De-Limiting Arbitrage: Evidence from the Term Asset-Backed Securities Loan Facility

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Motivation

- Financial crises feature severe asset price dislocations.

- Prices diverge from the underlying fundamental value due to financial constraints preventing arbitrageurs from taking advantage of arbitrage opportunities (Xiong (2001), Brunnermeier and Peterson (2009), Gromb and Vayanos (2002,2018)).

- Price dislocations impact the real economy, e.g., through a reduction of credit supply (see, e.g., Benmelech, Meisenzahl, and Ramcharan (2016)).

# Figure 1. Auto ABS Issuance and Spreads 2007-10 and 2019-20
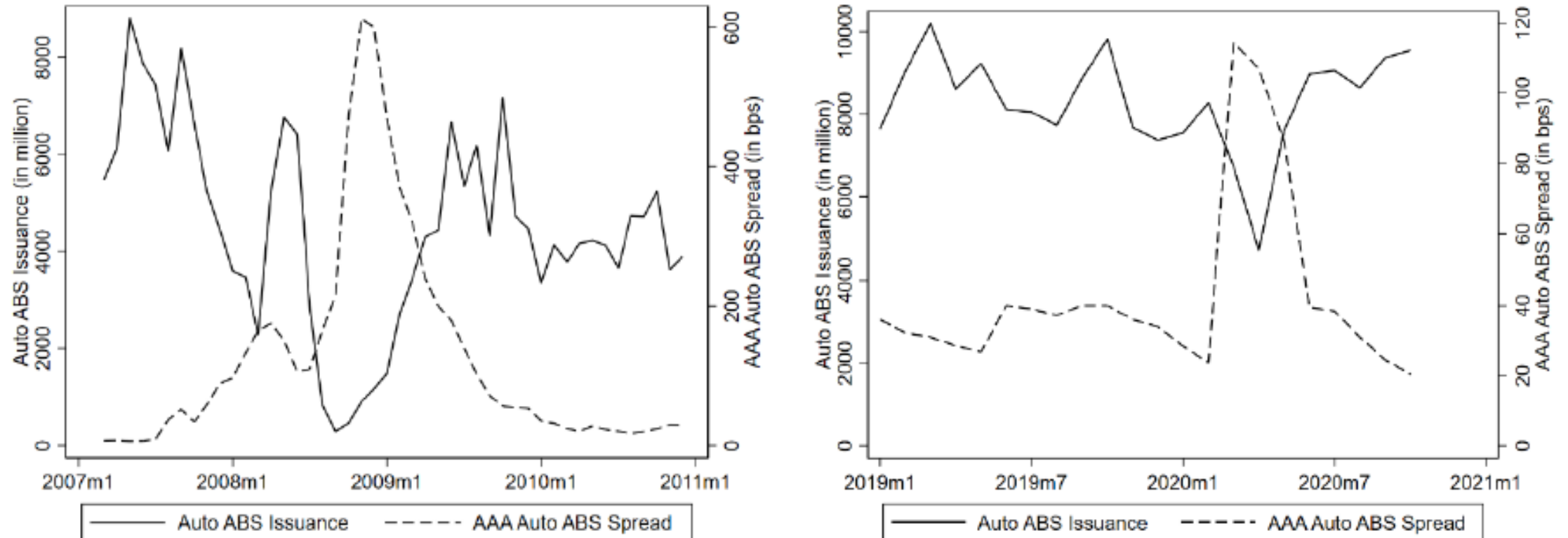
Benmelech, Meisenzahl, and Ramcharan (2016) attribute 1/3 of the drop in car sales 2008-09 to the collapse of ABS markets.

This paper

- Uses TALF as laboratory to test implications of limits-to-arbitrage theory---specifically Gromb and Vayanos (2018).

- TALF relaxed financial constraints by offering non-recourse term funding to finance certain type of asset purchases (no tail risk to investors).

- TALF accepted a large cross-section of assets and was available to a large cross-section of (potential) arbitrageurs.

- TALF had several subscription allowing us to test implications of theory for dynamics of financially constrained arbitrage.

- Returns to TALF loans estimated between 8-13 percent and 20-40 percent (time and security type dependent) and perceived as low risk (Chan and Protess (2010), Williamson, (2020a, 2020b)).

