 (1.76)	-51.83 (-1.65)	-25.54 (-0.60)	-36.31 (-1.30)	-71.59 (-1.08)	-16.50 (-0.47)	-16.55 (-0.46)
Num of Obs	4000	4000	4000	4000	3601	4000	4000
R ²	0.309	0.313	0.319	0.356	0.318	0.343	0.343

Impact of other central bank announcements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
I. Sep 24 '08:							
<u>Lines introduced with Australia, Sweden, Denmark, and Norway</u>							
Exposure	-42.89 (-1.24)	-39.94 (-1.15)	-42.76 (-1.26)	-7.40 (-0.75)	-0.39* (-2.07)	5.79 (0.58)	4.94 (0.49)
Transp	97.17** (4.99)	96.36** (5.02)	97.26** (4.97)	96.73** (4.83)	108.09** (5.21)	90.89** (5.09)	91.06** (5.11)
Illiquid	88.06 (0.26)	61.04 (0.18)	64.72 (0.19)	64.69 (0.19)	106.20 (0.31)	5.76 (0.02)	10.83 (0.03)
II. Oct 28 '08:							
<u>Lines introduced with New Zealand, Brazil, Mexico, South Korea, and Singapore</u>							
Exposure	-73.09 (-1.62)	-74.99** (-3.54)	-94.30** (-2.85)	-44.46** (-8.11)	-0.29 (-1.10)	-46.21** (-6.79)	-46.03** (-6.69)
Transp	-71.79** (-6.44)	-69.06** (-6.18)	-63.61** (-5.94)	-50.05** (-7.43)	-60.96** (-4.23)	-75.93** (-8.54)	-76.98** (-8.72)
Illiquid	67.53 (0.52)	-133.56* (-2.09)	-85.45 (-1.24)	34.15 (0.52)	-75.38 (-0.86)	81.06 (0.85)	71.73 (0.69)
Num of Obs	4000	4000	4000	4000	3601	4000	4000
R ²	0.309	0.313	0.319	0.356	0.318	0.343	0.343

Announcement Results

- US trade exposure significant for announcement concerning removal of swap ceilings on majors
- Greater illiquidity increased sensitivity to second and third major announcements
- Transparency variable enters with its predicted positive for first time in second "other" announcement
- Illiquidity variable robustly negative in second "other" CB announcement
- Expansion to New Zealand, Brazil, Mexico, Korea and Singapore may have led others to conclude that swaps would be forthcoming for them, if needed

Additional impacts of auctions on swap partners

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
direct	1.78 (1.81)	1.81 (1.90)	1.77 (1.82)	1.49 (1.49)	1.91 (2.01)	1.67 (1.67)	1.76 (1.77)
Exposure*auction	-2.82* (-2.08)	-2.62** (-5.22)	-3.15** (-2.92)	-0.68** (-3.86)	-0.01 (-1.54)	-0.63** (-3.17)	-0.65** (-3.27)
Exposure*dir	-4.70 (-0.24)	-17.02 (-1.84)	-16.26 (-0.97)	-1.73 (-1.34)	0.01 (0.10)	-1.46** (-2.74)	-1.41** (-2.84)
Transp*auction	-0.39 (-1.23)	-0.42 (-1.50)	-0.35 (-1.17)	-0.34 (-1.03)	-0.32 (-0.97)	-0.58* (-2.07)	-0.58* (-2.08)
Transp*dir	-0.33 (-0.21)	0.08 (0.09)	0.19 (0.14)	-1.00 (-1.24)	-0.74 (-0.65)	-0.70 (-1.00)	-0.72 (-1.03)
Illiquid*auction	1.26 (0.79)	0.33 (0.50)	0.44 (0.59)	0.56 (0.93)	0.33 (0.40)	0.48 (0.73)	0.53 (0.80)
Illiquid*dir	-254.49 (-1.72)	-103.10 (-1.09)	-132.89 (-0.95)	-150.13 (-1.61)	-282.19 (-1.59)	-198.59** (-2.71)	-200.98** (-2.75)
Exposure*SP500	-6.97** (-5.20)	-6.03** (-4.57)	-8.16** (-6.19)	-1.85** (-21.01)	-0.03** (-4.86)	-1.99** (-15.35)	-1.98** (-14.60)
Δ Default	0.35 (0.51)	0.48 (0.76)	0.28 (0.43)	0.61 (0.85)	1.50* (2.08)	0.66 (0.90)	0.67 (0.92)
Num of Obs	4005	4005	4005	4005	3607	4005	4005
R^2	0.201	0.201	0.213	0.241	0.210	0.218	0.217

Additional impacts of announcements on swap partners

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exports	Imports	Trade	Assets(TIC)	Assets(CPIS)	Debt	LTdebt
Exposure*major	-0.23 (-0.43)	-3.93** (-4.91)	-1.02 (-0.97)	-0.61** (-3.27)	-0.01 (-1.99)	-0.50** (-5.73)	-0.49** (-5.55)
Transp*major	-0.09 (-0.68)	-0.23** (-2.99)	-0.06 (-0.49)	-0.39* (-2.27)	-0.05 (-0.40)	-0.47** (-3.28)	-0.47** (-3.17)
Illiquid*major	-21.87** (-3.57)	-2.93 (-0.29)	-17.83* (-2.57)	2.74 (0.27)	0.44 (0.03)	-21.73** (-5.48)	-22.10** (-5.57)
Exposure*other	-6.89* (-2.20)	-0.42 (-0.79)	-1.67 (-1.87)	-1.16** (-6.95)	0.02 (1.21)	2.39** (3.88)	0.05 (0.03)
Transp*other	2.01** (2.93)	2.00** (15.65)	2.69** (20.61)	1.29** (3.86)	3.00** (7.63)	5.44** (6.53)	2.91 (1.61)
Illiquid*other	-34.07 (-0.93)	146.83* (2.08)	134.03* (2.56)	49.01* (2.57)	-25.10 (-0.35)	-135.02** (-3.42)	58.81 (0.51)
Num of Obs	4000	4000	4000	4000	3601	4000	4000
R^2	0.232	0.230	0.242	0.269	0.240	0.246	0.244

Conclusion

- Dollar appreciation during global financial crisis suggests dollar illiquidity
- Model consistent with pattern suggests empirical restrictions in cross section
 - Dollar injections disproportionately benefit those more heavily exposed to US through trade or financial channels, have more opaque assets, or more illiquid
- Use these restrictions to evaluate effects of TAF auction without difficulties associated with event study literature
- Results suggest greater benefits to countries with more US trade and asset exposure
 - Robust to wide variety of sensitivity tests
 - Weaker results for transparency and illiquidity
- Several important announcements also indicate greater benefits to those with less transparent asset portfolios