Eurosystem's asset purchases and money market rates

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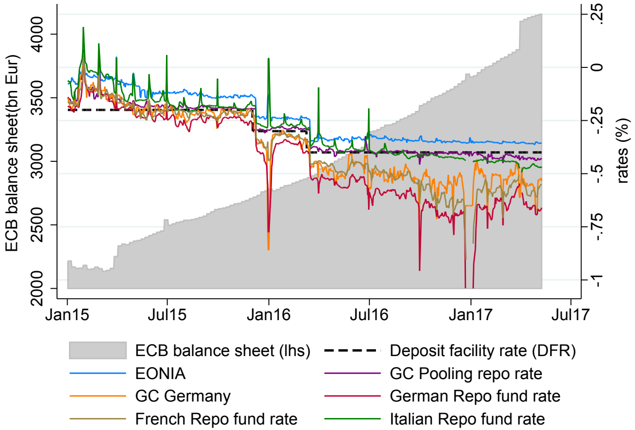
Money market rates in the Euro area



- ECB deposit facility rate ceased to be a floor for some money market rates since mid-2015, not long after the start of QE in Euro area
- Increased dispersion of MM rates: transmission issue? Same case in the US
- Country-specific dynamics for repo rates: fragmentation issue?

Repo rates and asset purchases

Why did repo rates start to deviate since the start of the *Public sector purchase program* (PSPP) ?

- Two possible explanations: 1) aggregate effects: such as excess liquidity pressuring down interest rates 2) bond-level effects: PSPP creates a shortage of collateral, which depresses some interest rates ("scarcity channel")
- This paper: we use the different repo rates to assess these two possible channels
- Preview of our results: we find support for both bond-level and aggregate effects. The latter seem a bit larger depending on countries ; other factors might be at play.

Large scale asset purchase in the Euro area

- Public sector purchase program (PSPP) started in March 2015 : large-scale purchases of euro-area governments and public entities bonds
- Initial total size announced to 1140 bn €, revised subsequently upward, current pace is 60 bn €/month, will reach 2280 bn € in Dec 17
- Eurosystem's holdings in Dec 17 will represent roughly 25% of the eligible outstanding (24% in the US, 30% in the UK...)
- and 20% of EA GDP (16% in the US, 14% in the UK...)

Basics on repo market in EA

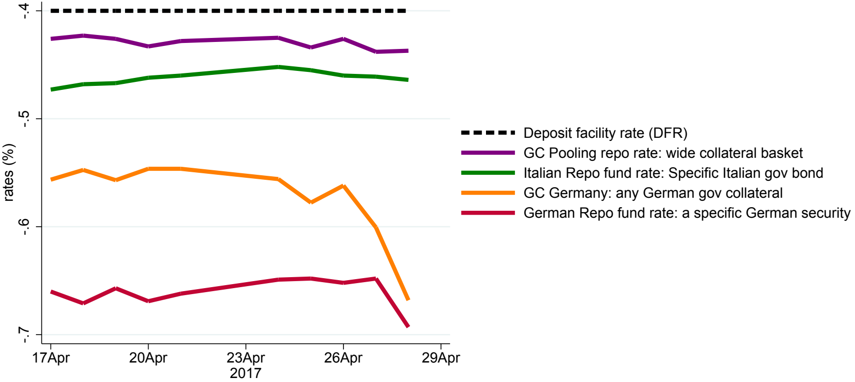
- Repo: counterparty A lends cash against a bond i (the collateral) in time t, counterparty B will repay cash $\times$ (1+the repo rate) to A and recover its bond in time $t+1$
- Largest money market: quarterly turnover of 29 Trn Eur (ECB money market survey, Sept 15)
- Two segments, two motives to transact :

Borrowing and lending liquidity	Borrowing a collateral
"General collateral" market (GC)	"Specific collateral" market (SC)
Collateral from a basket	Predetermined security

- Spread between GC and SC provides a metric of an individual bond scarcity (Duffie, 1996)
- A bond is said to trade "on special" or with a "specialness premium" when people are willing to pay a premium to borrow this specific security instead of one unspecified bond from a general collateral basket

Repo rates and preferences over collateral

Zooming in on the first graph rates: repo rates diversity reflects different preferences over collateral (and different motives)



- GC ("general collateral"), transactions secured by an unspecified bond listed in a basket, *a priori* liquidity-driven
- SC ("specific collateral"), transactions secured by a unique bond eg. the "Bund 0.5% coupon maturing the 25/08/2027": *a priori* security-driven.

