

Quantify the Quantitative Easing: Impact on Bonds and Corporate Debt Issuance.

Internet Appendix

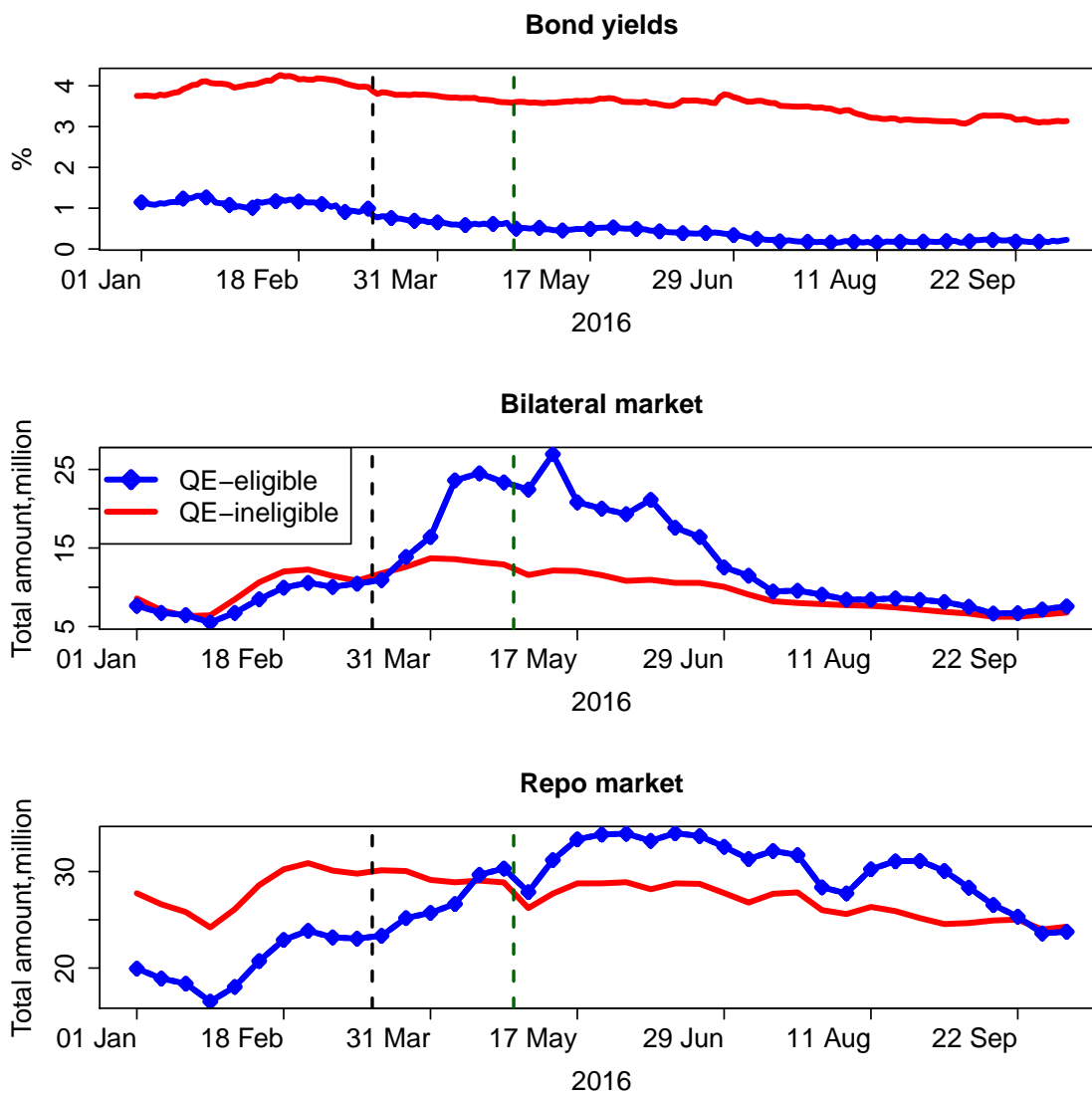
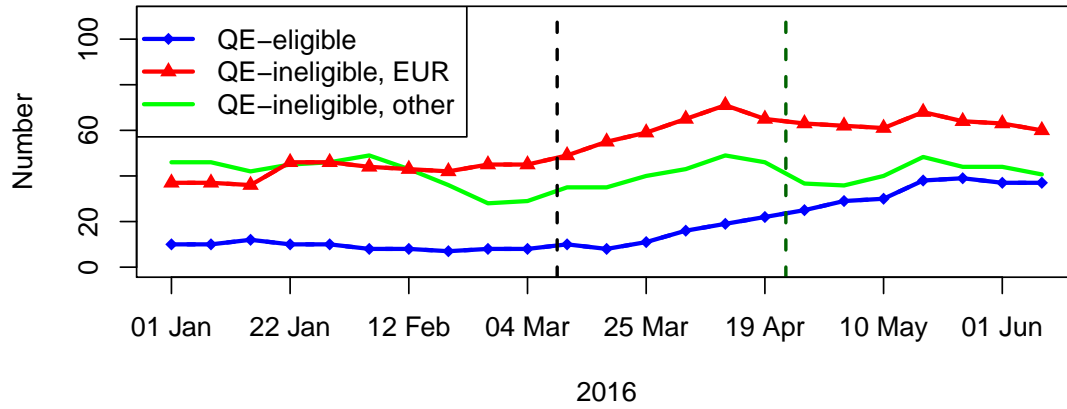


