Safe asset shortage and collateral re-use

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Motivation: Shortage of safe assets

Safe assets play an important role in the economy:

– Store value over time.

– Serve as collateral in financial transactions.

Concern: Supply of safe assets has not kept up with global demand.

Market reactions to safe asset shortages:

1. Privately-issued safe assets:
   Pooling of balance sheet assets, over-collateralization, tranching.

2. Market participants can also adjust to a shortage of safe assets by re-using received collateral in other transactions.
   In this paper we study this "collateral re-use channel".

What is collateral re-use?

*repo, securities lending, margin lending, OTC derivatives
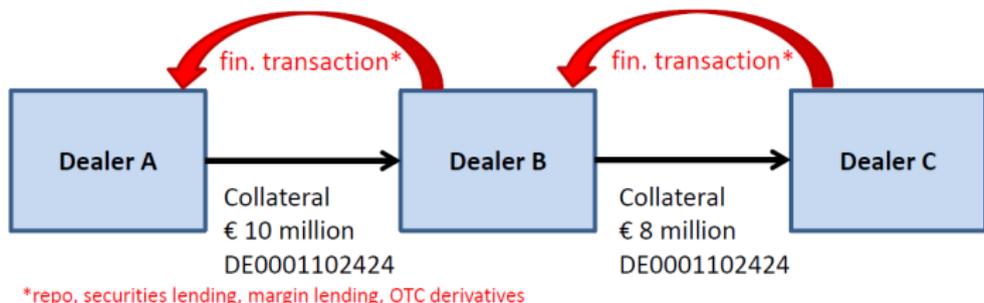
– Dealer B receives a security as collateral in a transaction with dealer A.
– Transactions include repo, securities lending, margin lending, OTC derivatives.
– Dealer B can re-use this security to back another independent transaction with dealer C.
– Condition: Transfer of ownership!

Note: Following the FSB's definition, rehypothecation is subsumed under collateral re-use.

▶ Rehypo

Collateral re-use and financial fragility

Potential costs and benefits of collateral re-use (FSB, 2017):

- Important role in financial markets: increase of collateral availability, reduction of transaction and funding costs, beneficial for market liquidity and functioning.
- Potential risks: build-up of excessive leverage, increase in interconnectedness, amplification of shocks.

Lack of data to measure collateral re-use:

- Ongoing data collection initiatives (e.g., EU Securities Financing Transaction Regulation, SFTR).

Literature on collateral re-use

Growing theoretical literature:

$\rightarrow$ Trade-off between economic efficiency and financial stability.

    (Lee, 2017; Brumm, Kubler, Grill, and Schmedders, 2018)

Empirical literature

- Rough estimate of collateral re-use based on hand-collected data from annual reports of the largest collateral dealers. Re-use rate: 74–88% (Singh and Aitken, 2010; Singh, 2011; Kirk et al., 2014)
- Approximation of collateral re-use from repo transaction data (Fuhrer, Guggenheim, and Schumacher, 2016)
- Dealer-level collateral re-use from U.S. confidential supervisory data (Infante, Press, and Saravay, 2020; Infante and Saravay, 2020)

This paper

Using a unique regulatory data set, we quantify German banks'
collateral re-use and their adjustment to collateral scarcity.
Novel features:
- Re-use is measured at the security/dealer-security level.
- Data includes both the repo and securities lending market.

Paper outline:

1. Data and descriptive statistics on collateral re-use

2. Asset purchases and collateral re-use

3. Mitigating effects of collateral re-use on scarcity

4. Collateral re-use and repo rate volatility

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Data sources

– Bundesbank Securities Holdings Statistics (SHS):
security-by-security data on German banks'

   (1.) outright ownership,

   (2.) collateral received in securities lending/repo transactions,

   (3.) collateral posted in securities lending/repo transactions.

   $\rightarrow$ This allows us to compute banks' collateral re-use activity.

– Overall sample:
- Period: 2008:Q1–2012:Q4, 2013:M1–2017:M12.
- Investment grade euro area government bonds

– Focus on PSPP period: 2015:M3 - 2017:M12.

– Security-level analyses focus on German government bonds due to market coverage.