Literature

Theoretical framework on the causes for low repo rates

- On the concept and source of specialness: Duffie (1996), Fisher (2002)
- Models on US money market and policy implications: Fleming et al. (2010), Bech and Klee (2011), Frost et al (2015), Duffie and Krishnamurthy (2016)

Effects of central banks' asset purchases on repo rates

- Empirical literature on APP and repo rates: D'Amico, Fan and Kitsul (2014), Ferrari et al. (2016), Corradin and Maddaloni (2017), Arrata et al. (2017)

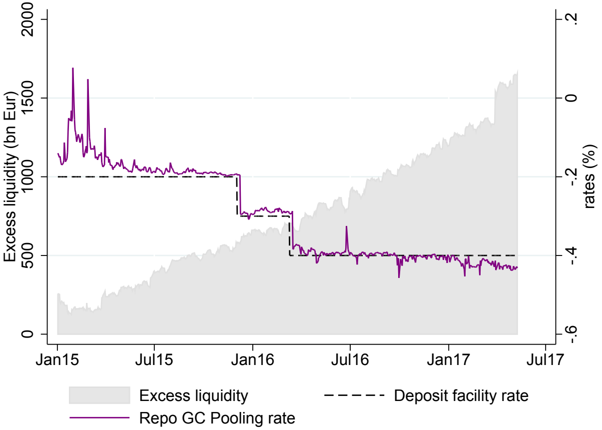
Outline of the presentation

We take advantage of the different information contained in the two types of transactions (GC/SC), allowing us to investigate aggregate and bond-level effects of the PSPP.

1. GC rates by EA countries and excess liquidity
2. The relationship between GC and SC rates
3. SC rates at the individual security-level:
   3.1 PSPP individual purchases and SC trade-by-trade data
   3.2 Standard panel regression methodology
4. Results: supporting both the existence of aggregate and bond-level effects of PSPP

GC rate and excess liquidity

Figure 1: GC Pooling, deposit facility rate and excess liquidity



Note: Excess liquidity computed as (current accounts held at the Eurosystem + recourse to the deposit facility - reserve requirements - recourse to the marginal lending facility), source: ECB SDW and Bloomberg.

Country-specific GC rates

- Some countries GC rates effectively floored by the DFR...
- ... but Core countries GC rates dropped -20bps below DFR

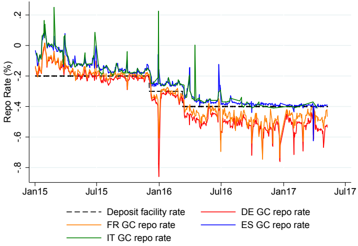


Figure 2: GC repo rates for selected countries. Weighted average of GC transactions rates passed on Brokertec by jurisdiction.

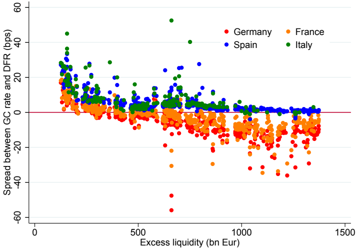


Figure 3: Spread of each GC repo rate against the deposit facility rate and excess liquidity. Data shown up to 1500 bn Eur of excess liquidity.