Fig. A.1. Extended post-announcement period: January 2016–October 2016. QE-eligible and QE-ineligible bonds. The top panel shows the daily time series of mean bond yields. The middle and the bottom panels illustrate the weekly dynamics of mean turnover. The first vertical dashed line indicates the day after 10 March 2016 (CSPP announced), the second dashed line shows 21 April 2016 (eligibility criteria made public). Units for turnover: USD.

Number of bonds with age less than 3m within each category



Par of bonds with age less than 3m within each category

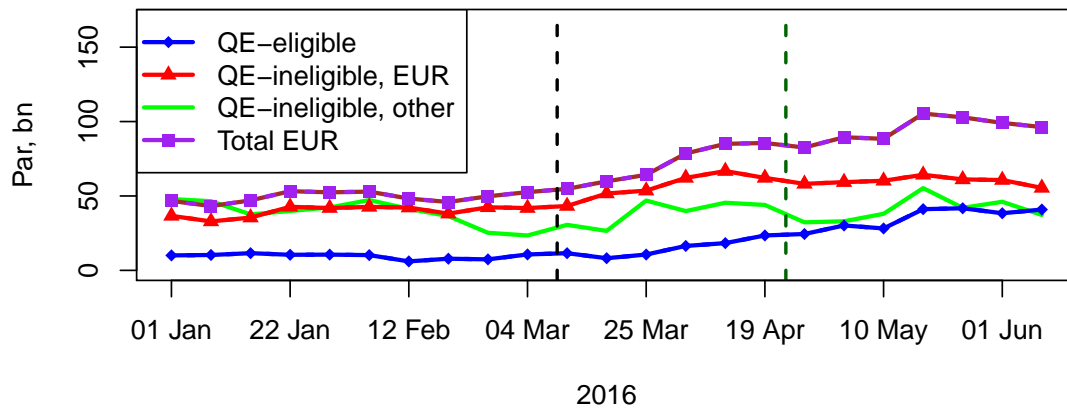


Fig. A.2. New bonds issued by firms issuing in several currencies: splitting the sample of euro-denominated bonds. Quarterly aggregation. Sample period: January 2016–June 2016. The first dashed line indicates the day after 10 March 2016 (CSPP announced), the second dashed line shows 21 April 2016 (eligibility criteria made public). Par is the notional amount of bonds outstanding, measured in billion EUR.

