Issuance and Valuation of Corporate Bonds with Quantitative Easing*

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Abstract

Using the European Central Bank's (ECB's) corporate quantitative easing program as a quasi-exogenous change in asset demand, we show corporations timed the market by substituting eligible for ineligible bond issuance. The within-firm substitution amounted to 55% of the ECB's purchases. Firms acted opportunistically and chose the characteristics of their bond issues based on market demand. Characteristics include bond listing status, seniority, collateralization, guarantees, maturity, and coupon type. We find no evidence firms increased total issuance, investment growth, or equity holders' payoff thanks to their ability to time the market.

Keywords: Corporate bonds, market timing, capital structure, quantitative easing, CSPP.

JEL Classification: G32, G12, E52, E58, G18.

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1 INTRODUCTION

Firms time capital markets by issuing and redeeming securities in response to market valuations and general market conditions (Baker et al., 2003b; Baker and Wurgler, 2002; Covas and Den Haan, 2011; Ma, 2019). However, researchers often face the crucial challenge of identifying exogenous variations in market conditions that are not driven by variations in firms' fundamentals. In this paper, we use the announcement of the European Central Bank's (ECB's) corporate quantitative easing (QE) program as a quasi-exogenous variation in demand for corporate bonds that are eligible for the program. We thus estimate the extent to which firms timed the market around the corporate QE announcement. We also investigate the relation between firms' market-timing activity and their total bond issuance, investment growth, and equity performance.

Although the ECB's corporate QE program (the Corporate Sector Purchase Program, or CSPP) was endogenous to the aggregate economic and financial conditions of the euro area, bonds were classified as eligible for purchase by the ECB based only on preexisting rules governing the conduct of monetary policy.[1] Hence, the ECB's decision to purchase some bonds (eligible bonds) and not others (ineligible bonds) was likely independent of the ECB's or the market's assessment of firms' fundamentals. The CSPP thus represents a quasi-exogenous increase in the demand for eligible bonds, and we exploit it to provide our main contributions.[2]

We make three main contributions. First, we estimate the extent to which firms substituted eligible for ineligible net issuance after the CSPP announcement. The estimates reveal a high elasticity of substitution among issuers of eligible bonds. Second, we show firms choose the characteristics of their bond issues based on market demand. We consider characteristics related to eligibility (bond listing status, seniority, and rating), risk (bond collateralization and guarantees), and interest-rate sensitivity (bond maturity and coupon type). Third, we show firms were unable to increase total issuance, investment growth, and equity valuation by timing the market and by substituting eligible for ineligible issuance.

We use a novel and comprehensive dataset of corporate bonds in the euro area, which

[1] To be eligible, a bond needs to satisfy a series of requirements including, but not limited to, being investment-grade rated, not being subordinated, and being listed in a regulated market. We report the list of eligibility criteria in Appendix A.5. Importantly, eligibility is based on bond characteristics and not on the issuer's credit rating. Thus, some firms may issue both eligible and ineligible bonds.

[2] Compared to previous studies of market timing, we adopt a different identification approach by using the CSPP as a quasi-exogenous change in the demand for eligible corporate bonds. By contrast, past literature focused on the correlation between issuance choices and asset-valuation measures (Baker et al., 2003a; Baker and Wurgler, 2000; Greenwood and Hanson, 2013; Ma, 2019) or exploited variation in non-fundamental investor demand (Becker et al., 2011; Faulkender and Petersen, 2006).

provides exact information on bond eligibility and other bond characteristics. We thus identify within-firm substitution patterns across bond characteristics while controlling for firm-time fixed effects. Corporations timed the market by substituting eligible for ineligible issuance after the announcement of the CSPP. Although we do not identify the effect of QE on aggregate issuance, we estimate issuers of eligible bonds (treated issuers) substituted about €4.1 billion per month of eligible for ineligible net issuance. This quantity does not account for firms' increase in total net issuance, yet it represents 55% of the €7.5 billion monthly purchases that the ECB conducted in the initial phase of the program.[3]

Using a back-of-the envelop calculation, we assess firms' elasticity of substitution of eligible for ineligible bonds. For every 100 bps drop in the relative spread between eligible and ineligible bonds, treated firms substituted eligible for ineligible issuance at a monthly pace equal to 6.2% of the firms' outstanding amount if we consider the 10 months following the announcement. The pace increases to 14.6% if we consider short-term issuance responses in the three months after the announcement, suggesting treated firms acted quickly to time the market. Looking at firms' issuance programs and at the time lag between bond-issue announcements and bond-issue dates, we provide anecdotal evidence that treated firms are typically able to issue bonds within a time frame of only seven days.

To evaluate the CSPP's effect on bond valuation, we consider *abnormal* changes in bond yield spreads after the CSPP announcement. After accounting for bond exposure to systematic risk, we find an abnormal drop in eligible bond spreads relative to ineligible bonds, consistent with the increase in demand for eligible bonds brought about by the CSPP. In fact, bond spreads were affected both by the ECB's demand for eligible bonds and by a drop in risk premia, which is often observed after QE announcements (Gilchrist et al., 2020; Gilchrist and Zakrajšek, 2013; Krishnamurthy and Vissing-Jorgensen, 2011). In the case of the CSPP, eligible bond spreads dropped less than ineligible bond spreads after the announcement, both for outstanding bonds and new issues. We attribute this result to ineligible bonds' higher exposure to systematic risk and hence higher sensitivity to changes in risk premia.

After the announcement, firms changed the features of their bond issues to meet market demand for certain bond characteristics. Because the ECB requires eligible bonds to be listed on a regulated exchange, not subordinated, and to be investment-grade rated, firms increased issuance of bonds listed on an exchange, senior bonds, and investment-

[3]The shift from ineligible to eligible issuance that we document after the announcement of the CSPP is analogous to the move from jumbo to conforming loans that Di Maggio et al. (2020) find during the first round of mortgage-backed securities purchases by the Federal Reserve.

grade rated bonds. Firms also increased the issuance of bonds with riskier profiles to take advantage of lower risk premia. Specifically, issuers shifted toward unsecured and non-guaranteed bonds. Our findings therefore indicate firms choose the features of their bond issues in response to market conditions, and not only in response to firms' characteristics, which were the focus of previous literature on debt composition (Barclay and Smith, 1995; Colla et al., 2013; Rauh and Sufi, 2010).

To provide more direct evidence of firms' intention to time the market, we show that after the announcement of the CSPP, treated firms revealed a willingness to issue bonds at that moment and at the current rates, rather than wait for future opportunities or needs to arise. In particular, treated firms displayed eagerness to lock in current rates as they shifted toward longer-maturity bonds, moved away from commercial paper, and issued more fixed-coupon bonds. They also showed hints of opportunistic behavior as they increased issuance of bonds justified by general corporate purposes rather than more specific purposes, and they took advantage of their established issuance programs to issue bonds quickly after the announcement of the CSPP.

