

# Securities Financing and Asset Markets

## New Evidence

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\*The views expressed here are do not reflect those of the Federal Reserve System or the Federal Reserve Bank of Chicago. This presentation contains no discussion of current or prospective monetary policy.

# Bilateral Securities Financing

- Plays an important role in financial markets.
  - Allows asset managers to take levered positions and facilitates arbitrage.
  - Was an epicenter of the GFC.
- Theoretical models hypothesize behavior in this market, and how it relates to the market for cash securities.
  - Gromb & Vayanos (2002); Brunnermeier & Pedersen (2008); Geanakoplos (2010); Ashcraft et al. (2011); Garleanu & Pedersen (2011); Dang et al. (2013); Martin et al. (2014); Fostel & Geanakoplos (2015); Infante (2018); others...
- Yet there is little systematic evidence on how this market works in reality.

“**It would be very helpful if the Fed were to gather these numbers** and periodically report leverage numbers across different asset classes.”

--Geanakoplos (2010)

“**Better data are particularly important** for understanding repo and securities lending markets and monitoring developments that may indicate stress.”

--Adrian et al. (2014a)

“**Much more data are needed** to track repo and securities lending markets.”

--Adrian et al. (2014b)

“The **lack of data is a serious limitation** for researchers interested in understanding the repo market. In the U.S., the most glaring need is data on the bilateral market.”

--Copeland et al. (2014)

“To fully understand the differential behavior of the bilateral and triparty repo markets, one needs quantity data on the bilateral market. To our knowledge, **no such data exists** either publicly or with regulators.”

--Krishnamurthy et al. (2014)

“**Data** available on bilateral repo and securities lending transactions **are spotty and incomplete**. .... High-quality data covering repo and securities lending activities are needed for regulators and policymakers to understand and monitor market developments, identify potential risks, and to conduct in-depth analysis of policy options.”

--Baklanova et al. (2015)

“Because of the **lack of volume, price, and rehypothecation data** on the bilateral repo market, it is not surprising that there are no empirical papers on the bilateral repo market other than Gorton and Metrick (2012).”

--Gorton et al. (2018)

## Small empirical literature on bilateral securities financing

- Auh and Landoni (2016), Baklanova et al. (2019)

...Both of these use very granular data but are relatively narrow in focus.

Papers on related markets not necessarily relevant:

- Gorton and Metrick (2012); Copeland et al. (2014); Krishnamurthy et al. (2014)

# This paper: New Evidence

- We analyze previously unexploited data that provide a broad view of this market.
- Senior Credit Officer Opinion Survey
  - Asks about several types of financing terms and related issues
  - Covers seven asset classes across all counterparty types
  - Respondents comprise “almost all” of this market
- We merge the SCOOS, by asset class, with data on returns, liquidity, financing volumes, volatilities, etc.

# Main Results

- Different types of funding terms (e.g., haircuts and rates) move closely together and correlate strongly with market conditions.
  - Tighter terms accompany higher volatility, widening credit spreads, etc.
- The strongest association is with market liquidity.
- Dealer-reported reasons for changing terms help distinguish the direction of causality.
  - Over most of our sample, liquidity causes funding conditions, but *not* vice versa.
  - But some evidence that tightening terms reduces liquidity in very stressful periods, like Q2 2020.

# SCOOS Details

- Administered to the senior credit officers at large broker-dealers
  - Sample is “nearly all dollar-denominated financing to non-dealers.”
  - 20 – 23 respondents per survey
  - High overlap with primary dealers
- Quarterly survey
  - We use 2010:2 – 2020:2
  - Survey redesign in 2011:3 changes some variables.
  - Results are robust to excluding COVID quarter

# SCOOOS Details

Particular questions of interest for us:

- By asset class:
  - Changes in terms—
    - Financing spreads
    - Haircuts
    - Max. maturity
    - Max. lending
  - Changes in demand for funding
  - Changes in liquidity in cash market
- By client type:
  - Reasons for changing terms

# Sample SCOOS question on terms

Over the past three months, how have the terms under which agency RMBS are funded changed?