Table A.1

Trading volume.

The table presents summary statistics of the monthly turnover for all bonds from June 2015 to June 2016. Panel A shows the numbers for the bilateral market, Panel B for the tri-party repo market. Panel C compares QE-eligible and QE-ineligible bonds before and after the CSPP announcement. Units: million USD.

<i>Panel A: Bilateral market</i>									
	06.2015	08.2015	10.2015	12.2015	02.2016	03.2016	04.2016	05.2016	06.2016
Mean	65	66	71	63	60	61	89	83	68
Standard deviation	197	244	247	205	252	167	382	293	226
Observations	4327	4434	4529	4744	4754	4820	4991	5062	5031
Deciles									
50%	25	23	23	22	22	24	25	27	23
70%	50	47	50	46	47	49	54	54	47
100%	5130	6901	5097	5021	11442	5068	8494	7175	4996
<i>Panel B: Tri-party repo market</i>									
	06.2015	08.2015	10.2015	12.2015	02.2016	03.2016	04.2016	05.2016	06.2016
Mean	199	208	195	166	166	168	183	180	175
Standard deviation	375	398	353	310	291	308	346	343	326
Observations	4093	4205	4354	4474	4588	4596	4692	4693	4696
Deciles									
50%	78	87	84	66	63	68	70	66	69
70%	178	189	179	143	147	151	161	153	152
100%	5944	10675	7532	4140	5287	8194	7052	6231	4687
<i>Panel C: Bond turnover before and after QE</i>									
	Bilateral market				Tri-party (repo) market				
	Mean	20%	50%	80%	Mean	20%	50%	80%	
Turnover (million USD), QE-eligible									
Before QE	8.51	1.64	4.07	9.74	20.74	4.15	10.91	28.04	
After QE	19.84	1.98	5.28	12.58	30.13	5.03	14.23	39.59	
Turnover (million USD), QE-ineligible									
Before QE	9.69	0.78	3.35	11.22	28.14	2.18	10.40	40.27	
After QE	12.03	0.90	3.91	12.80	28.57	2.02	10.30	39.58	
Turnover ratio (%), QE-eligible									
Before QE	0.91	0.23	0.51	1.11	2.52	0.57	1.31	3.44	
After QE	2.13	0.30	0.62	1.40	3.43	0.60	1.76	4.71	
Turnover ratio (%), QE-ineligible									
Before QE	1.24	0.21	0.53	1.43	4.61	0.32	1.53	5.81	
After QE	1.44	0.21	0.60	1.61	4.47	0.33	1.53	5.68	

Table A.2

Alternative measures of liquidity. Impact on price.

The table presents the results of regression (1) using price measures and the Amihud illiquidity measure. Columns 1–5 show the estimates for the daily bid-ask spread, effective spread, liquidity cost score, mid and ask prices as dependent variables. Column 6 presents the estimates for the Amihud illiquidity indicator in the bilateral market, Column 7—in the tri-party repo market. The Amihud illiquidity measure for a period p is $A_{ip} = \frac{1}{D_{ip}} \sum_{t=1}^{D_{ip}} \frac{|r_{it}|}{Dvol_{it}}$, where $Dvol_{it}$ is the daily trading volume in asset i , r_{it} is the daily return of the asset, and D_{ip} is the number of days in the period over which the averaging is done. Standard errors (shown in parentheses) are heteroskedasticity robust and double-clustered by firm and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for the estimates in Columns 1–3: %. Units for the estimates in Columns 6–7: 10^{-9} .