Although issuers timed the market, we find no relation between issuers' market-timing activity and changes in their total issuance, investment growth, and equity performance. First, although treated firms shifted toward eligible issuance, they did not increase total issuance relative to untreated firms. Second, within the sample of treated firms, issuers that increased their propensity to issue eligible bonds did not increase total net issuance. Third, treated firms did not increase investment growth relative to untreated firms; rather, they increased cash holdings. Fourth, after controlling for the change in total issuance, treated firms that more aggressively substituted eligible for ineligible issuance did not increase investment growth relative to other treated firms. Finally, treated firms and active market timers did not deliver higher stock returns or increased dividend yields to their shareholders relative to other firms. Taken together, these results suggest firms timed the market but appeared unable to increase investments or expected profits by doing so.

Finally, we study whether firm-level changes in total issuance are associated with changes in investment growth and cash holdings. Among treated firms, those that increased total issuance also increased investment growth. We consider growth in terms of assets, fixed assets, property, plant and equipment (PPE), and intangibles (excluding goodwill). In all these cases, we find that changes in net issuance around the CSPP announcement are associated with higher growth. Among untreated firms, corporations that increased total issuance increased cash reserves but not productive investments, suggesting that for precautionary purposes, smaller (untreated) firms increased issuance after

the CSPP announcement.

CONTRIBUTION TO THE LITERATURE. This paper belongs to the literature that studies corporate market timing. We contribute to this literature by showing that firms modify several characteristics of their bond issues in response to market conditions. Previous market-timing literature has focused on equity issuance (Baker and Wurgler, 2000; Dong et al., 2012; Loughran and Ritter, 1995), debt maturity (Baker et al., 2003a), interest-rate exposure (Faulkender, 2005), the choice between bank loans and bonds (Becker and Ivashina, 2014), and the joint timing of equity and debt markets (Gao and Lou, 2012; Ma, 2019). We also show firms that timed the market more aggressively were not able to increase total bond issuance, investment growth, or equity value more than other firms. We thus relate to the debate on whether firms can generate value by timing the market (Bakke and Whited, 2010; Butler et al., 2011, 2006; Warusawitharana and Whited, 2016).

By studying the heterogeneous characteristics of corporate bond issues, we also add to the literature that analyzes the composition of corporate debt. Previous literature (Barclay and Smith, 1995; Colla et al., 2013; Rauh and Sufi, 2010) emphasized the role of firm characteristics in determining the composition of firm debt, consistent with the agency-based theories of capital structure. We show firms choose the features of their debt issues also based on market conditions, because they shift issuance towards bonds with characteristics that are in higher demand.

Unlike existing studies of the CSPP, we focus on how firms timed the market around the announcement and modified the characteristics of their bond issues to meet increased demand for eligible bonds and to take advantage of lower credit risk premia. Other papers focus on substitution between bonds and bank loans (Arce et al., 2017; Betz and De Santis, 2019; Ertan et al., 2020; Galema and Lugo, 2021; Grosse-Rueschkamp et al., 2019) or the entrance of new issuers (Darmouni and Papoutsi, 2021). Whereas previous literature on bond yields and issuance around the CSPP (Abidi and Miquel-Flores, 2018; Grosse-Rueschkamp et al., 2019; Todorov, 2020) proxied for eligibility by using credit ratings, we observe exact information on bond eligibility. We are therefore able to identify the effect of the CSPP on eligible bonds while controlling for their characteristics. In particular, we attribute the spillover effects on ineligible bond yields, observed also by Bonfim and Capela (2020) and Zaghini (2019), to bonds' systematic risk exposure.

In response to the 2020 pandemic, the Federal Reserve expanded its QE programs to include corporate bonds. Our work therefore provides insights for understanding issuers' responses to the Fed's corporate QE as well. Ongoing research on the Federal Reserve's Corporate Credit Facility has shown the Fed's policy reduced risk premia, improved liq-

uidity, and led to increased issuance for both investment-grade and high-yield issuers (Boyarchenko et al., 2020; D'Amico et al., 2020; Darmouni and Siani, 2021; Haddad et al., 2021; O'Hara and Zhou, 2020).

2 Background and Data

Before proceeding to our analysis, we provide a description of the CSPP, our data, and the corporate bond market in the euro area.

2.1 The Corporate Sector Purchase Program

The ECB announced its corporate QE program, the Corporate Sector Purchase Program (CSPP), on March 10, 2016. The CSPP's purpose was to provide monetary accommodation and to help the ECB achieve its inflation target. On April 21, 2016, the ECB released additional technical details on the CSPP, and purchases began on June 8, 2016. In the first 12 months of operation, the ECB purchased €7.5 billion in corporate bonds, 85% of which was purchased in the secondary market. The initial end date for the CSPP was set at no earlier than March 2017, although it was progressively extended through December 2018. Net purchases later resumed in November 2019, although for smaller amounts.

On the same day of the CSPP announcement, the ECB also expanded the size of its existing government-bond purchases, reduced interest rates by 5 bps, and launched a new round of Targeted Long-Term Refinancing Operations (TLTROs). In Appendix A.4, we consider previous announcements of analogous policies in the absence of any corporate QE measure and use them as placebo tests. We find these policies alone cannot account for firms' market-timing activity around the March 2016 announcement.

With the CSPP announcement in March 2016, the ECB declared its intention to purchase euro-denominated bonds issued by non-bank corporations established in the euro area, provided that the bonds were eligible to be posted as collateral for the ECB's credit operations. The ECB has always accepted corporate bonds as collateral for its refinancing operations.[4] To be accepted as collateral, a bond needs to satisfy a list of eligibility requirements. We report this list in Appendix A.5. Such requirements include, among others, that a bond be investment-grade rated, listed on an eligible regulated market, deposited with an eligible centralized security depository, and not subordinated. The eligibility requirements also restrict the type of coupon, the conditionality of the principal

[4]Pelizzon et al. (2020) show a bond's yield and liquidity are affected by the bond's inclusion in the list of eligible collateral.

amount, and the form of the note. A list of eligible securities is published daily on the ECB's website.

Going forward, we define a bond as *eligible* if it is eligible to be used as collateral at the ECB. For our sample of euro-denominated bonds issued by euro-area nonfinancial corporations, eligibility as collateral coincides with eligibility for the CSPP based on the March 2016 announcement.[5]

DIFFERENCES FROM THE FEDERAL RESERVE'S CORPORATE QE PROGRAM. In March 2020, the Federal Reserve launched its corporate QE program, the Secondary Market Corporate Credit Facility (SMCCF). The CSPP and the SMCCF differ substantially in terms of the rules governing bond eligibility. With the SMCCF, the Federal Reserve purchased corporate bonds issued by investment-grade US companies. Hence, eligibility is defined at the issuer level. With the CSPP, the ECB purchased bonds that were eligible to be used as collateral. Thus, under the CSPP, eligibility is defined at the bond level. In particular, any firm could potentially issue both CSPP-eligible and CSPP-ineligible bonds at any point in time.