Figure 2

Panel (a) Median Haircuts on Repo Transactions Collateralized by CMBS
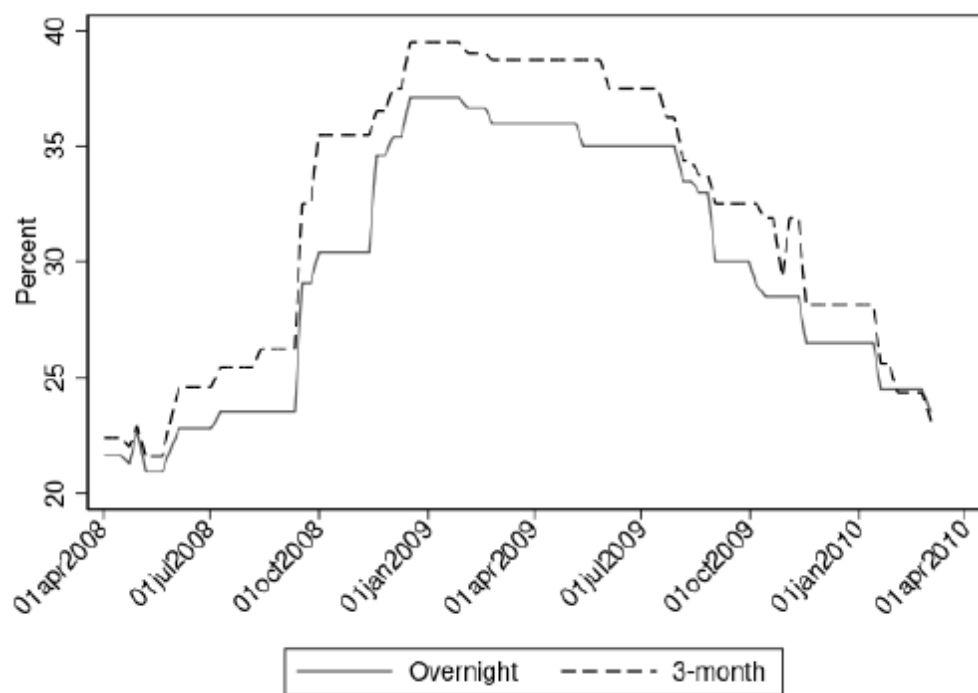
Panel (b) Return on Equity for a CMBS Investment Financed by Repo or a TALF Loan
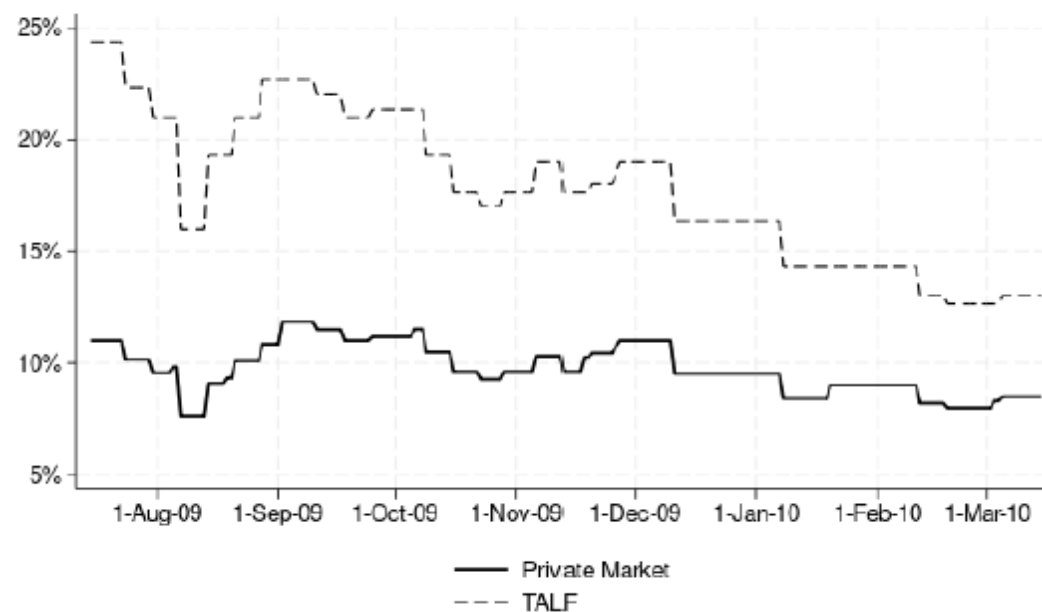
Gromb and Vayanos (2018) in a nutshell

- Key idea: arbitrageurs need capital as collateral (endogenous haircuts) for trades.

- Studies what happens after a shock to arbitrageurs' capital.

- With limited capital, arbitrageurs stay away from riskier trades and spreads stay above fundamentals for a period of time.

- With arbitrage capital replenishing over time, more and more (high risk) assets are traded and asset prices converge to fundamentals.

The TALF Program

- TALF was designed to restore liquidity to the ABS market.

- Eligible collateral for TALF: AAA-rated tranches of several types of new-issue ABS and "legacy" CMBS that were trading in the secondary market.

- Non-recourse term loans (3/5 years for ABS/CMBS) at "penalty" rate

- Haircuts in line with riskiness of asset

- Credit review by NYFED (crucial for CMBS program)

Theory – Data Tensions

- In Gromb-Vayanos haircuts raise endogenously.

- In TALF haircuts were set to 99th percentile of the historical loss distribution (and still were significantly lower than repo haircuts).

- Theory also considers the ability to hedge risk --- CDS for CMBS were not available. But TALF providing no-recourse loans offered tail risk protection.

- Judgement call which TALF participants are "arbitrageurs" based on their funding structure (depended on short-term/repo funding).

Data

- Loan-level data
  - 1,919 loan requests in the 2009-10 TALF program
  - 220 requests submitted in the 2020 TALF program

- Augment with bond information from Trepp and Bloomberg

- Classify the type of borrower (not publicly available)
  - Traditional Investors (Life Insurance, Pension Funds, Mutual Funds, Banks)
  - Constrained Arbitrageurs (Hedge Funds, REITs) --- relied on repo funding
  - Unconstrained Arbitrageurs (Asset Managers, TALF-only Funds)

| TALF Borrowers	All Collateral			CMBS Collateral		
	Borrowers (number)	Loan Requests (number)	Loan Amount (millions)	Borrowers (number)	Loan Requests (number)	Loan Amount (millions)
TALF 1.0						
Arbitrageurs						
Hedge funds	41	536	20,628	16	173	2,951
mREITs	9	125	2,401	9	125	2,401
Total	50	661	23,029	25	298	5,352
Long-Term Investors						
Insurance companies	10	119	5,068	4	44	1,106
Pension funds	6	49	6,114	1	14	230
Banks	3	8	606	0	0	0
Mutual funds	25	136	2,926	24	100	1,904
Individuals	21	123	2,399	3	7	105
Fixed life partnerships	8	62	3,488	4	33	653
TALF-only funds	44	761	28,391	19	193	3,656
Total	117	1,258	48,992	55	391	7,654
Total	167	1,919	72,021	80	689	13,006
TALF 2.0						
Arbitrageurs						
Hedge funds	5	8	153	2	2	26
Long-Term Investors						
Fixed-life partnerships	4	20	231	3	17	141
TALF-only funds	11	192	4,065	9	78	991
Total	15	212	4,296	12	95	1,132
Total	20	220	4,449	14	97	1,158