Relationship between GC and SC repo rates

GC rates are in each country the upper envelope of SC rates ⇔ SC rates can be decomposed into one GC component common to all bonds issued by a given country + a bond-specific specialness premium

Investigating the determinants of SC rates: data

- 7 largest EA countries: DE, FR, IT, ES, NL, BE, AT
- Repo market (Brokertec) trade-by-trade data (dates, bond used, rates and volumes) from January 2015 to May 2017. Raw data $\approx$ 5 millions of trades collateralized with 1282 different ISINs representative of either a basket (GC) or specific securities used as collateral (the vast majority, 87% on average).
- Most traded tenor (S/N), drop the 1st and 99th percentile and the period from 25 Dec 2016 to 7 Jan 2017
- Eurosystem PSPP purchases data at the security-level
- Securities characteristics from Bloomberg & EADB

Descriptive Statistics

Table 1: Cleaned sample 2nd Jan 2015 - 9th May 2017

Variable	mean	min	max	sd	obs
Repo rate (bps)	-40.48	-153.79	10.00	20.42	203203
Share held PSPP	0.06	0.00	0.33	0.08	203203
Time-to-maturity (yr)	6.99	0.01	70.05	8.59	203203
Nom. outstanding (bn Eur)	14.52	0.00	43.19	8.26	203203
Share held by inelastic investors	0.21	0.00	0.90	0.17	199885
Daily volume in Repo (mn Eur)	294	1.00	7571	453	203203
Credit rating (1=AAA)	2.96	1.00	8.00	2.64	203203

Average repo rate is -0.405%, slightly below the DFR

Inelastic investors refer to holdings by insurances and pension funds, households, non-financial corporations and governments, in the spirit of Koijen et al. (2016) and using Securities holdings statistics data.

Methodology

1. Baseline panel regression:

$$\Delta Repo\ rate_{i,t} = \beta \Delta PSPP_{i,t} + FE_i + FE_{country,t} + \epsilon_{i,t} \quad (1)$$

   where FE_i is a bond fixed effect, $FE_{country,t}$ a country-time fixed effect.

2. We interact the PSPP variable with some time-varying bond characteristics of interest (being on the run, being cheapest-to-deliver, holding structure...)
3. We get rid of the country-time FE and try to assess the contribution of country and macro variables:

$$\Delta Repo\ rate_{i,t} = \beta_1 \Delta PSPP_{i,t} + \beta_2 Excess\ liquidity_t + \beta_3 OIS_t + \beta_4 VSTOXX_t + \beta_5 CDSs_t + \beta_6 SLF vs cash + \beta_7 End_{m,q} + FE_i + \epsilon_{i,t} \quad (2)$$

Endogeneity issues

- PSPP individual purchases may be influenced by specialness (likely: ECB Coeuré's speech on "market neutrality" explicitly states that PSPP will avoid bonds in high demand in the repo market such as the cheapest-to-deliver bond)
- but then we know the endogeneity bias *underestimates* the PSPP effects
- Bond outstanding themselves might be affected by repo rates (ie. Treasury would tap bonds in high demand in the repo market), but again this would only play against us and lead to *underestimate* the PSPP effects

Results

Table 2: Effect of PSPP purchases on SC repo rates

This table shows the impact of PSPP purchases on SC repo rates. PSPP variable is the variation of the share of the bond outstanding held by the PSPP. We use various set of fixed effects. The number of observations may change due to singletons. Standard errors are clustered at the maturity bucket-country level.

	(1) SC repo rate	(2) SC repo rate	(3) SC repo rate
PSPP	-0.583***	-0.729***	-0.755***
	(0.162)	(0.132)	(0.146)
Bond FE	No	No	Yes
Country-Time FE	No	Yes	Yes
R^2	0.000	0.472	0.474
Observations	202311	202308	202300

Standard errors in parentheses, clustered at the maturity bucket-country level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Assuming we purchase 33% of each bond, variable PSPP would be equal to 0.33 and the effect on SC repo rate would be equal to $0.33 \times$ $-0.755 = -25$bps.