Moreover, bond eligibility for the CSPP is determined by an extensive list of criteria and not only by credit rating. Therefore, the CSPP offers an ideal setting to study corporate market timing, because highly rated firms are able to chose between eligible and ineligible issuance. For example, an investment-grade issuer may issue an investment-grade bond with a step-up coupon, which would render the bond ineligible. In fact, according to Article 63 of the EU Guideline 2015/510 (reported in Appendix A.5), bonds with step-up coupons are not eligible for the CSPP, regardless of their credit rating.

2.2 DATA

Our main source of data is the Centralized Security Database (CSDB). The CSDB provides security-level information on every equity, debt, and hybrid instrument issued by residents of the euro area. This dataset is managed by the Eurosystem and is updated monthly, with observations starting in February 2011, although the coverage is limited before the beginning of 2013. The CSDB provides comprehensive information about each

[5] In April 2016, the ECB further specified it would purchase bonds with maturity between 6 months and 31 years. For two reasons, our analysis focuses just on a bond's eligibility as collateral and ignores its remaining maturity. First, the maturity requirement was announced on April 21, whereas the issuance response of firms can be observed starting in March, after the ECB announced its intention to purchase bonds that were eligible as collateral. Second, during the course of 2015, bonds with maturity less than 6 months and more than 31 years represented only 16% of the outstanding amount for the whole market and 10% of the collateral-eligible market.

Table 1: Summary statistics. The table shows the number of bonds outstanding in the 10 months before and after the CSPP announcement and summary statistics for the bonds' issued amount. A firm is classified as treated if it had eligible bonds outstanding at some time in 2015.

	All	Eligible bonds	Ineligible bonds	Treated firms	Untreated firms	Datastream	Bloomberg
Number of bonds	32,288	7,151	25,679	9,293	22,995	12,119	2,818
Mean (€mln)	49.68	113.13	32.01	109.46	24.18	80.94	324.09
Median (€mln)	10	25	5	29	4.72	20	184.50
St. deviation (€mln)	157.74	255.17	110.68	241.81	91.55	197.44	368.16
Decile 1 (€mln)	0.75	5	0.50	5	0.50	3	10
Quartile 1 (€mln)	2	10	1.50	10	1.25	10	32
Quartile 3 (€mln)	25	50	20	50	14.06	50	500
Decile 9 (€mln)	75	500	50	350	37	192.72	750

security and its issuers. It also specifies whether a bond is eligible as collateral.

We then use credit ratings from the four ECB-recognized rating agencies: S&P, Fitch, Moody's, and DBRS. For each bond and for each issuer, we consider their best credit rating at each date, consistent with the ECB's use of the best rating when assessing eligibility of a bond.

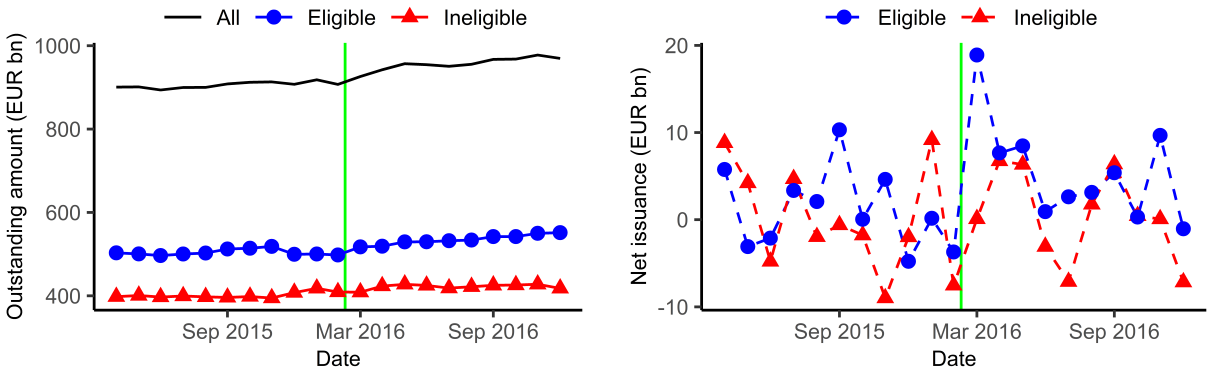
We obtain daily bond yields and bid-ask prices from Datastream. Although yield data are not available for all bonds, we obtain data for 4,507 bonds. Of these bonds, 1,709 were outstanding for the entire period spanning the three months before and after the CSPP announcement, and they represent 78% of the aggregate outstanding amount in the period.

We gather additional bond information from commercial data providers.Use of proceeds comes from both Datastream and Bloomberg; issuance-program information comes from Datastream, and dates for bond-issuance announcements come from Bloomberg. We obtain yearly financial statements from Bureau van Dijk's Orbis dataset. Finally, we collect stock return and divided data from Compustat.

We are interested primarily in the period surrounding the announcement of the CSPP. For the 10 months before and after the announcement, the CSDB provides information on 32,288 euro-denominated bonds issued by 3,587 non-financial corporations domiciled in the euro area. Of these corporations, 205 had eligible bonds outstanding at some time in 2015. We label such firms as *treated firms* because their outstanding bonds were eligible to be purchased under the CSPP.

Table 1 shows summary statistics for the sample of bonds. We find fewer eligible than ineligible bonds (7,151 to 25,679), but eligible bonds were issued in larger amounts.[6] On

[6]Bonds can be added to or dropped from the list of eligibility securities. Therefore, some bonds may appear both as eligible and ineligible over time. For this reason, the sum of the number of eligible and



(a) Outstanding amount

(b) Net issuance

Figure 1: Outstanding amount and net issuance of euro-denominated bonds issued by non-financial corporations in the euro area. The vertical line marks the announcement of the CSPP (March 10, 2016).

average, eligible bonds are issued in amounts of €113 million, compared with €32 million for ineligible bonds. Similar differences can be seen for bonds issued by treated versus untreated firms.

For comparison, we also add statistics for the bonds available in Datastream and Bloomberg. Datastream and Bloomberg cover only 12,119 and 2,818 bonds of the CSDB's 32,288. Moreover, they over-represent large issues. Whereas the average issued amount of a corporate bond is €50 million, the average issued amount of a bond in Datastream and Bloomberg is €81 million and €324 million, respectively.

2.3 The Corporate Bond Market in the Euro Area

To gain a more accurate perspective on the size and the relevance of the CSPP, in Figure 1(a), we plot the aggregate outstanding amount of euro-denominated corporate bonds issued by non-financial corporations domiciled in the euro area. The figure also shows the outstanding amount of eligible and ineligible bonds.

As of February 2016, the total outstanding amount of bonds was €907 billion, of which €498 billion were eligible. Over the course of the first year of the CSPP, the purchases of eligible bonds, averaging €7.5 billion per month, amounted to 18% of the eligible bonds outstanding just before the announcement. The CSPP was therefore a large program relative to the size of the market.