Dependent variables	BA, prices (1)	ES (2)	LCS (3)	Mid (4)	Ask (5)	A, bilateral (6)	A, tri-party (7)
<i>Treat</i> × <i>Inter</i>	-0.35*** (0.04)	-0.49*** (0.04)	-0.55*** (0.10)	4.22*** (0.48)	4.04*** (0.46)	-1.62 (1.47)	-24.97 (23.56)
<i>Treat</i> × <i>Post</i>	-0.32*** (0.03)	-0.49*** (0.04)	-0.59*** (0.12)	3.29*** (0.52)	3.13*** (0.54)	-2.87** (1.46)	-22.92* (12.76)
Bond fixed effects and time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations (Bond-Week)	539951	539951	539951	539951	539951	238442	238442
<i>F</i> -statistic	60.07	13.84	4.22	25.72	24.29	4.63	4.13

Table A.3

Impact of QE on turnover.

Column 1 estimates regression (2) for the bilateral turnover (BT). Column 2 estimates the same regression with several controls (bond coupon, rating dummies, age, par amount). Column 3 estimates regression (2) for a sample of bonds matched on par outstanding, rating, and time to maturity. Column 4 estimates regression (1) with a control group consisting of all bonds that satisfy the CSPP eligibility criteria. Columns 5–6 present the results for the same regressions as in Columns 3–4, respectively, but for the bilateral turnover ratio (BTR). Columns 7–12 estimate the same regression specifications as in Columns 1–6 for the tri-party repo market. Columns 13–14 estimate the same regression specifications as in Columns 3–4, respectively, but for bid-ask spreads. Standard errors (shown in parentheses) are heteroskedasticity robust and double-clustered by firm and time (1,550 · 23 clusters). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for BTR, RTR, and BA: %. Units for BT, RT: million USD.

Dependent variables	BT (1)	BT (2)	BT (3)	BT (4)	BTR (5)	BTR (6)	RT (7)	RT (8)	RT (9)	RT (10)	RTR (11)	RTR (12)	BA (13)	BA (14)
<i>Coupon</i>		-1.07*** (0.23)						0.11 (0.35)						
<i>AA</i>		0.01 (1.05)						-1.64 (1.49)						
<i>A</i>		-0.86 (0.64)						-0.51 (0.91)						
<i>BBB</i>		0.78 (0.73)						1.42 (0.95)						
<i>BB</i>		-0.24 (0.62)						0.63 (1.06)						
<i>B</i>		1.16 (1.54)						0.34 (1.16)						
<i>Junk</i>		-1.91** (0.74)						-0.27 (1.56)						
<i>Age</i>		-1.11*** (0.13)						-0.63*** (0.17)						
<i>Par</i>		0.01 (0.01)						0.01 (0.01)						
<i>Treat</i>	-1.47* (0.85)	-3.84*** (0.90)					-9.95*** (1.24)	-10.21*** (1.23)						
<i>Inter</i>	3.41*** (0.90)	3.36*** (0.91)					1.26 (0.80)	1.32* (0.80)						
<i>Post</i>	1.61* (0.84)	1.55*** (0.83)					0.10 (0.87)	0.17 (0.88)						
<i>Treat × Inter</i>	3.31* (1.74)	3.30* (1.75)	2.20 (2.87)	2.04 (1.84)	0.39 (0.29)	0.24 (0.19)	2.75** (1.45)	2.75* (1.43)	1.21 (1.45)	1.23 (1.58)	0.37 (0.26)	0.06 (0.17)	-0.02 (0.02)	-0.02* (0.01)
<i>Treat × Post</i>	7.66*** (2.28)	7.40*** (2.25)	6.70*** (2.08)	6.42*** (3.17)	1.03*** (0.38)	0.85*** (0.48)	8.45*** (2.05)	8.37*** (2.04)	7.45*** (1.92)	7.75*** (2.61)	1.37*** (0.32)	1.16*** (0.31)	-0.05*** (0.01)	-0.04*** (0.01)
Bond fixed effects and time dummies	No	No	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No	Yes
Observations (Bond-Time)	115174	115174	115174	38216	115068	38193	107875	107875	107781	36103	107875	36092	611186	101672
<i>F</i> -statistic	65.09	92.23	87.57	47.98	88.97	63.38	41.63	49.82	33.59	41.29	64.52	66.60	88.19	399.63

Table A.4

Data collapsed by time period.