TALF-only Funds

- Market innovation in response to central bank innovation

- Private funds (similar to private equity funds) with locked-in funding with the sole purpose to invest in TALF-eligible securities and lever up.

- Attractive to smaller investors (small pension funds etc)

- Details matter ---- stringency of investment parameters

Hypothesis 1: Spreads on securities that were TALF-eligible should be lower.

- Test: Bond price announcement effect on April 9th, 2020

- Idea: SASB CMBS were eligible for 2009-2010 TALF….

- But not for 2020 TALF.

- March 23, 2020 announcement of TALF did not include CMBS at all.
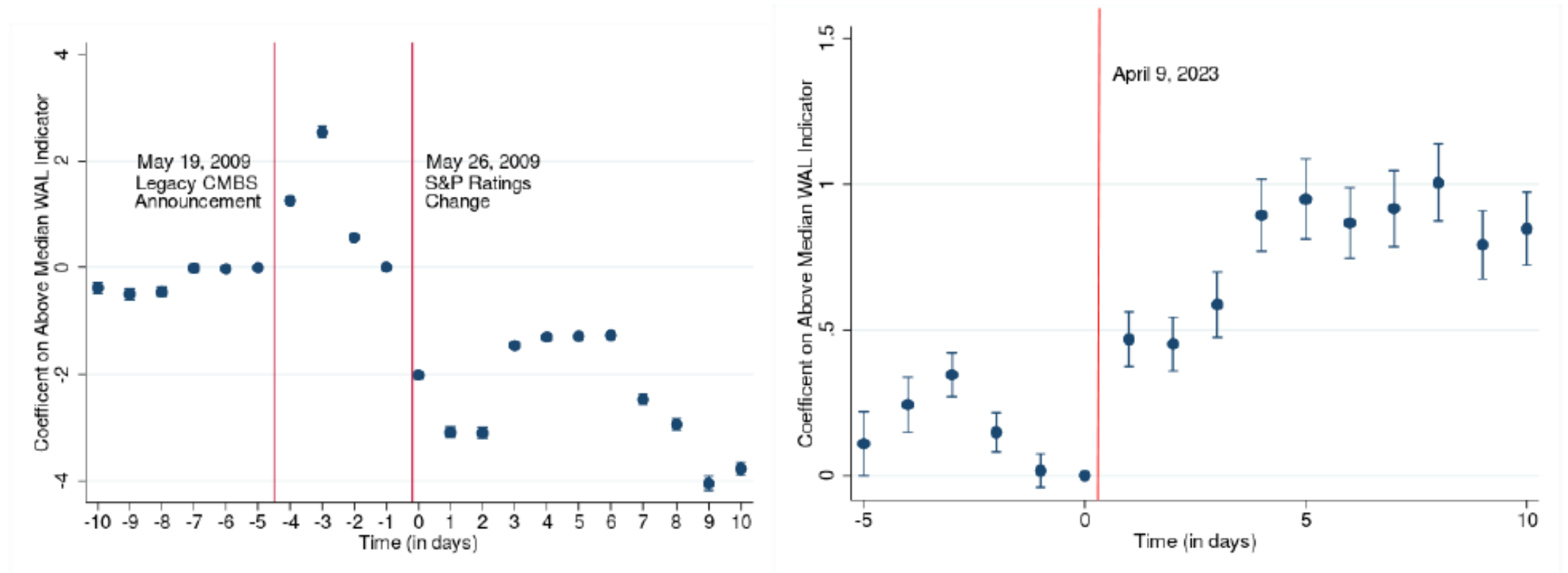
Figure 2. Event Study: TALF Announcement of CMBS eligibility on April 9, 2020
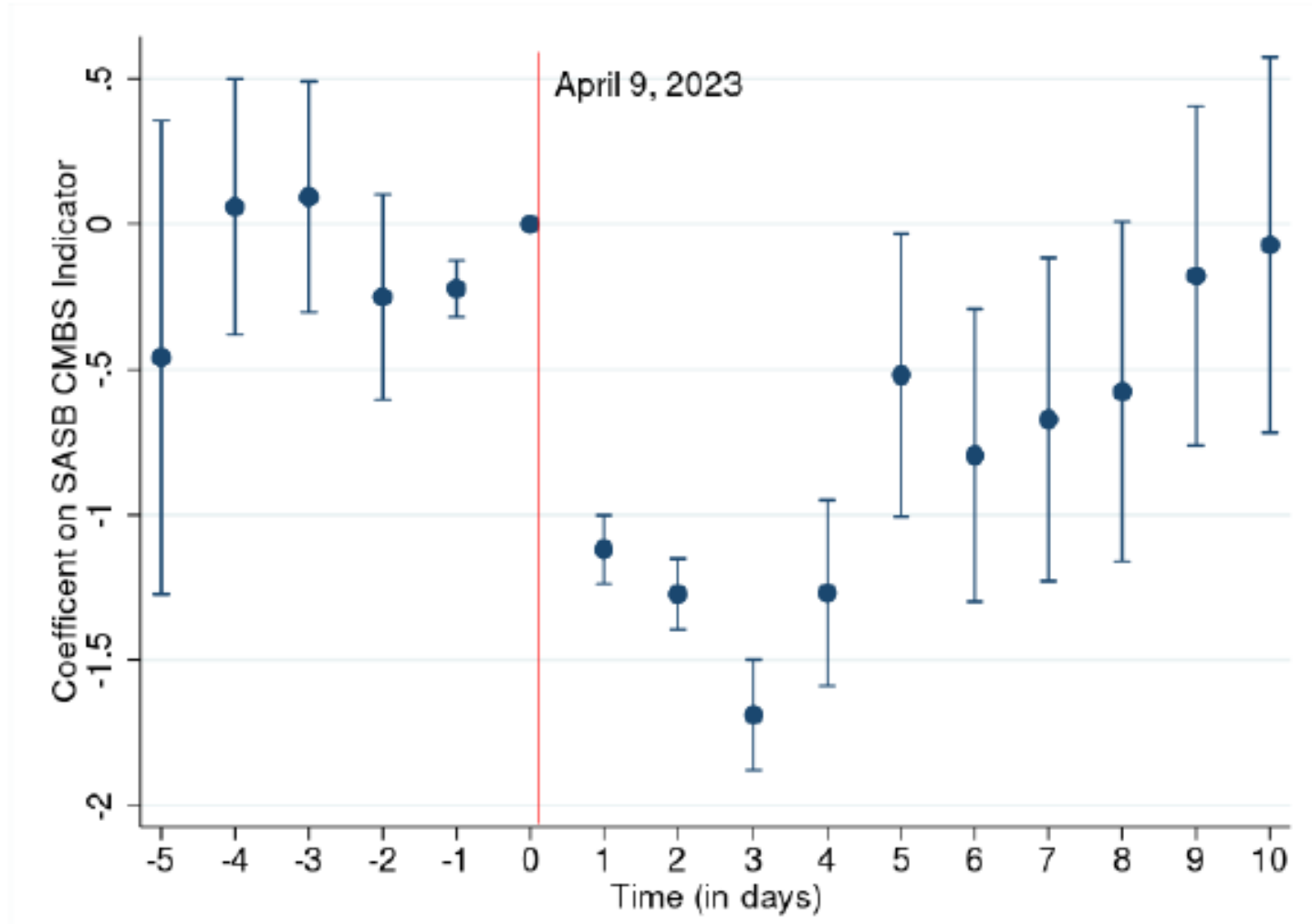
Effect diminishing over time consistent with liquidity spillovers to other asset classes.