Measuring collateral re-use

Main measure of collateral re-use (FSB, 2017):

$$Re\text{-}use_{ij}^{prop.} = \left(\frac{Received_{ij}}{Received_{ij} + Outright\ ownership_{ij}} \right) \times Posted_{ij}$$

Assumption: No distinction between outright ownership and collateral received when posting collateral (this is common market practice).
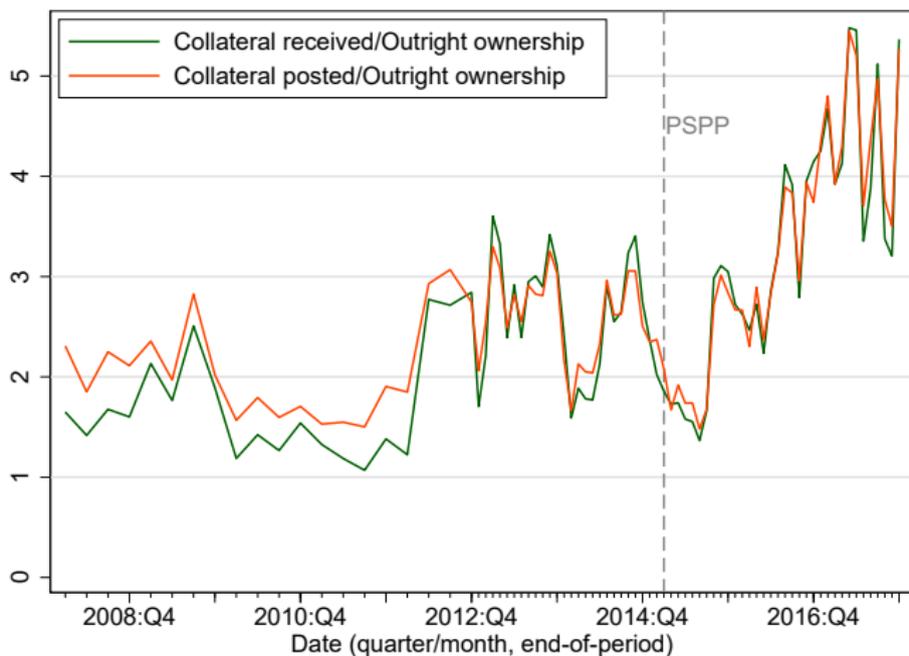
Robustness: Lower/upper bound

$$\text{Re-use}_{ij}^{lower} = \max((Posted_{ij} - Outright\ ownership_{ij}), 0)$$
$$\text{Re-use}_{ij}^{upper} = \min(Received_{ij}, Posted_{ij})$$

Dealer	ISIN	Outright ownership	Collateral received	posted	Re-use lower	prop.	upper
A	DE0...	20	100	90	70	75	90

$\rightarrow$ Note: Re-use measures are highly correlated ρ : 0.90-0.97.