Figure 1(a) shows the total outstanding amount of bonds increased at a faster pace in the months immediately following the announcement of the CSPP than in previous periods. In Figure 1(b), we compute the monthly net issuance of each individual bond

ineligible bonds, when considered separately, exceeds the total number of bonds.

and plot the aggregate series by eligibility. By doing so, we make sure that series are not affected by bonds that are added or removed by the list of eligible collateral. Net issuance of eligible bonds sharply increased immediately after the announcement of the CSPP, and remained above the net issuance of ineligible bonds for most of the subsequent months.

3 Spreads at the Announcement

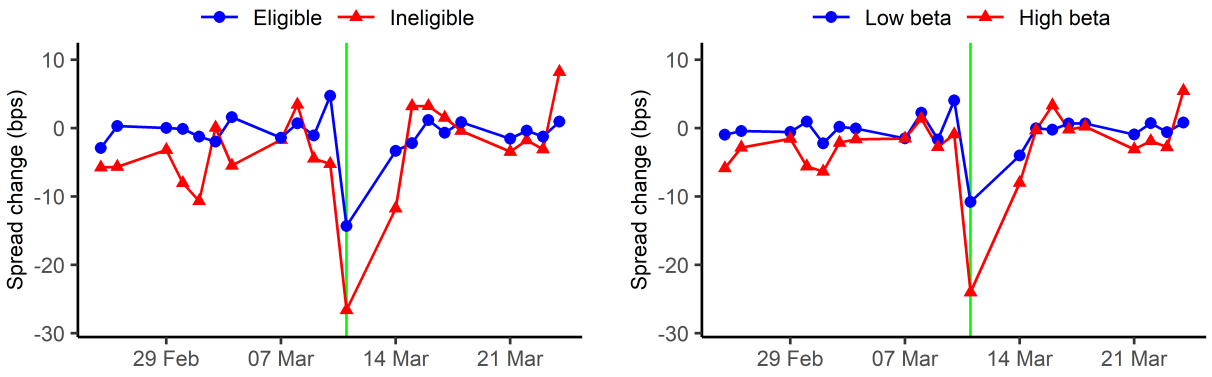
As a preliminary step in our analysis of corporate market timing around the CSPP announcement, we study how bond valuation changed around the announcement. In particular, we document that eligible bond spreads dropped less than ineligible bond spreads, even when considering spreads at issue. However, after accounting for systematic risk exposure, we find a positive effect of the CSPP announcement on eligible bond valuation, consistent with the increased demand for eligible bonds.

3.1 Spreads of Outstanding Bonds

We consider all bonds outstanding in the three months before and after the announcement for which we have daily yield data. By doing so, we identify the effect of QE on bond valuation only through changes in the spread of preexisting bonds. Our estimates are therefore not affected by a change in characteristics of newly issued bonds.

Starting from bonds' yields to maturity and the term structure of risk-free rates in the euro area, we compute each bond's daily *yield spread* as the difference between the bond yield and the maturity-matched risk-free rate. To measure a bond's aggregate risk exposure, we compute its beta with the aggregate market. First, we build a bond market index as the weighted average of bond yield spreads, where the weights are the nominal amounts outstanding three months before the announcement of the CSPP. Then, we compute a bond's *beta* as the slope coefficient in a regression of the daily change in the bond's yield spread on the daily change in the index. To estimate the beta, we use trading days from December 11, 2015 (three months before the CSPP announcement), to February 25, 2016 (two weeks before the CSPP announcement).

Figure 2(a) shows the spreads of ineligible bonds dropped more than the spreads of eligible bonds. However, ineligible bonds are more exposed to systematic risk: their average beta is 1.22 units larger than eligible bonds' average beta, with a t-stat of -5.05 when clustering standard errors at the country-sector level. Figure 2(b) shows bonds with higher betas reacted more to the announcement than lower-beta bonds, consistent with a market-wide decline in risk premia. Thus, ineligible bonds' higher systematic risk exposure partially accounts for their relative drop in spreads.



(a) Yield spreads by eligibility

(b) Yield spreads by aggregate risk exposure

Figure 2: Average change in yield spreads of euro-denominated corporate bonds around the 2016 CSPP announcement. Bonds are sorted according to their eligibility and their exposure to aggregate risk. We measure a bond's aggregate risk exposure in terms of its beta before the announcement. The beta is the slope coefficient in a regression of the daily change in bond spreads on the change in the aggregate bond market's spread. Bonds are classified as high beta if their beta is above the median of the cross-sectional distribution of betas. The vertical line marks the first trading day after the announcement of the 2016 CSPP.

To formally estimate the change in relative valuation of eligible and ineligible bonds, we run the following regression:

$$\Delta S_i = \alpha^E \text{EligibleBond}_i + \alpha^{BAS} \text{BidAsk}_i + \iota_{f(i)} + \iota_{m(i)} + \iota_{r(i)} + u_i, \tag{1}$$

where i denotes the bond; ΔS_i is the change in the yield spread of bond i after the CSPP announcement; EligibleBond_i = 1 if bond i is eligible at the beginning of the sample period, and 0 otherwise; BidAsk_i is bond i's average bid-ask spread (relative to midpoint) in the period starting three months before the announcement and ending two weeks before the announcement; $\iota_{f(i)t}$ is either a country-sector fixed effect or a firm fixed effect; $\iota_{m(i)}$ is a maturity fixed effect, where the continuous maturity variable is grouped into eight maturity bins;[7] and $\iota_{r(i)}$ is a rating fixed effect. Standard errors are clustered at the country-industry level.

To control for illiquidity, we include bid-ask spreads in the regression specification. We also weight regressions by bonds' outstanding amounts. By weighting for outstanding amounts, we also obtain a better estimate of the CSPP's economic impact on the bond market. In Table 3, we consider the entire sample of bonds, whereas in Table A.1 of Appendix A.2, we consider only those bonds that experience price changes in at least half of the trading days in the sample. These bonds represent 88% of the original set of bonds.

[7]The maturity bins are (i) under 6 months, (ii) 6 months to under 1 year, (iii) 1 to under 2 years, (iv) 2 to under 5 years, (v) 5 to under 10 years, (vi) 10 to under 20 years, (vii) 20 to under 30 years, and (viii) 30 years or longer. We include maturity fixed effects to control for potential changes in the term structure of credit risk.

Table 2: Liquidity and beta statistics. Distribution of initial outstanding amounts, average bid-ask spreads relative to midpoint, fractions of days with a change in bid or ask prices, and bond beta. Average bid-ask spreads and quote changes are computed over the three months before and after the CSPP announcement.