Hypothesis 2: Spreads on longer WAL CMBS should tighten more (TALF more "valuable").

Figure 4. Event Studies: Price Effect on Longer WAL CMBS Conduit Securities

Hypothesis 3: Borrowers with more stable funding use higher yielding/riskier securities as collateral.

	WAL Regressions		Yield Regressions		
	OLS	Median	OLS	OLS	Median
	(1)	(2)	(3)	(4)	(5)
Hedge Fund	0.209	0.200	0.224	0.205	0.0200
	(0.649)	(0.155)	(0.441)	(0.158)	(0.0619)
Mutual Fund	0.712	0.440**	0.355	0.00797	0
	(0.552)	(0.204)	(0.282)	(0.0824)	(0.0642)
TALF-Only Fund	1.195**	1.450***	0.627**	0.0497	0
	(0.509)	(0.316)	(0.252)	(0.0669)	(0.0543)
Fixed Life Partnership	2.262***	3.980***	1.268***	0.307***	0.350***
	(0.756)	(0.479)	(0.341)	(0.0950)	(0.0875)
Month FE	Yes	Yes	Yes	Yes	Yes
WAL Bucket FE	No	No	No	Yes	Yes
Observations	831	831	826	826	826
R^2	0.194		0.156	0.773	

Table 2: WAL and Yields on CMBS Loan Request

Notes. Includes CMBS loan requests that were rejected by FRBNY. Omitted borrower type is mortgage REITs. Insurance companies, pension funds, and private individuals are excluded from the sample. WAL obtained from Trepp. All other data are from FRBNY or authors' research. OLS standard errors (in parentheses) are robust and clustered by the borrower. CMBS
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

REITs (constrained arbitrageurs) is the omitted category.

WAL: Weighted Average Life (of loans in the structure) is a common measure of risk in CMBS.

Change in risk

- Gromb and Vayanos (2018) predicts that riskier assets are less likely to be traded by constrained arbitrageurs.

- Non-recourse TALF loans limit losses to haircuts (tail risk) and therefore lowers the riskiness of the assets (increasing the likelihood of the asset to be traded).

Quasi-exogenous variation in riskiness

- **A rejection** of a TALF loan request by the NYFED removes the tail risk protection.

- Industry publication: rejections "roiled the market" and quoted one analyst as saying that "Several investors have started to compare the TALF rejection process to a random number generator."

- **October Surprise**: No rejections in September leading market participants to believe that they had figure it out….