Haircuts:

- Tightened considerably
- Tightened somewhat
- Remained basically unchanged
- Eased somewhat
- Eased considerably

# Sample SCOOS questions on demand and liquidity

Over the past three months, how demand for funding of agency RMBS by your institution's clients changed?

- Increased considerably
- Increased somewhat
- Remained basically unchanged
- Decreased somewhat
- Decreased considerably

Over the past three months, how have liquidity and functioning in the agency RMBS market changed?

- Improved considerably
- Improved somewhat
- Remained basically unchanged
- Deteriorated somewhat
- Deteriorated considerably

# Treatment of the SCOOS data

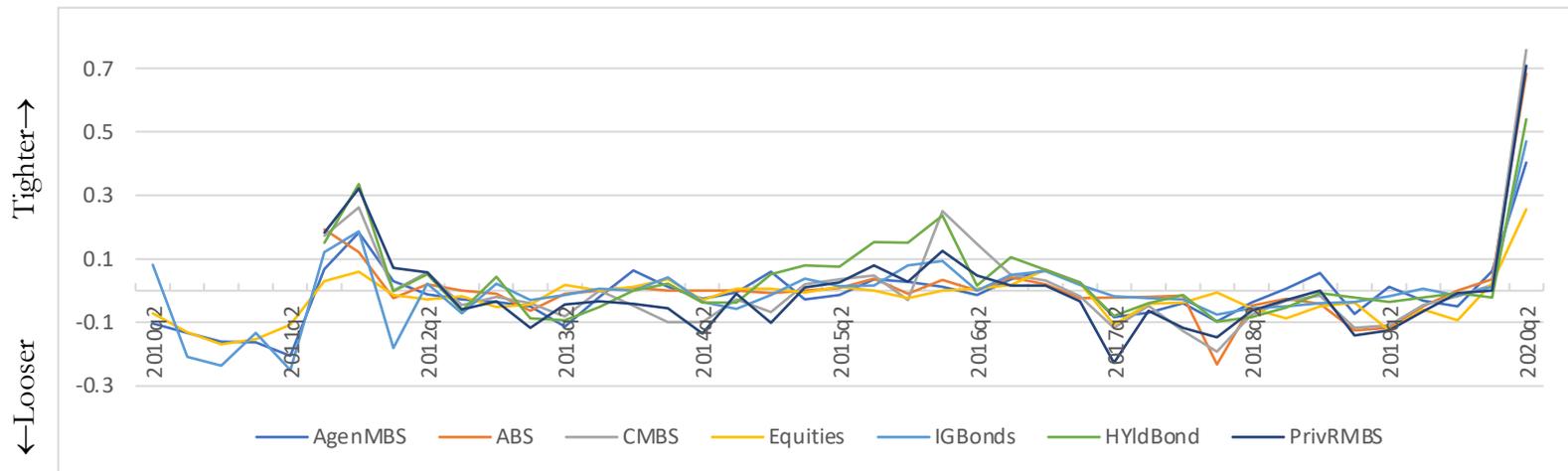
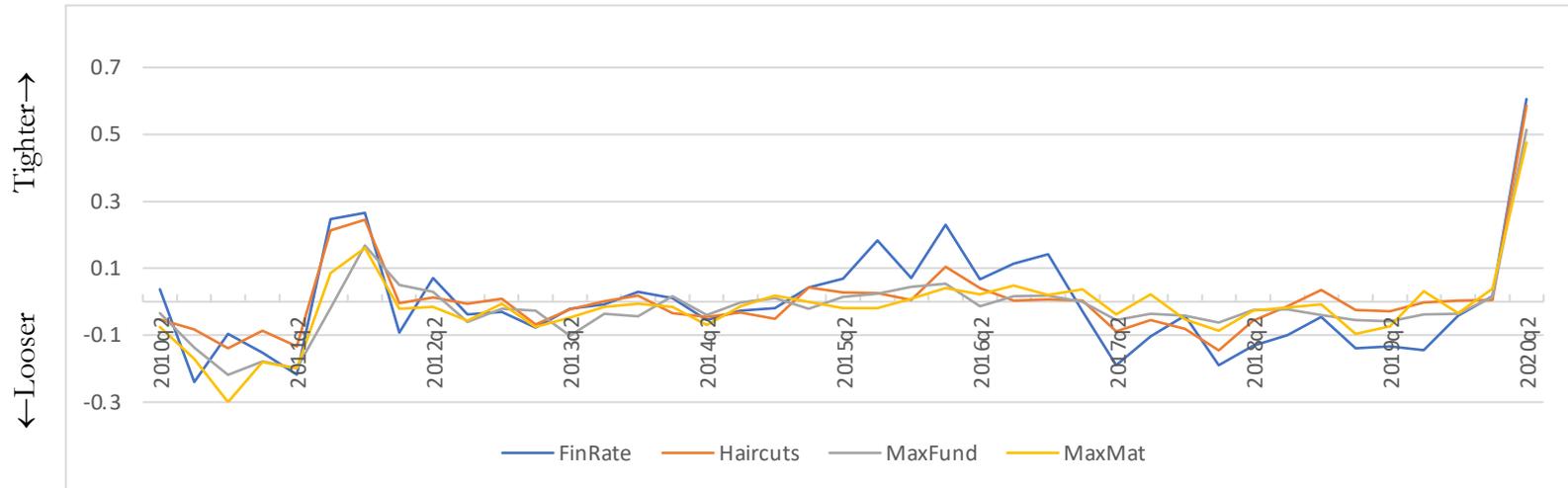
- Diffusion indices  $\tau_{i,j,t}$ 
  - $i$  indexes term type
  - $j$  indexes asset class.