▸ Example: detail

Collateral received and posted over time

Note: Aggregate over euro area sovereign bonds (maturity 1-30 years) of German dealers.
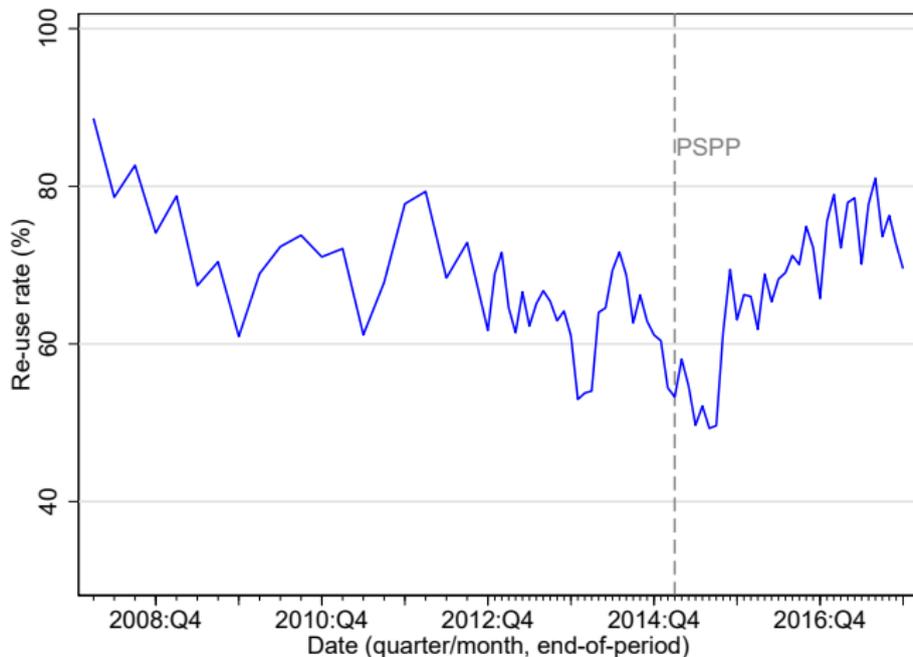
Collateral re-use over time
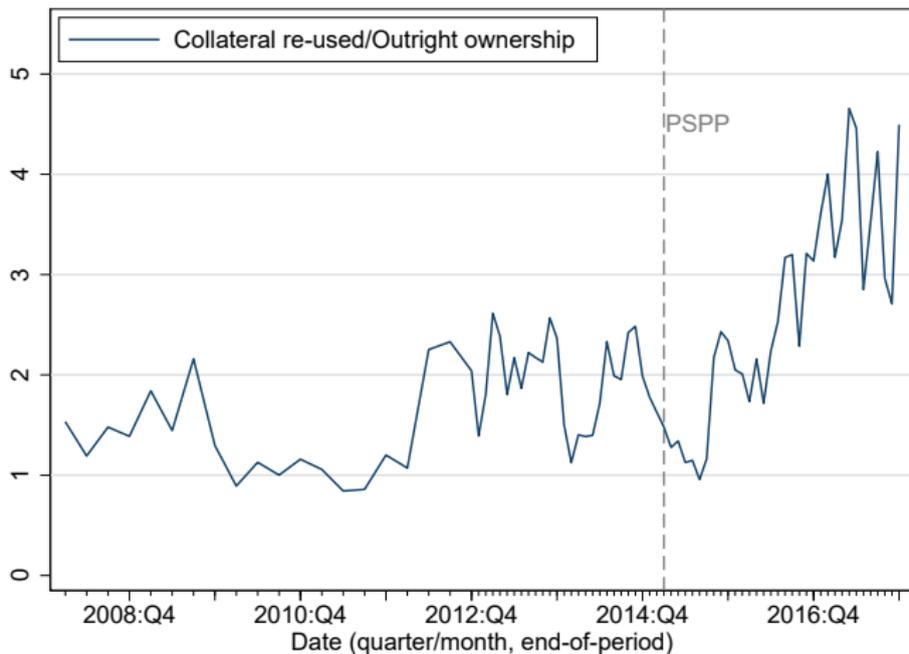
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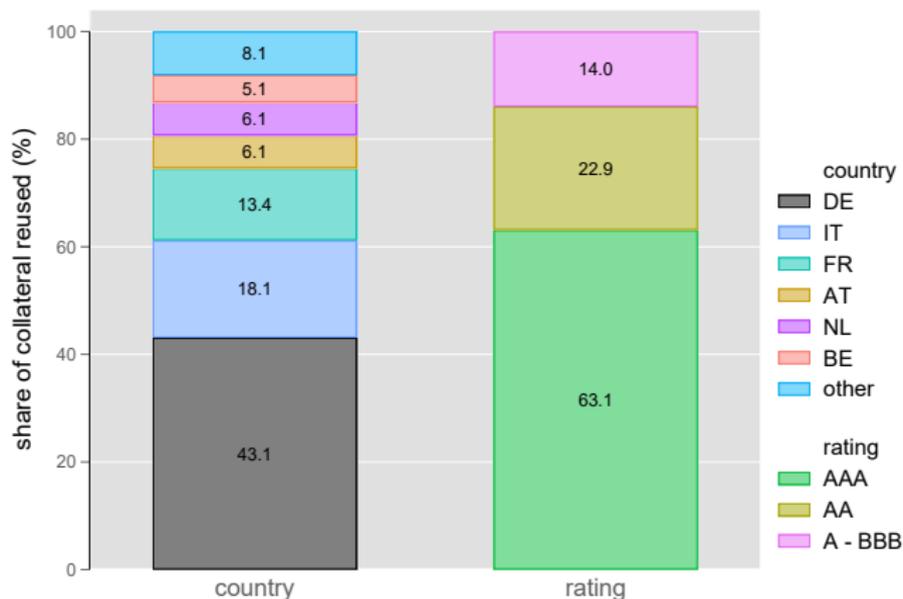
Re-use rate over time

$$re\text{-}use\ rate_{i,j} = \frac{Re\text{-}use_{i,j}}{Collateral\ received_{i,j}}$$

Note: Aggregate re-use rate over euro area sovereign bonds (maturity 1-30 years) of German dealers.