- Less participation

Hypothesis 4a: More uncertainty, less participation
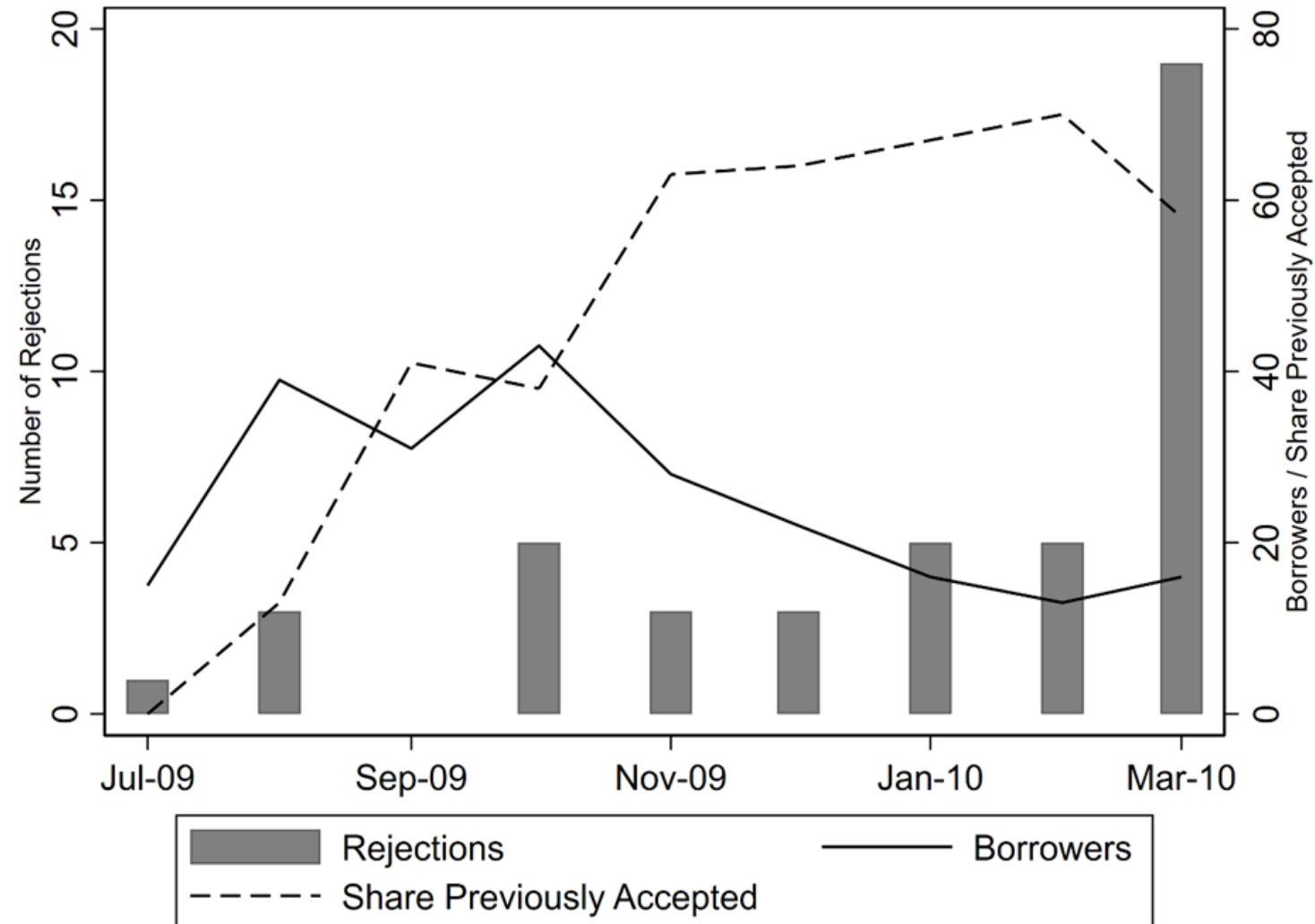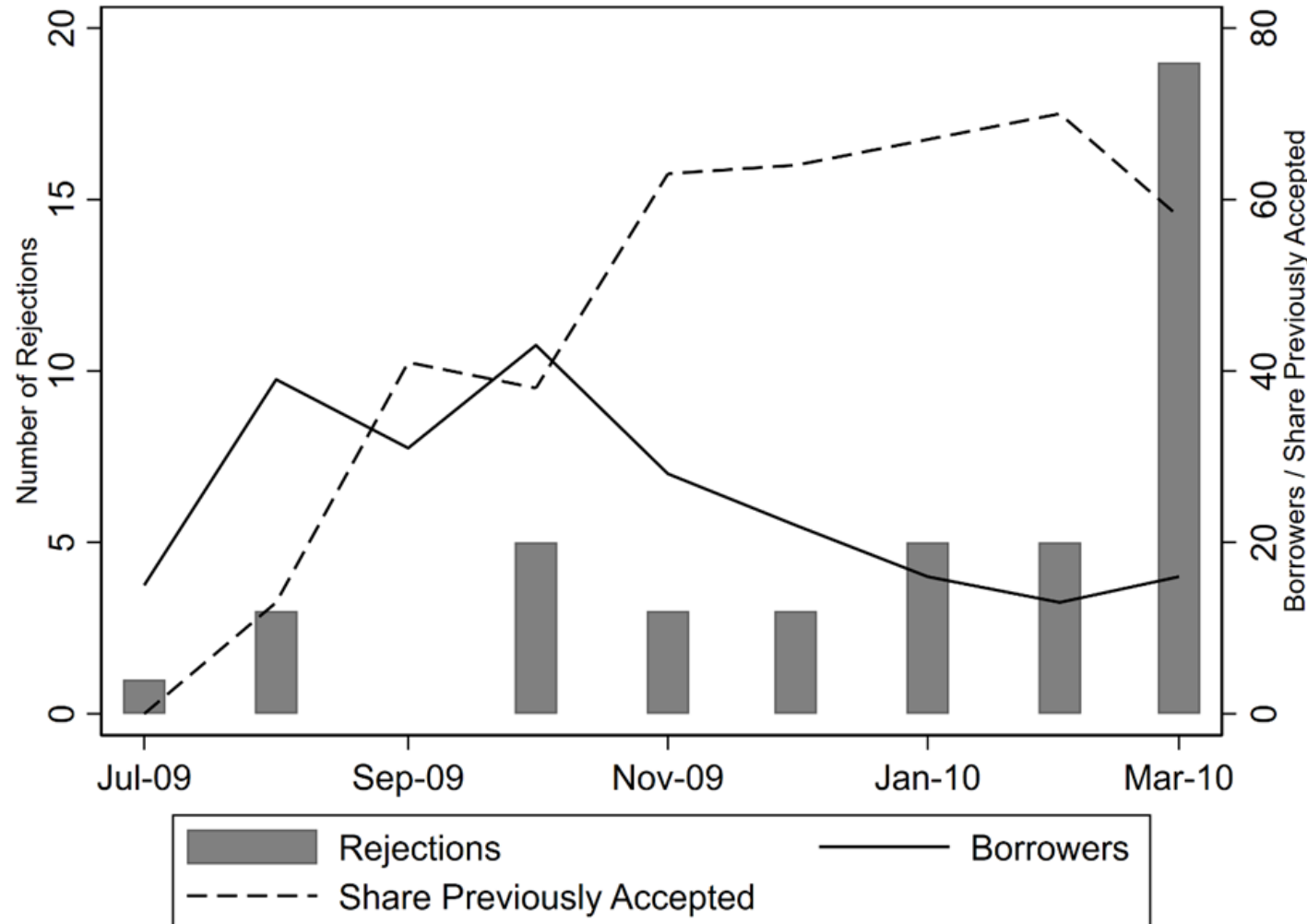