- For example:

$$\frac{\# \text{ increasing haircuts on AMBS in } t - \# \text{ lowering haircuts on AMBS in } t}{\text{total respondents for AMBS in } t}$$

- Follows standard practice with the SLOOS.
- Very similar results for
  - Weighted vs. unweighted indices
  - “Average” vs. “most favored” clients
- We construct indices for demand and liquidity in the same way.

# Terms over time



# Volatility and correlation of terms

	Financing spread	Haircut	Max. <u>maturity</u>	Max. <u>amount</u>
Agency MBS	0.13	0.11	0.10	0.11
IG corporate bonds <sup>#</sup>	0.16	0.12	0.13	0.10
HY corporate bonds	0.18	0.15	0.11	0.10
ABS <sup>#</sup>	0.19	0.15	0.11	0.13
CMBS <sup>#</sup>	0.21	0.18	0.14	0.15
Private MBS <sup>#</sup>	0.22	0.19	0.14	0.15
Equities	0.11	0.04	0.09	0.09

	Fin. Spread [1]	Haircut [2]	Max. <u>mat.</u> [3]	Max. <u>amt.</u> [4]
Fin. Spread	1			
Haircut	0.82***	1		
Max. <u>matur.</u>	0.72***	0.81***	1	
Max. <u>amt.</u>	0.72***	0.77***	0.83***	1

# Correlations of terms with market conditions

## *Averaging across asset classes*

	3-Month <u>Tbill</u> [25]	10 Year Treasury [26]	CDX.IG [27]	CDX.HY [28]	GZ Bond Premium [29]	Chicago FCI [30]
Fin. Rate	-0.50***	-0.28***	0.55***	0.64***	0.43***	0.59***
Haircut	-0.62***	-0.41***	0.48***	0.63***	0.45***	0.61***
Max. <u>matur.</u>	-0.57***	-0.34***	0.43***	0.59***	0.40***	0.57***
Max. <u>amt.</u>	-0.57***	-0.29***	0.41***	0.59***	0.37***	0.49***

## *Averaging across term types*

	3-Month <u>Tbill</u>	10 Year Treasury	CDX.IG	CDX.HY	GZ Bond Premium	Chicago FCI
Agency MBS	-0.45***	-0.23***	0.36***	0.51***	0.39***	0.47***
IG Corp	-0.49***	-0.27***	0.57***	0.67***	0.43***	0.66***
HY Corp	-0.54***	-0.42***	0.57***	0.69***	0.47***	0.58***
ABS	-0.72***	-0.43***	0.51***	0.66***	0.42***	0.62***
CMBS	-0.66***	-0.42***	0.51***	0.67***	0.41***	0.62***
Priv. RMBS	-0.63***	-0.37**	0.49***	0.67***	0.41***	0.58***
Equities	-0.38***	-0.14*	0.30***	0.43***	0.26***	0.43***