Type of collateral re-used

Note: Share of collateral reused by issuer country (left) and issuer rating (right). *Other countries*: Spain, Finland, Greece, Ireland, and Portugal. Time-series average of 2008-2017 at quarterly frequency.

▸ Time-series: domestic vs. other euro area collateral

Presentation outline

1. Data and descriptive statistics on collateral re-use

2. Asset purchases and collateral re-use

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4. Collateral re-use and repo rate volatility

Presentation outline

Asset purchases and collateral re-use

$$\Delta \log(\textit{re-use})_{i,j,t} = \beta_0 + \beta_1 \textit{Asset purchases}_{i,t} + \gamma'\text{Controls}_{i,t}$$
$$+\alpha_{j,t} + \alpha_{i,j} + \alpha_{m,c,t} + \varepsilon_{i,j,t},$$

- Dependent variable: $\log(\textit{re-use})_{i,j,t}$: change in re-use (log) of bank j in bond i in month t
- *Asset purchases*$_{i,t}$: Eurosystem asset purchases (PSPP) in % of amount outstanding $\rightarrow$ Collateral supply reduction
- Controls$_{i,t}$ Other collateral demand/supply factors (re-issuances, on-the-run status, cheapest-to-deliver)
- $\alpha_{j,t}$ bank×time fixed effects
- $\alpha_{i,j}$ bank×bond fixed effects
- $\alpha_{m,c,t}$ maturity bucket×country×time fixed effects
  (Arrata et al., 2020)

❚ Asset purchases and collateral re-use (cont'd)

	Dependent variable: $\Delta \log(re\text{-}use)_{i,j,t}$				
Asset purchases$_t$ (%)	0.16**	0.15**	0.16**	0.17**	0.21**
	(2.34)	(2.24)	(2.13)	(2.27)	(2.40)
Δ Amount outstanding$_t$	0.01	0.01	0.02	0.02	0.02*
	(1.25)	(1.14)	(1.51)	(1.53)	(1.96)
Dummy: On the run$_t$	0.45	0.46	0.67	0.68	0.66
	(1.16)	(1.12)	(1.43)	(1.48)	(1.40)
Dummy: Cheapest-to-deliver$_t$	0.16	0.09	0.15	0.11	0.06
	(0.46)	(0.26)	(0.38)	(0.28)	(0.14)
Constant	-0.12	-0.11	-0.14*	-0.15*	-0.18**
	(-1.64)	(-1.51)	(-1.68)	(-1.78)	(-2.11)
Fixed effects:					
dealer	yes	-	-	-	-
time	yes	-	-	-	-
bond	yes	yes	-	-	-
dealer×time	-	yes	yes	yes	yes
dealer×bond	-	-	yes	yes	yes
country×time	-	-	-	yes	-
maturity bucket×country×time	-	-	-	-	yes
R^2	.02074	.1017	.1122	.1285	.1634
N	27,927	27,744	27,006	27,006	26,936

t-statistics based on clustered standard errors (bond×time) are provided in parentheses.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Channels of collateral re-use adjustment

Two possible channels:

1. Adjustment of re-use rate
2. Adjustment of collateral received

Dependent variable:	$\Delta \log(\text{Re-use})_t$	$\Delta \text{Re-use Rate}_t$	$\Delta \log(\text{Coll. Rcvd.})_t$
Panel A: Euro area collateral			
Asset purchases$_t$ (%)	0.21**	1.14**	0.15*
	(2.40)	(2.44)	(1.94)
R^2	.1634	.1698	.1291
N	26,936	26,936	26,936
Panel B: German collateral			
Asset purchases$_t$ (%)	0.29**	1.65**	0.20
	(2.02)	(2.09)	(1.56)
R^2	.1827	.1868	.1378
N	7,636	7,636	7,636
Fixed effects:	dealer×time + dealer×bond + maturity bucket×country×time		

t-statistics based on clustered standard errors (bond×time) are provided in parentheses.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