Note: No rejections in September

Five rejections in October

Participations subsequently declines

Hypothesis 4b: Financially constrained arbitrageurs focus on previously accepted tranches (less risk).

Share of previously accepted CUSIPs jumps from 40 to 60 percent (trending up to 70 percent)

Note: contrary to program goal of broad liquidity provision

Hypothesis 4: More Evidence

Table 4: Change in CMBS Participation by Borrower Type, October-November 2009

	Borrowers (number)		Loan requests ($million)		CUSIP accepted before (percent)	
	Oct 2009	Nov 2009	Oct 2009	Nov 2009	Oct 2009	Nov 2009
Arbitrageurs						
Hedge fund	11	8	509	384	35	71
mREIT	4	1	281	145	21	56
Long-Term Investors						
Mutual fund	7	7	327	351	60	76
Fixed-life partnership	3	1	102	78	33	50
TALF-only fund	16	11	746	488	48	65
PPM allows for Rejection	3	3	119	97	44	43
PPM doesn't allow for rejection	8	4	448	183	44	100
All	43	30	2,005	1,475	43	68

Note. No insurance companies or pension funds participated in the CMBS program in October or November 2009.

Hypothesis 5a: When financial constraint relax, arbitrageurs take more risk

a) All Borrowers
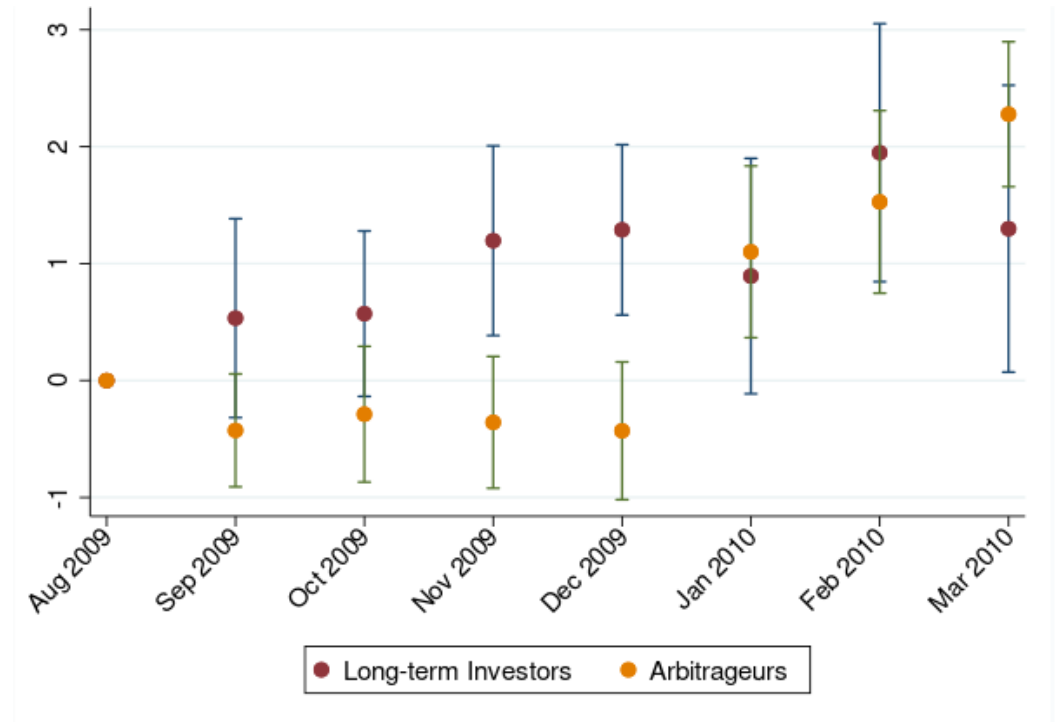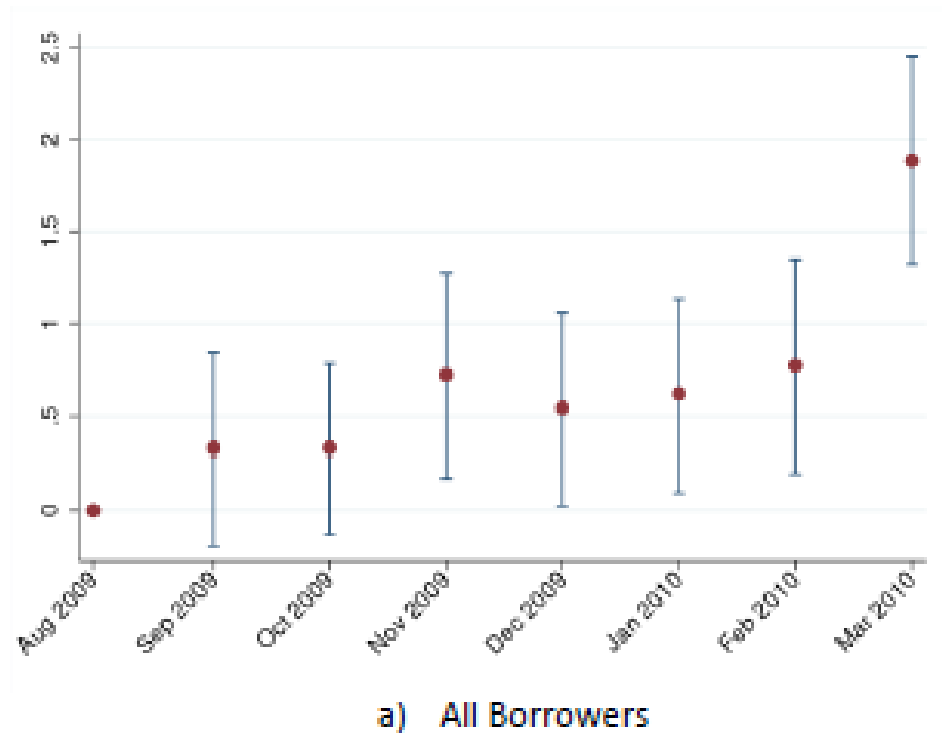
Note: CMBS pool fixed, so WAL goes down over life time of program.

Hypothesis 5b: When financial constraints relax, arbitrageurs care less about rejection risk.

$$\text{Rejected}_{it} = \beta_1 Arbitrageur + \beta_2 Arbitrageur * Late + \alpha_t + \epsilon_{it}$$

- How do we define "Late" to be consistent with theory (laxer constraints)?

- News reports suggest that by Dec 2009, private repo funding became available again (e.g., REIT reported having a repo facility).

- By Dec 2009 private repo market haircuts were about 25% down from a 40% high a few months before

Hypothesis 5b: When financial constraints relax, arbitrageurs care less about rejection risk.