# Correlations of terms with market conditions

	Liquidity				Volatility				Other Asset-Specific Market Conditions		
	SCOOS Liquidity [5]	Amihud liquidity [6]	TED Spread [7]	5 Year On/Off [8]	Real. vol. [9]	VIX [10]	Swap IV 10Yr [11]	MOVE [12]	Returns [13]	Trading volume [14]	Issuance [15]
Fin. Spread	-0.72***	0.26***	0.29***	0.48***	0.18***	0.36***	0.20***	0.13**	-0.26***	-0.09	0.02
Haircut	-0.70***	0.20**	0.27***	0.45***	0.13**	0.27***	0.11*	0.07	-0.16**	-0.09	0.01
Max. <u>matur.</u>	-0.65***	0.31***	0.25***	0.39***	0.16**	0.25***	0.09	0.04	-0.17***	-0.06	-0.07
Max. <u>amt.</u>	-0.60***	0.20**	0.24***	0.39***	0.10	0.19***	0.03	-0.04	-0.20***	-0.04	0.04

	Securities Financing					Dealer Condition			
	Funding Demand [16]	"Securities in" <sup>(a)</sup> [17]	Fails to <u>deliv.</u> [18]	Triparty volume [19]	Triparty haircuts [20]	Excess CDS [21]	Leverage [22]	%Δ Book Equity [23]	Liq. Assets [24]
Fin. Rate	0.19***	-0.10	0.10	-0.02	0.04	0.23***	0.08	-0.41***	0.13**
Haircut	0.18***	-0.14*	-0.08	0.01	-0.03	0.25***	0.29***	-0.39***	0.33***
Max. <u>matur.</u>	0.03	-0.18**	-0.02	-0.02	-0.07	0.13**	0.23***	-0.32***	0.24***
Max. <u>amt.</u>	0.08	-0.23***	0.02	-0.09	-0.02	0.08	0.13**	-0.31***	0.24***

# Funding terms regressions: *Financing spreads*

	By Asset Class ( <i>j</i> )							Pooled			
	Agency MBS	IG Corp	HY Corp	ABS	CMBS	Priv. RMBS	Equities	5 asset classes	6 asset classes	5 asset classes	6 asset classes
Demand $j,t$	-0.01 (0.13)	0.04 (0.2)	0.53*** (0.18)	0.35 (0.24)	0.27 (0.18)	0.32** (0.13)	-0.05 (0.1)	0.22*** (0.07)	0.24*** (0.06)	0.16*** (0.06)	0.15*** (0.05)
Liquidity $j,t$	-0.42* (0.22)	-0.36* (0.17)	-0.56*** (0.14)	-0.15 (0.14)	-0.50*** (0.16)	-0.50*** (0.16)	--	-0.42*** (0.06)	-0.43*** (0.06)	-0.28*** (0.06)	-0.29*** (0.05)
Realized vol $j,t$	-1.82 (2.12)	0.98 (1.17)	-0.24 (1.06)	-3.68 (3.88)	-2.30 (2.08)	--	0.12 (0.25)	-0.13 (0.54)	--	-0.16 (0.45)	--
%Δ dealer equity $t$	0.60 (1.63)	-0.17 (1.52)	-1.02 (1.62)	-4.34** (1.75)	-3.92** (1.82)	-5.97*** (1.87)	-2.45* (1.29)	-1.63** (0.70)	-2.26*** (0.66)	--	--
CDX HY $t$	0.04 (0.05)	0.07 (0.05)	0.01 (0.06)	0.01 (0.06)	-0.06 (0.07)	-0.05 (0.07)	-0.01 (0.04)	0.02 (0.02)	0.01 (0.02)	--	--
VIX $t$	0.01 (0.31)	-0.11 (0.32)	0.11 (0.30)	0.67* (0.34)	0.68* (0.36)	0.52 (0.39)	0.30 (0.31)	0.17 (0.14)	0.21 (0.13)	--	--
10Y swaption vol $t$	0.13 (0.26)	0.13 (0.27)	0.00 (0.28)	-0.39 (0.34)	-0.36 (0.37)	-0.64 (0.42)	-0.03 (0.21)	-0.04 (0.13)	-0.11 (0.12)	--	--
T bill rate $t$	-0.03 (0.09)	-0.07 (0.1)	-0.09 (0.09)	-0.29** (0.12)	-0.30** (0.13)	-0.28** (0.12)	-0.25*** (0.08)	-0.15*** (0.04)	-0.17*** (0.04)	--	--
Asset Class F.E.	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Time F.E.	--	--	--	--	--	--	--	No	No	Yes	Yes
Adj R <sup>2</sup>	0.31	0.53	0.73	0.65	0.70	0.69	0.34	0.62	0.64	0.82	0.83
Obs	41	41	36	36	36	36	41	190	226	190	226