The table presents the results of the main regressions (except those from Table A.5 in the online Internet Appendix) if the data are collapsed by time (week or day). All estimates are from pure time-series regressions. Column 1 presents the results for yields, Column 2 for bid-ask spreads, Columns 3–6 for the turnover measures, Columns 7–13 for the number of newly issued bonds by a firm’s rating category and by bond maturity. Columns 14–21 show the estimates for firms’ financial indicators. Standard errors (shown in parentheses) are heteroskedasticity and autocorrelation robust. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Dependent variables	Y	BA	BT	BTR	RT	RTR	AA	A	BBB	0–2y	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
<i>Treat × Inter</i>	-0.20*** (0.02)	-0.01 (0.03)	2.62 (2.12)	0.46*** (0.11)	1.72 (1.33)	0.39*** (0.13)					
<i>Treat × Post</i>	-0.30*** (0.02)	-0.06* (0.03)	7.70*** (0.98)	1.19*** (0.10)	8.40*** (0.55)	1.45*** (0.11)					
<i>Treat × Post2</i>							0.32 (0.50)	0.55** (0.28)	0.57** (0.28)	0.01 (0.20)	
Observations (Day/Week/Quarter)	114	114	23	23	23	23	23	23	23	23	
<i>F</i> -statistics	101.1	2.31	22.74	64.78	91.27	76.06	2.04	5.41	5.80	0.06	
	2–5y	5–10y	>10y	D	D-matched	TFA	LTD	RD	PPE	WC	Cash
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
<i>Treat × Post</i>				5.97** (1.05)	22.47** (8.40)	-14.85 (26.43)	-6.13 (5.78)	-2.43 (2.12)	-14.28 (9.96)	-4.91 (3.75)	0.60 (6.41)
<i>Treat × Post2</i>	0.44 (0.47)	0.57** (0.28)	0.55** (0.27)								
Observations (Day/Week/Quarter)	23	23	23	3	3	3	3	3	3	3	3
<i>F</i> -statistics	0.75	3.95	3.20	542.20	685.21	14.12	13.76	5.75	15.15	0.53	0.00

Table A.5

Isolating QE channels: data collapsed by time period.

The table presents the coefficients for the $Treat \times Post2$ interaction dummy in a time-series regression estimated for a particular maturity-rating bucket of bonds. Panel A presents the results for yields, Panel B for bid-ask spreads. The last row in each panel estimates the time-series regression only for the sample of treated bonds. Standard errors (shown in parentheses) are heteroskedasticity and autocorrelation robust. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for all estimates: %.

<i>Panel A: Yields</i>					<i>Panel B: Bid-ask spreads</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
AA	-0.328 (0.281)	-0.184 (0.144)	-0.142*** (0.050)	-0.305*** (0.022)	AA	-0.295 (0.230)	0.098 (0.122)	-0.011*** (0.005)	-0.024*** (0.002)
A	-0.162 (0.150)	-0.191*** (0.054)	-0.226*** (0.029)	-0.298*** (0.061)	A	-0.015 (0.015)	-0.023*** (0.002)	-0.023*** (0.001)	-0.020*** (0.002)
BBB	-0.139 (0.082)	-0.284*** (0.116)	-0.473*** (0.123)	-0.822*** (0.133)	BBB	-0.031 (0.022)	-0.023*** (0.002)	-0.026*** (0.002)	-0.023*** (0.002)
BBB, QE	-0.097*** (0.026)	-0.178*** (0.061)	-0.316*** (0.122)	-0.356*** (0.120)	BBB, QE	-0.173 (0.150)	0.032 (0.032)	-0.008*** (0.002)	0.017 (0.014)

Table A.6

Isolating QE channels: relative changes.