	Eligible bonds						Ineligible bonds					
	N	10^{th}pc	25^{th}pc	Median	75^{th}pc	90^{th}pc	N	10^{th}pc	25^{th}pc	Median	75^{th}pc	90^{th}pc
Amount out. (€mln)	771	100	300	500	750	1,000	938	20	50	180	464	700
Bid-Ask spread (%)	764	0.15	0.25	0.48	0.76	1.00	891	0.26	0.47	0.86	1.36	2.80
Quote change (%)	771	83.33	95.45	97.73	99.24	100	938	19.47	70.45	93.56	97.73	99.24
Bond beta	771	0.06	0.18	0.32	0.46	0.66	938	0.01	0.17	0.47	2.10	4.33

Table 2 shows the distribution of bond statistics related to their liquidity.

Besides considering spread changes, we study abnormal spread changes. The abnormal spread change is the difference between the change in yield spread and the change predicted by the bond's systematic risk exposure. Specifically, let β_i be the bond's beta, let ΔS_i be the bond's spread change, and let ΔS^m be the average spread change in the market. The *abnormal spread change* is thus $\Delta S_i - \beta_i \Delta S^m$.

Results are reported in Table 3. In Panel A, we consider spread changes on the first trading day after the announcement. In Panel B, we consider cumulative changes over the first two trading days after the announcement. In odd-numbered columns, we control for country-industry fixed effects, whereas in even-numbered columns, we control for firm fixed effects, thus exploiting heterogeneity across bonds issued by the same firm.

When considering simple spread changes, eligible bond spreads still appear to drop less than ineligible bond spreads, even after controlling for bond fixed effects and firm fixed effects. The magnitude of the within-firm difference over the first day is 7.3 bps for the set of treated firms. The difference increases to 8.5 bps when considering two-day changes.

On the other hand, when using abnormal spread changes, results flip. After accounting for systematic risk exposure and for firm-level risk with firm fixed effects, eligible bond spreads dropped by about 9.1 bps on the first day relative to ineligible bonds within the sample of treated firms. Eligible bond spreads extended their relative drop to 10.4 bps when we consider the two-day abnormal change.

These results suggest the effect of CSPP was strongest for the bonds most exposed to aggregate risk, indicating a decline in credit risk premia.[8] After accounting for systematic risk exposure, we observe relative spreads dropping for eligible bonds, consistent with

[8]In Appendix A.3.1, we further study whether credit risk premia declined, using information in CDS spreads and expected default frequencies (EDFs). Although the sample is limited by data availability, we observe patterns that are consistent with a decline in risk premia: CDS spreads dropped more for entities more exposed to systematic risk, and EDFs did not drop, but CDS risk premia did. We define CDS risk premium as the ratio between the one-year CDS spread and the one-year EDF.

Table 3: Changes in bond spreads after the CSPP announcement. We use bonds outstanding in the three months before and after the announcement of the CSPP. The dependent variable is the change in spread (columns (1)-(4)) and the abnormal change in spread (columns (5)-(8)). EligibleBond = 1 if the bond is eligible to be used as collateral at the ECB as of three months before the CSPP announcement. BidAsk is the bond's average bid-ask spread relative to the midpoint during the period starting three months before the announcement and ending two weeks before it. A firm is classified as treated if it had eligible bonds outstanding at some time during the calendar year before the announcement. Regressions are weighted by the bond's outstanding amount. Standard errors are in parentheses and are clustered at the country-industry level.

PANEL A: SPREAD CHANGES OVER ONE DAY

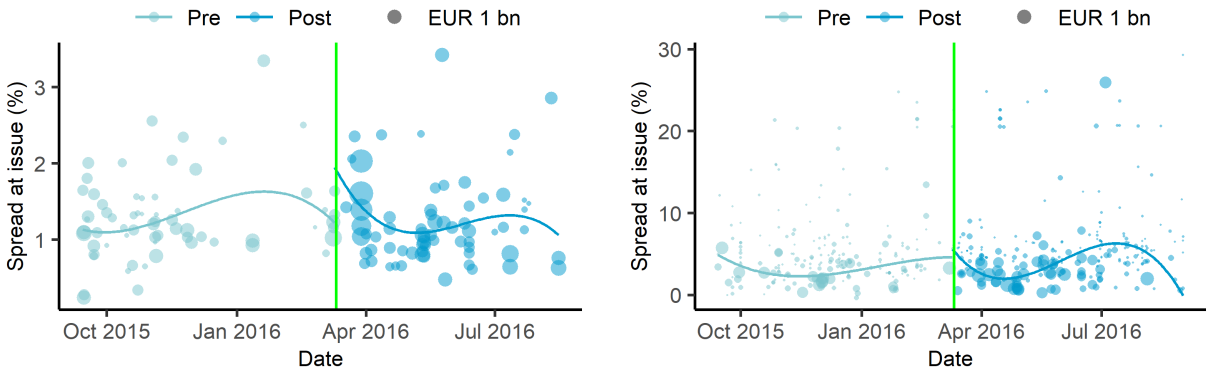
	One-day spread change (bps)				One-day abnormal spread change (bps)			
	All firms		Treated firms		All firms		Treated firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EligibleBond	7.573***	6.749**	8.891***	7.331***	−6.618**	−9.034**	−6.740**	−9.050**
	(2.485)	(2.973)	(2.735)	(2.647)	(2.941)	(3.992)	(2.799)	(4.082)
BidAsk	0.672	15.155	0.183	0.958	5.320	14.502*	3.929**	2.495**
	(3.470)	(9.396)	(0.951)	(0.677)	(3.339)	(7.581)	(1.852)	(1.195)
Country-industry FE	Yes	No	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,624	1,310	955	926	1,624	1,310	955	926
R^2	0.194	0.701	0.554	0.643	0.204	0.723	0.662	0.544

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

PANEL B: SPREAD CHANGES OVER TWO DAYS

	Two-day spread change (bps)				Two-day abnormal spread change (bps)			
	All firms		Treated firms		All firms		Treated firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EligibleBond	8.193***	8.185*	9.201**	8.513**	−11.623***	−10.052**	−8.950**	−10.370**
	(3.033)	(4.396)	(3.958)	(4.042)	(3.758)	(4.299)	(3.405)	(4.274)
BidAsk	−1.425	−2.736	0.812*	1.076**	−0.189	−0.944	2.482**	2.052**
	(1.339)	(2.760)	(0.448)	(0.474)	(1.857)	(3.716)	(1.112)	(0.868)
Country-industry FE	Yes	No	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,624	1,310	955	926	1,624	1,310	955	926
R^2	0.111	0.541	0.394	0.533	0.070	0.549	0.622	0.428

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$



(a) Eligible bonds

(b) Ineligible bonds

Figure 3: Spreads at issue of newly issued zero-coupon and fixed-coupon bonds around the CSPP announcement. The dots represent the spreads of newly issued bonds, and their area is proportional to the amount issued. The lines represent the predicted value from a third-degree polynomial regression of spreads on issue date. Regressions are separately estimated for the six months before and after the announcement, and they are weighted by the bonds' issued amounts.

the ECB's demand pressure. These two effects thus offered two types of incentives to firms. On the one hand, firms were incentivized to issue riskier bonds to take advantage of lower risk premia. On the other hand, firms were incentivized to issue eligible bonds to meet increased demand.