# Funding terms regressions: Haircuts

	By Asset Class ( <i>j</i> )							Pooled			
	Agency MBS	IG Corp	HY Corp	ABS	CMBS	Priv. RMBS	Equities	5 asset classes	6 asset classes	5 asset classes	6 asset classes
Demand $j,t$	-0.25** (0.09)	0.10 (0.1)	0.20 (0.14)	0.29* (0.15)	0.07 (0.15)	0.04 (0.11)	0.00 (0.04)	0.05 (0.05)	0.05 (0.04)	0.04 (0.05)	0.02 (0.05)
Liquidity $j,t$	-0.22 (0.15)	-0.33*** (0.09)	-0.52*** (0.11)	-0.02 (0.09)	-0.42*** (0.13)	-0.32** (0.13)	--	-0.31*** (0.05)	-0.31*** (0.04)	-0.18*** (0.05)	-0.18*** (0.05)
Realized vol $j,t$	-0.14 (1.5)	-0.31 (0.59)	-0.87 (0.86)	2.72 (2.35)	-0.73 (1.77)	--	0.03 (0.09)	-0.20 (0.40)	--	-0.45 (0.41)	--
%Δ dealer equity $t$	0.22 (1.16)	-0.99 (0.77)	0.14 (1.31)	-2.83** (1.06)	-2.48 (1.55)	-4.67*** (1.51)	-0.93* (0.47)	-1.28** (0.52)	-1.79*** (0.49)	--	--
CDX HY $t$	0.03 (0.03)	0.04 (0.02)	0.06 (0.05)	0.02 (0.04)	-0.06 (0.06)	-0.05 (0.06)	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	--	--
VIX $t$	0.08 (0.22)	-0.12 (0.16)	-0.37 (0.25)	0.27 (0.21)	0.23 (0.31)	0.49 (0.31)	0.06 (0.11)	-0.03 (0.10)	-0.04 (0.10)	--	--
10Y swaption vol $t$	-0.2 (0.18)	-0.06 (0.13)	-0.06 (0.22)	-0.39* (0.21)	-0.31 (0.31)	-0.56 (0.34)	-0.11 (0.08)	-0.17* (0.09)	-0.22** (0.09)	--	--
T bill rate $t$	-0.15** (0.06)	-0.19*** (0.05)	-0.13* (0.07)	-0.35*** (0.07)	-0.37*** (0.11)	-0.43*** (0.1)	-0.05* (0.03)	-0.25*** (0.03)	-0.28*** (0.03)	--	--
Asset Class F.E.	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Time F.E.	--	--	--	--	--	--	--	No	No	Yes	Yes
Adj R <sup>2</sup>	0.56	0.77	0.74	0.80	0.71	0.72	0.30	0.70	0.71	0.78	0.80
Obs	41	41	36	36	36	36	41	190	226	190	226