The table presents the relative change in yields or bid-ask spreads for a particular maturity-rating bucket from Table 4. The numbers are the coefficients from Table 4 divided by the control group before-QE mean of bonds within a particular bucket. Panel A presents the quantities for yields, Panel B for bid-ask spreads. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for all estimates: %.

<i>Panel A: Yields</i>					<i>Panel B: Bid-ask spreads</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
AA	-9.40	0.71	-10.85***	-15.25***	AA	-226.77	-22.43***	-12.94***	-27.27***
A	2.05	-8.62***	-13.97***	-13.83***	A	22.73	-13.16**	-16.96***	-20.59***
BBB	-8.42	-8.36*	-17.89***	-19.79***	BBB	-87.96	-14.97***	-21.36***	-20.17***
BBB, QE	-19.31*	-27.65***	-30.51***	-30.68**	BBB, QE	-98.31	26.68	-9.09***	-8.05

Table A.7

Isolating QE channels: number of observations and F -statistics.

The table presents the number of observations and F -statistics (in brackets) for each regression for a particular maturity-rating bucket from Table 4. Panel A presents the quantities for yields, Panel B for bid-ask spreads.

<i>Panel A: Yields</i>					<i>Panel B: Bid-ask spreads</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
AA	9260 (18.97)	15015 (243.75)	10349 (272.46)	6203 (154.73)	AA	9260 (6.43)	15015 (22.37)	10349 (94.18)	6203 (59.62)
A	33699 (88.12)	56294 (1706.81)	46352 (1795.82)	25442 (965.57)	A	33699 (1.54)	56294 (39.02)	46352 (215.84)	25442 (96.17)
BBB	34240 (393.01)	53925 (506.87)	54059 (2553.16)	31934 (695.40)	BBB	34240 (166.08)	53925 (276.16)	54059 (64.52)	31934 (6.56)
BBB, QE	3771 (156.326)	17868 (2269.38)	21211 (2334.11)	3617 (1079.98)	BBB, QE	3771 (15.72)	17868 (245.26)	21211 (945.99)	3617 (521.24)

Table A.8

Isolating QE channels: splitting bonds on liquid and illiquid before QE.

The table presents the coefficients for the $Treat \times Post2$ interaction dummy in regression (3) estimated for a particular maturity-rating bucket for the sample of liquid bonds (below median bid-ask spread before QE) and illiquid bonds (above median bid-ask spread before QE). Panels A and B present the results for liquid bonds, Panels C and D for illiquid bonds. Panels A and C present the results for yields, Panels B and D for bid-ask spreads. Empty cells indicate that there are no bonds within the particular maturity-rating bucket. Each regression has firm and time fixed effects. Standard errors (shown in parentheses) are heteroskedasticity robust and double-clustered by firm and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for all estimates: %.

<i>Panel A: Yields. Liquid</i>					<i>Panel B: Bid-ask spreads. Liquid</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
AA		0.110 (0.041)	-0.209*** (0.063)	-0.376*** (0.034)	AA		-0.009** (0.004)	0.024*** (0.005)	-0.024*** (0.004)
A	-0.054 (0.081)		-0.516*** (0.115)	-0.479*** (0.063)	A	0.324** (0.143)		-0.018*** (0.005)	-0.016*** (0.002)
BBB	-0.262 (0.274)	0.414 (0.855)	-0.785*** (0.179)	-0.792*** (0.130)	BBB	-0.149 (0.253)	0.035 (0.047)	-0.025*** (0.006)	-0.022*** (0.004)
<i>Panel C: Yields. Illiquid</i>					<i>Panel D: Bid-ask spreads. Illiquid</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
AA	0.012 (0.059)	0.059 (0.036)	-0.101*** (0.030)		AA	-0.133 (0.144)	-0.017* (0.010)	-0.013*** (0.002)	
A	0.036 (0.039)	-0.123*** (0.027)	-0.203*** (0.032)	-0.609*** (0.079)	A	-0.033 (0.042)	0.023 (0.022)	-0.019*** (0.002)	-0.011** (0.005)
BBB	-0.048 (0.094)	-0.126* (0.070)	-0.258*** (0.045)		BBB	-0.254 (0.192)	-0.022*** (0.006)	-0.045*** (0.016)	

Table A.9Isolating QE channels: t -tests.