3.2 Coupon Spreads at Issuance

To conclude this section, we consider spreads of new bond issues. Grosse-Rueschkamp et al. (2019) observe that the spreads of new issues declined for bonds rated between BBB+ and BBB- in the second quarter after the announcement of the CSPP. They do not observe any significant decline in spreads in the quarter immediately after the announcement. However, as Figure 1(b) shows, firms sharply increased eligible issuance in March 2016, when the CSPP was announced. Thus, in the same spirit of Grosse-Rueschkamp et al. (2019), we consider the spreads of new issues. Unlike them, we focus on the change in spreads in the days immediately following the announcement.

We consider zero-coupon and fixed-coupon bonds issued in the six months before and after the CSPP announcement. For these bonds, we can compute yields at issue given information on their issue price, redemption price, maturity, and coupon payments. We then compute each bond's spread at issue as the difference between the yield at issue at the maturity-matched risk-free rate.

Figure 3 plots yield spreads at issue around the CSPP announcement, together with the predicted values using third-degree polynomials for the pre-announcement and the post-announcement period. Polynomial regressions are weighted by bonds' issued

amounts. One can immediately observe two patterns around the CSPP announcement. First, firms increased their issuance activity rapidly after the announcement. Second, the predicted spreads do not appear to immediately decline for either group of bonds. In Appendix A.3.2, we investigate the change in spreads using a regression discontinuity design. A comparison between unweighted and weighted regressions in Table A.8 of the appendix suggests smaller issuers of ineligible bonds gained the most in terms of the valuation of new issues.

Unlike outstanding bonds, changes in the yields of new bond issues are affected by firms' market-timing activity, because firms choose which type of bonds to issue and when to issue them. We therefore avoid a causal interpretation of these results. In fact, in section 4.5, we show firms shifted toward riskier issuance after the CSPP announcement, favoring unsecured and non-guaranteed bonds. Because firms shifted toward riskier bonds, changes in spreads at issue underestimate the effect of the CSPP on bond spreads.

Our results thus indicate that when assessing changes in bond valuation following a corporate QE announcement, one should account for two key factors: the change in risk premia and the change in the characteristics of newly issued bonds driven by firms' market-timing activity. In the last four columns of Panels A and B of Table 3, we account for these factors by studying abnormal changes in the spreads of outstanding bonds. In the next section, we study how issuers responded to the changes in market conditions brought about by the CSPP announcement.

4 Issuance and Market Timing

We now explore whether and how non-financial corporations timed the market after the announcement of the CSPP. We show treated firms substituted eligible for ineligible bonds. However, their total issuance did not increase relative to ineligible firms. More broadly, we show firms issued bonds with characteristics that were in higher demand, but we find no evidence they were able to increase total issuance by doing so.

4.1 Substitution of Eligible for Ineligible Bonds

We start by studying the monthly net issuance of bonds by firms. We compute the *net issuance* of each bond as the change in the outstanding amount of the bond, including new issues and early and final redemptions. We then aggregate net issuance at the firm-eligibility level, so that for each firm i and each month t, we obtain two types of net issuance: eligible issuance I_{it}^E and ineligible issuance I_{it}^I.

Table 4: Summary statistics. The table shows the number of firms, the distribution of the initial outstanding amount of bonds 10 months before the announcement of the CSPP, and the distribution of net issuance in the 10 months before and after the announcement of the CSPP. Net issuance is scaled by the initial outstanding amount of all the firm's bonds 10 months before the announcement. Wt.Avg. is the weighted average, where weights are given by the initial outstanding amount of all the firm's bonds 10 months before the announcement.

Firms:	All	Treated			Untreated
Bonds:	All	All	Eligible	Ineligible	Ineligible
N firms	2,761	198	198	198	2,563
Initial amount: Mean (€mln)	326.59	3,205.29	2,541.30	663.99	104.20
Initial amount: Median (€mln)	10	1,577.27	1,200	13.19	7.50
Initial amount: St.Dev. (€mln)	1,491.35	4,487.26	3,859.54	1,493.51	397.26
Initial amount: Decile 1 (€mln)	0.88	170.61	33.50	0	0.80
Initial amount: Quartile 1 (€mln)	2.10	607.50	500	0	2
Initial amount: Quartile 3 (€mln)	63.76	3,864.70	2,842.38	628.12	40
Initial amount: Decile 9 (€mln)	500	7,900.20	6,360.02	1,817.50	250
Pre-CSPP net issuance: Mean (%)	-0.27	0.96	0.63	0.33	-0.36
Pre-CSPP net issuance: Median (%)	0	0	0	0	0
Pre-CSPP net issuance: Wt.Avg (%)	-0.25	-0.03	0.03	-0.06	-0.78
Pre-CSPP net issuance: St.Dev (%)	49.04	21.07	18.90	9.35	50.56
Post-CSPP net issuance: Mean (%)	0.52	1.12	0.86	0.26	0.47
Post-CSPP net issuance: Median (%)	0	0	0	0	0
Post-CSPP net issuance: Wt.Avg (%)	0.31	0.58	0.75	-0.17	-0.33
Post-CSPP net issuance: St.Dev (%)	205.75	22.67	20.29	10.27	213.46

One concern for our identification strategy is that some firms may become able to issue eligible bonds because of the CSPP itself. For example, rating agencies provided more favorable ratings after the announcement (Abidi et al., 2019).[9] To overcome this endogeneity problem, we consider both the eligible net issuance, I_{it}^E, and ineligible net issuance, I_{it}^I, of treated issuers. For untreated issuers, we consider only their ineligible net issuance, I_{it}^I.

We investigate both the short-term and the longer-term issuance response. For the short-term response, we compare issuance during the three months before the CSPP announcement with issuance in the subsequent three months. For the longer-term response, we compare the 10 months before and after the announcement.

To conduct our empirical tests, we scale each firm's net issuance by the outstanding amount of the firm's bonds at the beginning of the sample period under consideration, B_i. That is, for the short-term response, we divide I_{it}^E and I_{it}^I by the notional value of

[9] In the three months before the CSPP announcement, our data contain 23 rating upgrades and 10 downgrades out of 3,924 bond-month observations of rated bonds. For the three months after the CSPP announcement, we observe 135 upgrades and 21 downgrades out of 3,925 bond-month observations of rated bonds.

all of firm i's bonds that were outstanding on November 30, 2015. For the longer-term response, we divide the net-issuance variables by the notional value of all of firm i's bonds that were outstanding on April 30, 2015.

Table 4 reports the summary statistics for the scaled net issuance in the 10 months before and after the announcement. This sample represents 2,761 issuers, of which 199 were treated (i.e., they had eligible bonds outstanding at some time in the calendar year before the announcement of the CSPP).