Table 3: Effect of PSPP purchases on SC repo rates, differentiated effects

	(1) SC repo rate	(2) SC repo rate	(3) SC repo rate	(4) SC repo rate
PSPP	-0.755***			
	(0.146)			
PSPP x on-the-run dummy		-1.137***		
		(0.281)		
PSPP x cheapest-to-deliver			-1.637***	
			(0.556)	
PSPP x DE				-1.008***
				(0.281)
Bond FE	Yes	Yes	Yes	Yes
Country-Time FE	Yes	Yes	Yes	Yes
R^2	0.474	0.474	0.474	0.474
Observations	202300	202300	202300	202300

Standard errors in parentheses, clustered at the maturity bucket-country level
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Quite intuitive: being on-the-run and cheapest-to-deliver commands lower repo rates

Table 4: Effect of PSPP purchases and excess liquidity on SC repo rates

	(1) SC repo rate	(2) SC repo rate	(3) SC repo rate
PSPP	-0.755***	-0.501***	-0.496***
	(0.146)	(0.139)	(0.151)
Excess liquidity (excl. MRO and LTRO)		-0.0268***	-0.0268***
		(0.00213)	(0.00212)
MRO and LTRO		-0.0493***	-0.0482***
		(0.00558)	(0.00568)
GC Pooling		0.635***	0.633***
		(0.0383)	(0.0388)
end-of-month		-1.201***	-1.197***
		(0.419)	(0.422)
end-of-quarter		-1.432***	-1.467***
		(0.447)	(0.450)
SLF cash dummy		1.576***	1.598***
		(0.153)	(0.161)
Bond FE	Yes	No	Yes
Country-Time FE	Yes	No	No
R^2	0.474	0.045	0.048
Observations	202300	202311	202303

Standard errors in parentheses, clustered at the maturity bucket-country level
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Interpreting our results

- Direct and individual bond scarcity created by PSPP purchases: would account for -25bps in the repo rate
- Indirectly (aggregate effect of the program), excess liquidity associated with -30 bps for every 1 trn
- Core countries repo rates more affected by such aggregated effects
- Unlikely to explain alone why repo rates dropped so low: part of the story may be related to other factors, regulatory demand for instance: ongoing work.
- Period of implementation of Securities lending against cash seems to have alleviated pressure on repo rates

How do we compare with the literature ?

- In our case (PSPP) buying 1% of the total outstanding associated with a decrease of -0.75 basis points of SC repo rates.
- Close to D'Amico et al (2014) estimation for Fed LSAPs (-0.23 bps for 1% purchased)
- Lower than Corradin et al (2017) for the Italian repo market during the SMP program (2010-2012: bond buying of EA peripheral countries debt to avoid euro area breakup). They found an effect of about -5 bps per % purchased.

A possible explanation lies in the existence and different modalities of securities lending programs.

Table 5: Securities lending facilities (SLF) **against collateral** conditions

Country	SLF cost, to borrow a specific security	Limits
Germany	GC rate minus some fixed (confidential) spread	200 mln EUR/security
Netherlands	GC rate minus 10 to 25 basis points	200 mln EUR/security
France	GC rate minus 10 to 25 bps	200 mln EUR/security
Italy	The special repo rate for that security minus an additional penalty of 10 basis points	200 mln EUR/security
Spain	The most penalizing of these two rates: special repo market rate for that security or the GC rate minus 10 basis point	200 mln EUR/security
US	Minimum bid rate of 5 basis points	90% limit on holdings

Table 6: Securities lending facilities (SLF) **against cash** conditions

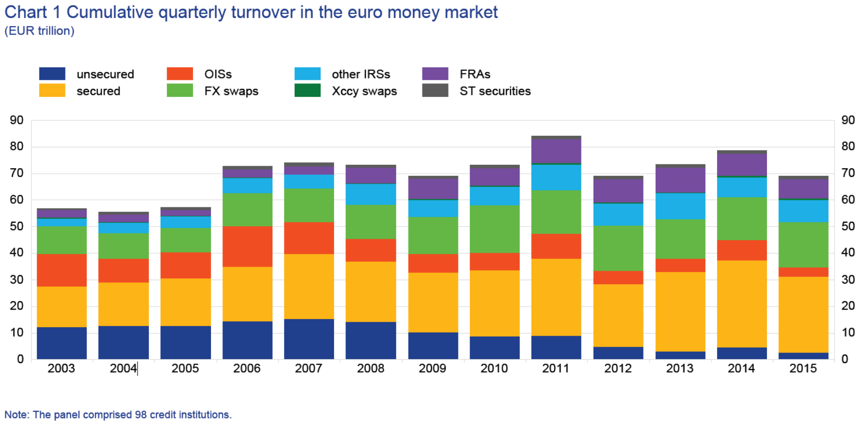
Country	SLF cost, to borrow a specific security	Limits
Eurosystem	-30 bps below the ECB deposit facility rate	50bn Eur in total