$$\text{Rejected}_{it} = \beta_1 Arbitrageur + \beta_2 Arbitrageur * Late + \alpha_t + \epsilon_{it}$$

Table 5. Propensity of Loan Rejection over time

	Unweighted		Weighted
	(1)	(2)	(3)
Arbitrageur	0.042***	0.008	-0.006
	(0.016)	(0.015)	(0.020)
Arbitrageur * Late		0.094**	0.087*
		(0.040)	(0.046)
Time FE	Yes	Yes	Yes
Observations	804	804	804
R^2	0.19	0.19	0.14

Hypothesis 6a: Spreads on AAA-tranches of CMBS will increases after rejections.

- Test: Movement in bond prices around rejections.

- Idea: NYFED rejections were quasi-random (and exogenous) from the perspective of market participants.

- Control of CUSIP FE and Time FE

- Identification from within-bond variation on a given day.

Hypothesis 6a: Spreads on AAA-tranches of CMBS will increases after rejections.

$$\Delta Spread_{it} = \beta_1 Rejected_{it} + \theta_i + \alpha_t + \epsilon_{it}$$

	Panel A: All subscriptions			
	5-day window	7-day window	9-day window	11-day window
	(1)	(2)	(3)	(4)
Rejected	8.87**	13.45***	22.44***	23.53***
	(3.60)	(4.09)	(6.55)	(7.57)
Time FE	Yes	Yes	Yes	Yes
CUSIP FE	Yes	Yes	Yes	Yes
Observations	49,920	49,913	49.906	49,899
R^2	0.41	0.42	0.40	0.39

Note: Larger effects are expected for longer windows due to relatively low trading activity and hence slow price discovery.

Hypothesis 6b: Spreads on AAA-tranches of CMBS will increases more for riskier (high WAL) CMBS

	5-day window (1)	7-day window (2)	9-day window (3)	11-day window (4)
Rejected x High WAL	10.56	32.45**	47.78***	46.26***
	(7.91)	(13.10)	(8.78)	(10.57)
Rejected	3.50	-3.10	-1.93	-0.04
	(5.34)	(7.38)	(7.77)	(10.28
High WAL	-0.44	0.97	1.42	0.25
	(1.33)	(1.91)	(2.44)	(2.64)
Time FE	Yes	Yes	Yes	Yes
CUSIP FE	Yes	Yes	Yes	Yes
Observations	49,920	49,913	49.906	49,899
R^2	0.42	0.42	0.40	0.399

Hypothesis 6c: The response of spreads to rejections decreases over time.