We then run the following regression:

$$\frac{I_{it}^T}{B_i} = \alpha^P \text{EligibleIssuance}^T \times \text{Post}_t + \alpha^M \text{EligibleIssuance}^T \times \text{FirstMonth}_t + \iota_{f(i)t} + \iota_{iT} + u_{iTt}, \quad (2)$$

where T denotes the type of issuance, that is, whether the issuance is eligible or not; i denotes the firm; and t denotes the month. EligibleIssuance^T = 1 if the issuance is eligible, that is, $T = E$; Post$_t$ = 1 if the month is after the announcement of the CSPP; FirstMonth$_t$ = 1 for March 2016, which is the month the CSPP was announced; $\iota_{f(i)t}$ is either a country-sector-month fixed effect, or a firm-month fixed effect; and ι_{iT} is a firm-issuance eligibility fixed effect (one fixed effect for any i, T pair).[10] The sample size is large enough to allow us to double-cluster standard errors at the country-sector-month and firm level. Because issuance is very lumpy and a small denominator B_i could introduce a large amount of noise for firm i's observations, we weight regressions by the initial outstanding amount B_i to correct for the noise. By doing so, we also obtain estimates that are more informative of the aggregate issuance patterns.

Table 5 reports our results. Eligible issuance increased relative to ineligible issuance after the announcement of the program. In the entire sample, the longer-term change in eligible issuance was 0.510% higher than the change in ineligible issuance. The short-term response is higher at 1.093%, although marginally statistically significant.

We then explore whether the relative increase in eligible issuance occurred because treated firms substituted eligible for ineligible bonds, or because treated firms issued more than untreated firms. Our results show a clear pattern of within-firm substitutions. In columns (3) and (4) of Table 5, we consider only treated firms and control for firm-month fixed effects. Thanks to this identification strategy, we control for all the time-varying firm characteristics, including investment opportunities, financing needs, and cost of issuance. These regressions therefore focus on the choice of issuing eligible or

[10] We control for the first-month effect for two reasons. First, the CSPP was announced on the 10th day of the month, after some issuance activity had already taken place. Attributing the whole month's net issuance to the CSPP would therefore be incorrect. Second, as we see in Figure 1(b), net issuance of eligible bonds increased sharply during March 2016. We therefore choose to control for the first-month effect to obtain a more accurate estimate of the change in net issuance that persisted after the announcement.

Table 5: Net issuance of eligible and ineligible bonds around the CSPP announcement. In columns (1)-(4), the dependent variable is the monthly net issuance of eligible and ineligible bonds, scaled by the firm's outstanding amount of bonds at the beginning of the sample period. In columns (5) and (6), the dependent variable is total net issuance scaled by the firm's outstanding amount of bonds at the beginning of the sample period. EligibleIssuance = 1 if the net issuance is eligible. Post = 1 after the announcement of the CSPP. FirstMonth = 1 for the month in which the CSPP was announced. A firm is treated if it had eligible bonds outstanding in the calendar year before the CSPP announcement. Odd-numbered columns consider the three months before and after the announcement; even-numbered columns consider the 10 months before and after the announcement. Regressions are weighted by firms' outstanding amount of bonds at the beginning of the sample period. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)				Total net issuance (%)	
	All firms		Treated firms		All firms	
	(1)	(2)	(3)	(4)	(5)	(6)
EligibleIssuance∗Post	1.093*	0.510**	1.516***	0.644**		
	(0.563)	(0.249)	(0.529)	(0.251)		
EligibleIssuance∗FirstMonth	2.055	2.030	1.800	1.871		
	(2.226)	(2.262)	(2.225)	(2.239)		
TreatedFirm∗Post					−0.643	−0.337
					(1.306)	(0.593)
TreatedFirm∗FirstMonth					2.992	3.454
					(2.756)	(2.723)
Country-industry-month FE	Yes	Yes	No	No	Yes	Yes
Firm-month FE	No	No	Yes	Yes	No	No
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	No	No
Firm FE	No	No	No	No	Yes	Yes
Observations	17,766	58,240	2,412	7,920	16,506	54,100
R^2	0.282	0.146	0.578	0.525	0.347	0.177
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

ineligible bonds conditional on these characteristics.

Treated firms shifted toward eligible issuance, at an average monthly rate of 1.516% of their outstanding amount in the short term and 0.644% in the longer term. These estimates enable us to quantify the amount of within-firm substitution of eligible for ineligible issuance. At the end of February 2016, the total outstanding amount of euro-denominated bonds issued by treated firms was €641 billion. Multiplying this amount by the longer-term effect on eligible issuance in column (4), we estimate a €4.1 billion monthly substitution of eligible for ineligible bonds in the 10 months following the announcement of the CSPP. This number accounts only for the within-firm increase in eligible issuance relative to ineligible issuance. It therefore does not account for the change in total net issuance among treated firms, nor does it include any change in the total net issuance

of untreated firms. Yet, this relative increase alone represents 55% of the €7.5 billion monthly purchases that the ECB made over the course of the first year of the program.

Because the estimates are higher when we control for firm-month fixed effects, we conclude, following the reasoning in Jiménez et al. (2020) and Khwaja and Mian (2008), that a positive correlation exists between the firm-level monetary policy shock and the firm-level shock to demand for financing. Therefore, we can be reasonably confident that a firm-level analysis will not overestimate the impact of the CSPP announcement.

In the last two columns of Table 5, we conduct a firm-level analysis of the total issuance of firms. Although treated firms substituted eligible for ineligible bonds, they did not increase their total issuance compared to untreated firms. Point estimates indicate that with the exception of the first month, treated firms lowered total issuance relative to untreated firms, although the difference is not statistically significant. Our results thus suggest treated issuers failed to increase total net issuance relative to untreated issuers.

We provide a model in Appendix A.1 where, although treated firms time the market, in equilibrium, they fail to increase total issuance relative to untreated firms. The key mechanism relies on the intuition that if firms can elastically substitute across bond characteristics, they will eventually offset any increase in eligible bond demand by increasing eligible bond supply. Because of treated firms' market-timing activity, higher demand for eligible bonds by the central bank is met by a change in the composition of bond issuance in treated firms, but not by a relative increase in their total issuance relative to untreated firms.

4.2 Elasticity of Substitution: A Back-of-the-Envelope Estimate

To obtain a back-of-the-envelope estimate of the elasticity of bond substitution for treated firms, we now combine our substitution estimates in Table 5 with the relative abnormal drops in bond spreads of Table 3. Their ratio measures the extent to which treated firms, as a group, substituted eligible for ineligible issuance for a 1 bps abnormal drop in the relative spread of eligible bonds.

We consider abormal drops in the yield spreads to control for bonds' exposure to systematic risk. We also use two-day drops to account for potential illiquidity in bond markets. Because the estimated two-day abnormal drop in relative spreads is larger than the one-day drop, we also obtain more conservative estimates of firms' elasticity of substitution.

Using the 10 months before and after the announcement, we estimate that for a 100 bps abnormal drop in the relative spreads of eligible bonds, firms substituted eligible for ineligible net issuance at a monthly pace equal to 0.644%/0.10370 = 6.2% of the firms' out-

Table 6: Summary statistics of issue amounts and the announcement-to-issuance lag of bonds available on Bloomberg. The sample includes all euro-denominated bonds issued between January 1, 2014, and December 31, 2017, by non-financial corporations domiciled in the euro area.