Source: central banks' respective websites

Policy implications and issues for discussion

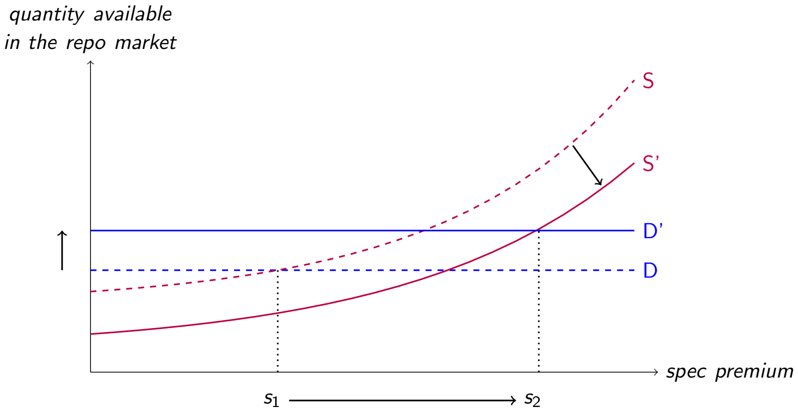
- What does it say about how QE works?
  - Part of QE purchases probably accommodated with short sales, and then covered by borrowing the security on the repo market
  - Trade-off btw controllability of short-term rates vs monetary accomodation? Are GC rates purely risk-free?
- Should low repo rates *per se* be a concern at all?
  - DFR less effective, less credible
  - Specialness reflects in yields: might reduce the monetary policy pass-through to money market but also to the yield curve
- What can central banks do about the low level of repo rates?
  - GC rates below DFR: probably a symptom of non-banks without access to the central bank
  - Our results suggest that removing liquidity would rise repo rates. Examples abroad, ie. Fed ONRRP
  - Securities lending (SLF) may (and seems) to help

Appendix



Source: ECB money market survey, Sept 2015

Supply, demand and SC repo rates: Duffie's model (1996)

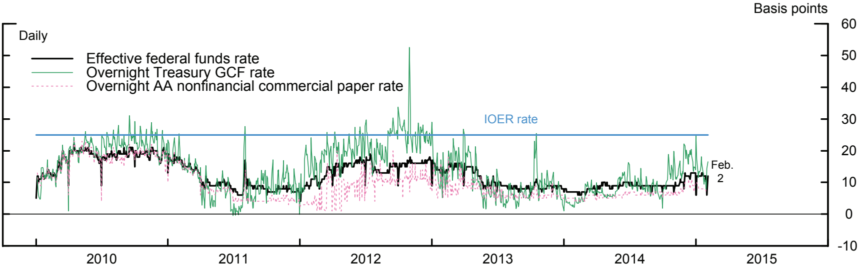


Fisher (2002) *"To attract additional collateral, the marginal holders require larger and larger spreads. (...)The fact that the supply curve rises at all indicates that some holders forgo repo spreads of smaller magnitudes. In fact, there are some holders who do not offer their collateral at any spread."*

Money market rates in the US

Both unsecured and secured rates below the rate of remuneration of reserves (IOER)

Figure 5: Selected US money market rates



Source: Frost et al. (2015)

Back

Repo market and financial regulation

- **Demand for high quality collateral**: Some regulations (LCR, NSFR, Solvency II, UCITS V) increase demand for holding certain assets (eg. High Quality Liquid Assets, HQLAs), and discourage lending them in the repo market
- **Leverage cost** : incentivize financial institutions to reduce repo exposure or repo intermediation (eg. SLR)
- **Window dressing:** US banks reporting on periods averages, European banks reporting at end-of-period (month-ends for LCR ratios, quarter-ends for SLR ratios, year-ends for Single Resolution Fund). See Munyan (2015) CGFS Paper n59 on repo market functioning (2017)