▸ Economic Significance   ▸ Robustness: Upper/lower bound

Presentation outline

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Mitigating effects of collateral re-use on scarcity

Security-level analysis:
How do asset purchases affect repo rates for different levels of collateral re-use?

$$
\begin{aligned}
\Delta \textit{repo rate}_{i,t} = \ & \beta_0 + \beta_1 \textit{Asset Purchases}_{i,t} + \beta_2 \log(\textit{Re-use/Outright own.})_{i,t-1} \\
& + \beta_3 \textit{Asset purchases}_{i,t} \times \log(\textit{Re-use/Outright own.})_{i,t-1} \\
& + \gamma' \textit{Controls}_{i,t} + \alpha_i + \alpha_{m,t} + \varepsilon_{i,t} \quad .
\end{aligned}
$$

- $\Delta \textit{repo rate}_{i,t}$: change in the specific collateral (SC) repo rate of bond i in month t
- $\textit{Asset Purchase}_{i,t}$: Eurosystem asset purchases (PSPP) in %
- $\log(\textit{Re-use/Outright ownership})_{i,t-1}$: lagged level of re-use of bond i
- Due to better market coverage we focus on German government bonds.
- Focus on period before enhanced securities lending (Dec 2016)
  $\rightarrow$ Cleanest setting for collateral supply reduction.

❚Mitigating effects of collateral re-use on scarcity (cont'd)

	Pre-enhanced securities lending period		enhanced securities lending period	
	Dependent variable: ΔRepo Rate$_t$ (bps)			
Asset purchases$_t$ (%)	-1.39***	-1.49***	-1.03*	-1.16
	(-3.60)	(-3.50)	(-1.69)	(-1.39)
Δ Amount outstanding$_t$	0.36	0.97*	0.19	0.14
	(1.55)	(1.67)	(1.39)	(0.84)
Dummy: On-the-run$_t$	-11.74	-27.29	2.45	5.40
	(-1.17)	(-1.54)	(0.36)	(0.75)
Dummy: Cheapest-to-deliver$_t$	-2.73*	-1.78	-5.39	-6.03
	(-1.91)	(-1.06)	(-0.65)	(-0.71)
$\log(Re\text{-}use/Outright\ ownership)_{i,t-1}$		0.26		0.67**
		(1.01)		(2.26)
Asset purchases$_t$ (%) $\times \log(Re\text{-}use/Outright\ ownership)_{i,t-1}$		-0.42***		0.07
		(-3.62)		(0.34)
Constant	-5.55***	-5.52***	8.72***	7.66***
	(-14.19)	(-11.24)	(18.04)	(12.41)
Fixed effects:	bond + maturity bucket×time			
R^2	.8079	.8163	.8147	.8166
N	1,043	1,005	506	496

t-statistics based on standard errors clustered at bond level are provided in parentheses.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

One SD increase in lagged re-use level increases the sensitivity of repo rates to asset purchases by approx. one basis point ($2.28 \times -0.42 = -0.96$)

▸ Robustness: high market share

Presentation outline

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Collateral re-use and repo rate volatility

High levels of collateral re-use imply long collateral chains, increased interconnectedness, and possibly higher volatility in the collateral market.
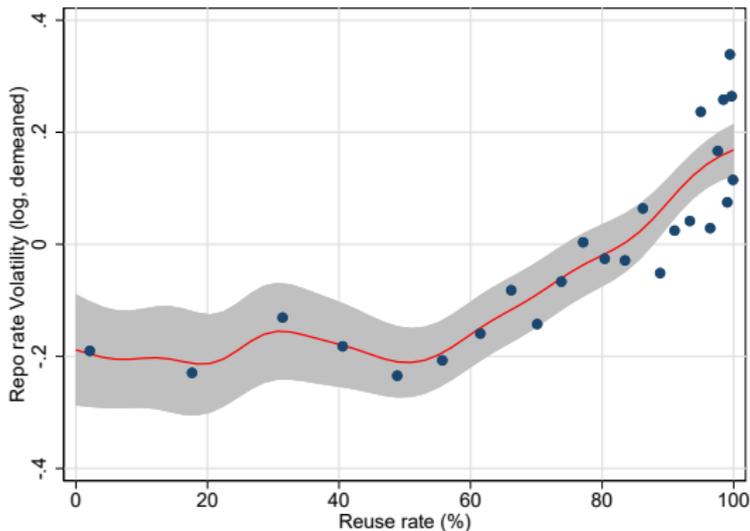
Note: Binned scatter plot of re-use rate and repo rate volatility (realized monthly volatility of daily rates) (Bunds, maturity 1-30 years, 2015:M3 - 2017:M12); local mean smoothing with 95% confidence intervals.