- As arbitrage capital replenishes, rejections are less likely to cause "fire sales" and the downside projection offered by TALF becomes less valuable.

	5-day window	7-day window	9-day window	11-day window
	(1)	(2)	(3)	(4)
Rejected * Early	22.00***	20.59***	47.29***	57.55***
	(3.82)	(2.50)	(15.84)	(15.58)
Rejected * Late	4.21	10.92*	13.62**	11.45**
	(2.91)	(6.16)	(6.15)	(5.28)
Time FE	Yes	Yes	Yes	Yes
CUSIP FE	Yes	Yes	Yes	Yes
Observations	49,920	49,913	49.906	49,899
R^2	0.41	0.42	0.40	0.39

Sidenote: Why was 2020 TALF take up so low?
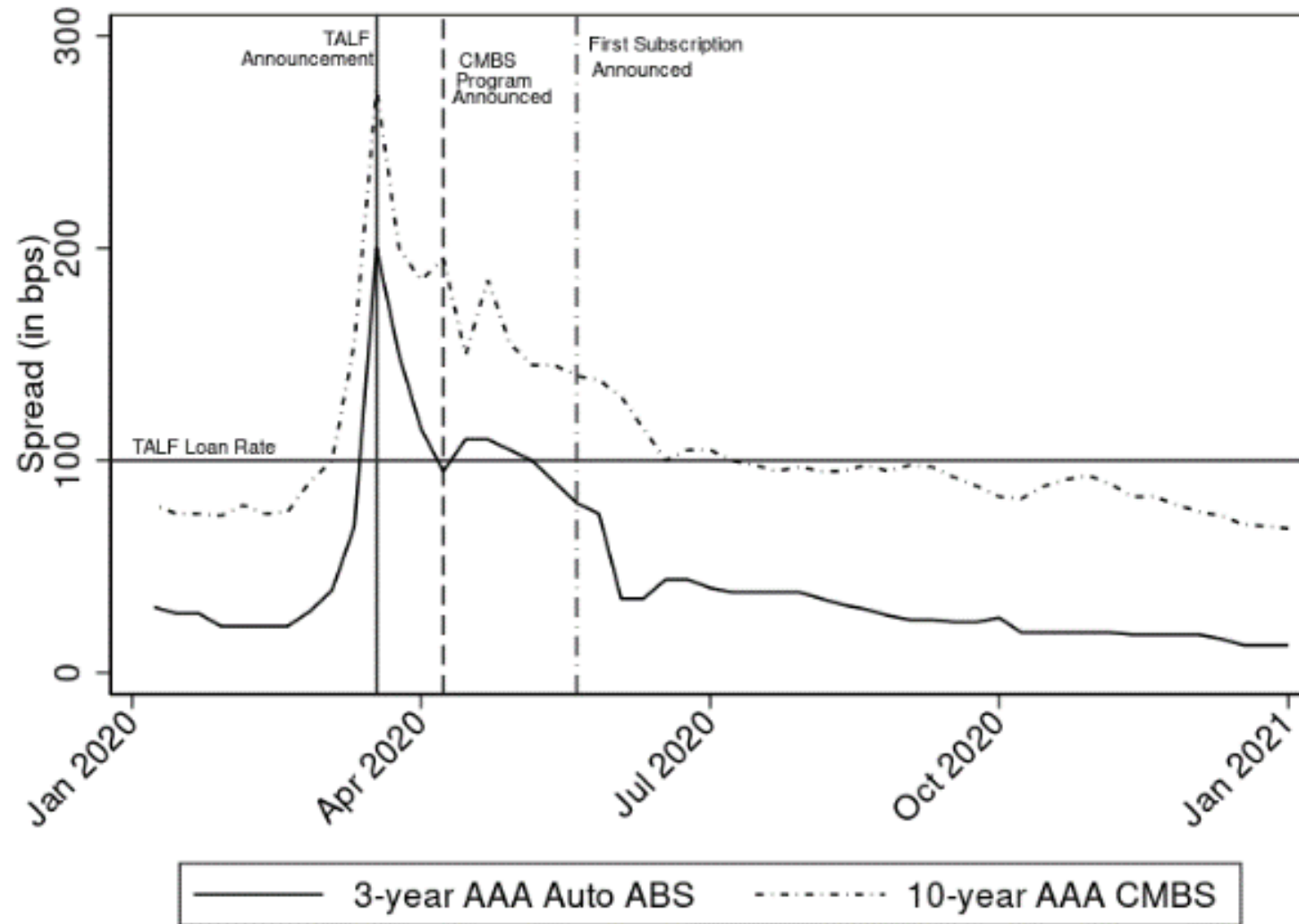
- Significant announcement effect

- Large-scale interventions

- At first subscription (June 2020) TALF loan rate was not longer economical.

Conclusion

- Evidence from TALF loan-level data broadly consistent with limits to arbitrage theory in the
    - Cross-section of assets
    - Cross-section of arbitrageurs
    - Dynamics over time

- Central bank innovation (TALF program) was followed by market innovation in form of TALF-only funds.

- Credible announcements of central banks promising increased liquidity in the (near) future can restore liquidity in markets immediately (2020 TALF announcement)