# Funding terms regressions:

## *Maximum maturities*

	By Asset Class ( <i>j</i> )							Pooled			
	Agency MBS	IG Corp	HY Corp	ABS	CMBS	Priv. RMBS	Equities	5 asset classes	6 asset classes	5 asset classes	6 asset classes
Demand $j,t$	-0.12 (0.09)	-0.11 (0.14)	0.01 (0.12)	0.15 (0.15)	0.00 (0.13)	-0.12 (0.09)	-0.13 (0.09)	-0.05 (0.05)	-0.06 (0.04)	-0.01 (0.05)	0.04 (0.04)
Liquidity $j,t$	-0.28* (0.14)	-0.46*** (0.12)	-0.21** (0.1)	0.04 (0.09)	-0.27** (0.11)	-0.21* (0.11)	--	-0.25*** (0.05)	-0.24*** (0.04)	-0.21*** (0.05)	-0.21*** (0.04)
Realized vol $j,t$	-2.93** (1.41)	0.29 (0.83)	-0.61 (0.73)	-0.69 (2.41)	-2.18 (1.53)	--	0.18 (0.24)	-0.32 (0.39)	--	-0.03 (0.37)	--
%Δ dealer equity $t$	-2.29** (1.09)	1.09 (1.07)	-2.20* (1.12)	-0.76 (1.09)	0.55 (1.34)	-0.43 (1.23)	-1.05 (1.2)	-0.76 (0.51)	-0.72 (0.46)	--	--
CDX HY $t$	-0.05 (0.03)	0.05 (0.03)	0.04 (0.04)	0.05 (0.04)	0.04 (0.05)	0.02 (0.05)	0.00 (0.04)	0.02 (0.02)	0.02 (0.02)	--	--
VIX $t$	0.35 (0.21)	-0.25 (0.23)	-0.02 (0.21)	0.11 (0.21)	-0.26 (0.27)	0.12 (0.25)	0.03 (0.29)	-0.05 (0.10)	-0.04 (0.10)	--	--
10Y swaption vol $t$	-0.12 (0.17)	-0.26 (0.19)	-0.19 (0.19)	-0.17 (0.21)	0.09 (0.27)	-0.4 (0.27)	-0.04 (0.2)	-0.16* (0.09)	-0.20** (0.08)	--	--
T bill rate $t$	-0.20*** (0.06)	-0.12* (0.07)	-0.21*** (0.06)	-0.24*** (0.07)	-0.19* (0.1)	-0.23*** (0.08)	-0.11 (0.07)	-0.20*** (0.03)	-0.20*** (0.03)	--	--
Asset Class F.E.	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Time F.E.	--	--	--	--	--	--	--	No	No	Yes	Yes
Adj R <sup>2</sup>	0.52	0.65	0.66	0.64	0.63	0.65	0.11	0.60	0.62	0.75	0.78
Obs	41	41	36	36	36	36	41	190	226	190	226