❚Collateral re-use and repo market volatility (cont'd)

$$\log(\text{repo rate volatility})_{i,t} = \beta_0 + \beta_1 I(\text{re-use rate}_{i,t-1} > 80\%) + \gamma' \text{Controls}_{i,t-1} + \alpha_i + \alpha_t + \varepsilon_{i,t},$$

	Full Sample Period		Excluding year ends	
	Dependent variable: $\log(\text{Repo Rate Volatility})_t$			
Dummy: re-use rate high$_{t-1}$	0.08**	0.06**	0.09**	0.07*
	(2.61)	(2.04)	(2.43)	(1.99)
Yield$_{t-1}$ (%)	-0.02	-0.01	-0.01	0.00
	(-0.38)	(-0.17)	(-0.15)	(0.07)
Amount outstanding$_{t-1}$ (log)	-0.30	0.10	-0.32	0.14
	(-1.26)	(0.55)	(-1.18)	(0.63)
Dummy: on-the-run$_t$	0.19	0.41***	0.18	0.44**
	(1.35)	(2.87)	(1.08)	(2.45)
Dummy: Cheapest-to-deliver$_t$	0.19***	0.18***	0.21***	0.21***
	(2.95)	(3.21)	(3.20)	(3.65)
Overall share purchased$_{t-1}$		-0.00		-0.00
		(-0.76)		(-0.57)
Repo rate$_{t-1}$		-0.77***		-0.80***
		(-5.15)		(-5.11)
Constant	4.09	-5.70	4.19	-6.95
	(0.72)	(-1.37)	(0.66)	(-1.32)
Fixed effects:	bond + time			
R^2	.8651	.8666	.7834	.7871
N	1,487	1,381	1,360	1,264

t-statistics based on standard errors clustered at bond level are provided in parentheses.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Summary and Conclusion

- Banks adjust to safe asset scarcity by increasing collateral re-use.

- Re-use alleviates part of the supply reduction, which is reflected in a lower scarcity premium.

- Side effect of collateral re-use: High levels of collateral re-use are associated with high volatility of repo rates.

References I

William Arrata, Benoît Nguyen, Imène Rahmouni-Rousseau, and Miklos Vari. The scarcity effect of quantitative easing on repo rates: Evidence from the Euro area. *Journal of Financial Economics*, 137(3):837–856, 2020.

Johannes Brumm, Felix Kubler, Michael Grill, and Karl Schmedders. Re-use of collateral: Leverage, volatility, and welfare. *ECB Working Paper Series No 2218*, 2018.

FSB. Non-cash collateral re-use: Measure and metrics. Report, 2017.

Lucas Marc Fuhrer, Basil Guggenheim, and Silvio Schumacher. Re-use of collateral in the repo market. *Journal of Money, Credit and Banking*, 48(6):1169–1193, 2016. ISSN 0022-2879.

Sebastian Infante and Zack Saravay. What drives us treasury re-use? *Working Paper, Federal Reserve Board*, 2020.

References II

Sebastian Infante, Charles Press, and Zack Saravay. Understanding collateral re-use in the us financial system. In *AEA Papers and Proceedings*, volume 110, pages 482–86, 2020.

Adam Kirk, James McAndrews, Parinitha Sastry, and Phillip Weed. Matching collateral supply and financing demands in dealer banks. *Economic Policy Review*, (Dec):127–151, 2014.

Jeongmin Lee. Collateral circulation and repo spreads. *Working Paper*, 2017.

Manmohan Singh. Velocity of pledged collateral: Analysis and implications. *IMF Working Paper*, (11-256), 2011. ISSN 1463994737.

Manmohan Singh and James Aitken. The (sizable) role of rehypothecation in the shadow banking system. *IMF Working Paper*, (10-172), 2010. ISSN 1455233404.