The table presents the p -values of t -tests on the hypothesis that the regression coefficients are equal for a set of bonds within a particular rating-maturity group. Each number in the table reports the p -value from such a test. Panel A presents the quantities for yields, Panel B for bid-ask spreads. For example, the first row presents the p -value from a test of whether the coefficient for BBB-rated bonds is the same as the coefficient on AA-rated bonds within each maturity group.

<i>Panel A: Yields</i>					<i>Panel B: Bid-ask spreads</i>				
	0–2 years	2–5 years	5–10 years	>10 years		0–2 years	2–5 years	5–10 years	>10 years
BBB vs AA	0.37	0.01	0.00	0.00	BBB vs AA	0.02	0.48	0.00	0.95
BBB vs A	0.03	0.94	0.00	0.00	BBB vs A	0.00	0.00	0.01	0.85
A vs AA	0.59	0.00	0.00	0.16	A vs AA	0.00	0.27	0.00	0.55
BBB, QE, 0–2 years		0.05	0.00	0.00	BBB, QE, 0–2 years		0.00	0.00	0.00
BBB, QE, >10 years		0.00	0.51		BBB, QE, >10 years		0.00	0.03	

Table A.10

Impact of QE on the issue of new bonds: whole sample of firms.

Panel A estimates regression (3) for the number of bonds issued each week, Panel B—the same regression for the total par of bonds issued each week. For both panels, Columns 1–3 present the results for the sample of all firms split into different rating groups, Columns 4–7 for the same sample split according to maturity of new bonds issued. Standard errors (shown in parentheses) are heteroskedasticity robust and double-clustered by firm and time. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Units for the estimates in Panel A: number of bonds. Units for the estimates in Panel B: billion EUR.

<i>Panel A: Number of bonds</i>							
Dependent variables	AA	A	BBB	0–2y	2–5y	5–10y	>10y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Treat</i> × <i>Post2</i>	0.10 (0.39)	0.59* (0.34)	0.61* (0.37)	0.37 (0.31)	0.37 (0.78)	0.28* (0.16)	0.48** (0.24)
Firm fixed effects and week dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations (Bond-Week)	1840	2651	3055	1860	2302	2698	2110
<i>F</i> -statistic	0.07	10.94	10.49	1.51	0.18	10.13	11.81
<i>Panel B: Par of bonds</i>							
Dependent variables	AA	A	BBB	0–2y	2–5y	5–10y	>10y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Treat</i> × <i>Post2</i>	0.62 (0.78)	0.57* (0.33)	0.91** (0.45)	0.45 (0.56)	-0.77 (1.13)	3.49*** (1.27)	3.15*** (1.10)
Firm fixed effects and week dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations (Bond-Week)	1840	2651	3055	1860	2302	2698	2110
<i>F</i> -statistic	0.71	11.76	11.16	0.71	0.40	15.95	16.06

Table A.11

Percentage of QE-eligible bonds issued by firms with different ratings.

The table shows the fraction of firms in each rating category and the corresponding proportion of QE-eligible bonds issued by these firms. Rating group junk includes bonds rated below BB. Units of the numbers: %.

Firm's rating group	Percentage of firms	Percentage of QE-bonds issued
AA	10.19	9.92
A	29.30	40.20
BBB	35.08	47.58
BB	22.54	2.29
Junk	2.89	0.00