# Funding terms regressions:

## *Maximum amounts*

	By Asset Class ( <i>j</i> )							Pooled			
	Agency MBS	IG Corp	HY Corp	ABS	CMBS	Priv. RMBS	Equities	5 asset classes	6 asset classes	5 asset classes	6 asset classes
Demand $j,t$	-0.22** (0.11)	-0.18 (0.12)	0.01 (0.12)	0.12 (0.16)	0.06 (0.14)	0.02 (0.09)	-0.03 (0.09)	-0.05 (0.05)	-0.05 (0.04)	-0.05 (0.05)	-0.07 (0.04)
Liquidity $j,t$	-0.12 (0.18)	-0.33*** (0.1)	-0.19* (0.09)	0.07 (0.09)	-0.18 (0.12)	-0.32*** (0.11)	--	-0.19*** (0.05)	-0.21*** (0.04)	-0.14*** (0.05)	-0.17*** (0.04)
Realized vol $j,t$	-3.07* (1.72)	-0.39 (0.69)	-1.85** (0.69)	-2.36 (2.54)	-4.31** (1.59)	--	0.14 (0.22)	-1.28*** (0.39)	--	-0.78** (0.36)	--
%Δ dealer equity $t$	0.44 (1.33)	1.03 (0.9)	0.53 (1.05)	-0.37 (1.15)	-1.01 (1.40)	0.47 (1.27)	-2.76** (1.15)	0.11 (0.52)	0.16 (0.49)	--	--
CDX HY $t$	0.05 (0.04)	0.07** (0.03)	0.12*** (0.04)	0.07* (0.04)	0.04 (0.06)	0.07 (0.05)	-0.01 (0.04)	0.06*** (0.02)	0.05*** (0.02)	--	--
VIX $t$	-0.11 (0.25)	-0.34* (0.19)	-0.10 (0.20)	0.02 (0.22)	0.19 (0.28)	-0.39 (0.26)	0.09 (0.27)	-0.14 (0.10)	-0.24** (0.10)	--	--
10Y swaption vol $t$	-0.08 (0.21)	-0.17 (0.16)	-0.03 (0.18)	-0.24 (0.22)	-0.18 (0.28)	-0.45 (0.28)	0.06 (0.19)	-0.15 (0.09)	-0.23** (0.09)	--	--
T bill rate $t$	-0.13* (0.07)	-0.11* (0.06)	-0.10* (0.06)	-0.26*** (0.08)	-0.28** (0.1)	-0.15* (0.08)	-0.16** (0.07)	-0.18*** (0.03)	-0.17*** (0.03)	--	--
Asset Class F.E.	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Time F.E.	--	--	--	--	--	--	--	No	No	Yes	Yes
Adj R <sup>2</sup>	0.41	0.63	0.62	0.66	0.65	0.70	0.22	0.56	0.58	0.75	0.77
Obs	41	41	36	36	36	36	41	190	226	190	226

# Reasons for changing terms

To the extent that the price or nonprice terms applied to hedge funds have tightened or eased over the past three months ... what are the most important reasons for the change?

Possible reasons for tightening:

- Deterioration in current or expected financial strength of counterparties.
- Reduced willingness of your institution to take on risk.
- Adoption of more-stringent market conventions.
- Higher internal treasury charges for funding.
- Diminished availability of balance sheet or capital at your institution.
- Worsening in general market liquidity or functioning.
- Less-aggressive competition from other institutions.

# Most important reasons for changing terms

*Relative frequency each reason is cited as among top three*

	Counterparty risk	Market liquidity	Risk willingness	Int. treas chrges	Capital avail	Competition	Market conventions
Hedge funds	0.13	0.20	0.12	0.07	0.12	0.28	0.09
Insurance cos.	0.14	0.18	0.06	0.12	0.16	0.21	0.14
<u>Nonfin. corps.</u>	0.14	0.18	0.14	0.12	0.09	0.23	0.11
Mutual funds	0.06	0.20	0.10	0.06	0.14	0.35	0.09
REITs	0.19	0.21	0.14	0.04	0.11	0.25	0.06
<u>Sep'ly mangd accts</u>	0.06	0.20	0.08	0.05	0.11	0.38	0.11
<i>Average:</i>	<b>0.12</b>	<b>0.20</b>	<b>0.11</b>	<b>0.08</b>	<b>0.12</b>	<b>0.28</b>	<b>0.10</b>

# Measuring the effect of funding conditions on liquidity

1) Decompose term changes by reason:

$$\tau_{i,j,t} = a_{i,j} + \sum_k \beta_{i,j,k} \bar{x}_{k,t} + e_{i,j,t}$$

*net fraction tightening for reason k,  
averaged across counterparty types*

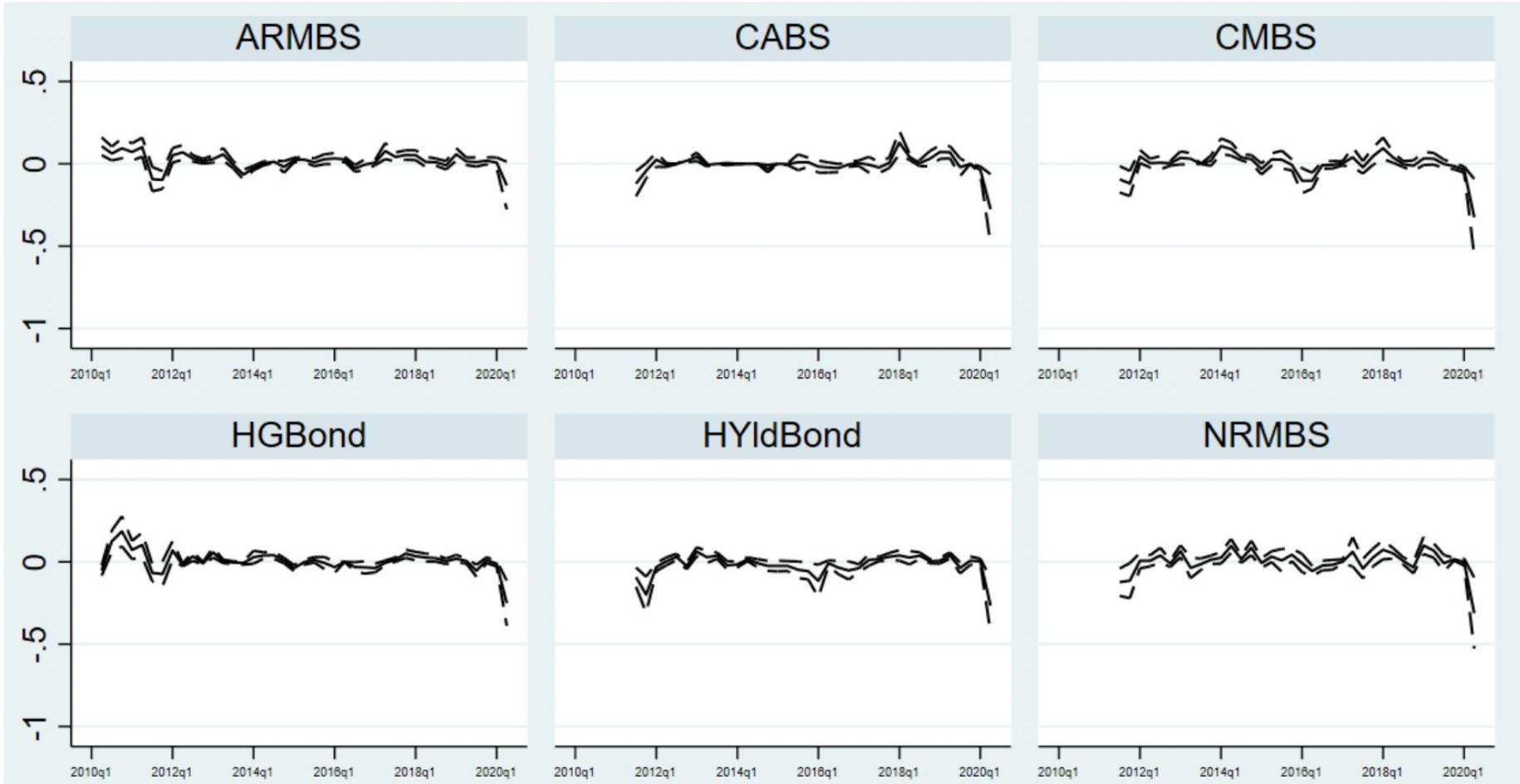
2) Check effect of “liquidity controlled” terms on liquidity:

$$\lambda_{j,t} = \gamma_j + \sum_i \delta_{i,j} \tilde{\tau}_{i,j,t} + \zeta' \mathbf{z}_{j,t} + u_{i,j,t}$$

*predicted value from first stage  
with liquidity coefficient set to zero*

# How do changing terms affect market liquidity?

*Difference*



# Implications & Conclusions

1. Terms move together.
  - Presents a challenge for theoretical models.
2. Terms are determined primarily by liquidity.
  - This broadly confirms the story of BP and others.
  - But many models also imply that volatility and credit risk matter.
3. Dealer condition is also somewhat important.
  - Broadly consistent with Adrian-Shin and similar stories.
  - More work is needed here.
4. Funding conditions usually have little impact on securities market conditions.
  - But during stressful periods, they do seem to have made liquidity worse.