	All bonds	Eligible bonds	Ineligible bonds
Number of issues	1350	374	976
Avg. issued amount (€mln)	228.74	387.67	167.47
Median issued amount (€mln)	100.00	500.00	54.97
Std. of issued amount (€mln)	258.84	287.43	218.05
Mean announcement-to-issuance lag (days)	8.64	7.97	8.89
Median announcement-to-issuance lag (days)	7.00	7.00	7.00
Std. of announcement-to-issuance lag (days)	9.38	2.82	10.89

standing amount. The estimated elasticity increases to 14.6% of the outstanding amount for a 100 bps abnormal spread drop if we consider the three months before and after the announcement, suggesting a very elastic supply of bonds in the short run.

Our analysis thus indicates treated firms acted quickly to shift their issuance toward eligible bonds. So how quickly can firms issue bonds? To answer this question, we collect some anecdotal evidence by manually searching information about treated issuers issuing bonds in the second half of March 2016. Most of the issuers had long-term issuance agreements already in place with major banks. These agreements allow firms to issue bonds of a predetermined type "from time to time," thus giving firms substantial flexibility to act quickly.

To conduct a more systematic analysis, we use data from Bloomberg, which provides both bonds' issue dates and the dates of the issues' public announcements. Table 6 provides summary statistics of the time lag between issuance announcements and bond-issue dates. In particular, the median time lag is only seven days. We also plot the weekly time series of bond-issuance announcements in Figure A.2 in Appendix A.3, where we observe that firms substantially increased announcement of new issues after the CSPP announcement.

Our elasticity estimates and the issuance-announcement data provide information on how aggressively treated firms can time the market and perform the substitution we have documented. Yet, one should not interpret these numbers as representative of the entire bond market. As Table 1 shows, bonds in Bloomberg are biased toward the largest issuers, and treated firms tend to be large and established issuers themselves. However, new and smaller issuers will face longer delays if they have to present themselves to investors by roadshow or establish relations with rating agencies.

Table 7: Net issuance and two-day changes in valuation. In columns (1) and (2), the dependent variable is the monthly difference between eligible and ineligible net issuance in the three and 10 months before and after the announcement. In columns (3)-(6), the dependent variable is the total monthly net issuance in the three and 10 months before and after the announcement. FirmBondBeta is the average beta of the firm's outstanding bonds in the three months before the CSPP announcement. $\Delta^A S^F$ is the average abnormal spread change in the firm's outstanding bonds in the two days following the announcement. Post = 1 after the announcement. Regressions are weighted by the firms' initial outstanding amount of bonds. Standard errors are in parentheses and are clustered at the firm level.

	Excess eligible iss. (%)		Total net issuance (%)			
	Treated firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
FirmBeta×Post	3.571***	0.209	1.750	−0.091	−0.354**	−0.031
	(1.266)	(0.480)	(1.411)	(0.540)	(0.171)	(0.077)
$\Delta^A S^F$×Post (bps)	−0.181***	−0.009	−0.115	0.005	0.004	0.001
	(0.067)	(0.027)	(0.072)	(0.029)	(0.004)	(0.002)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,092	3,560	1,092	3,560	2,844	9,020
R^2	0.404	0.269	0.399	0.277	0.311	0.177
Notes:	$^*p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

4.3 Did Changes in Valuation Predict Changes in Issuance?

We then ask if firms' issuance choices are related to the changes in the spread of their outstanding bonds. In section 3, we observed that bonds with larger exposure to systematic risk experienced larger drops in yield. We therefore decompose spread changes into their systematic component, proportional to their beta, and their abnormal component. We aggregate bond beta and abnormal spread change at the firm level using weighted averages of individual bonds' betas and abnormal changes, where the weights are given by the bonds' outstanding amounts.

We then consider the treated firms' *excess eligible issuance* as the monthly difference between a firm's eligible net issuance and its ineligible net issuance. Thus, excess eligible issuance measures a firm's monthly shift toward eligible bonds. We also consider firms' monthly total net issuance for both treated and untreated firms.

In Table 7, we study the relation between spread changes at the announcement, excess eligible issuance, and total net issuance. We consider abnormal spread changes in the two days following the announcement. Table A.2 in Appendix A.2 uses abnormal spread changes in the first trading day after the announcement. The first column shows that in

the short run, firms that experienced better valuation outcomes in the bond market shifted more toward eligible bonds. In particular, treated firms with higher beta and treated firms with more negative abnormal spread changes increased excess eligible issuance in the short run. However, this relation between changes in valuation and substitution vanishes over a longer time period. Moreover, both in the short and longer run, firms' bond beta and abnormal spread changes do not appear to be related to changes in total net issuance for treated firms. For untreated firms, firms with lower beta increase total issuance in the short run, but this relation disappears over a longer time period.

Table 7 thus suggests treated firms tried to time the market shortly after their credit valuation improved, but ultimately failed to acquire any advantage in terms of total issuance.

4.4 Did More Active Market Timers Issue More?

Next, we explore whether firms that timed the market more aggressively were able to increase total issuance relative to other firms. For the three- and 10-month periods before and after the announcement, we define a firm's *eligible share* as the period's fraction of gross issuance that is eligible. Because gross issuance includes only increases in a bond's outstanding amount, eligible share measures a firm's propensity to use eligible bonds when borrowing funds from the market. If a firm's eligible share increased after the announcement, the firm's propensity to use eligible bonds increased as well. Thus, the change in eligible share offers a measure of market timing that does not mechanically depend on the amount of bonds issued.

We then compute a firm's *change in total net issuance* as its change in net issuance around the CSPP announcement. We use three- and 10-month periods before and after the CSPP to evaluate the change. We also compute a firm's *eligible substitution* as the difference between the change in eligible net issuance and the change in ineligible net issuance around the announcement. The change in eligible and ineligible issuance is computed similar to the change in total issuance, but by considering only the net issuance of eligible and ineligible bonds, respectively. We scale these quantities by the initial amount to bonds outstanding at the beginning of the period under consideration.

Using the sample of treated firms, we then study whether the change in eligible share around the announcement of the CSPP is correlated with the change in total net issuance, by running a regression in the form

$$\Delta\text{NetIssuance}_i = \Delta\text{EligibleShare}_i + \iota_{c(i)} + \iota_{s(i)} + u_i,$$

where $\iota_{c(i)}$ and $\iota_{s(i)}$ are, respectively, country and industry fixed effects. Note that because of the definition of eligible share, the sample for this regression is reduced relative to Table 5. In fact, here we may include only firms with positive gross issuance both before and after the announcement, whereas in Table 5, we could include any firm with a positive outstanding amount of bonds at the beginning of the sample period.

Because eligible bonds may have characteristics that investors find attractive besides their eligibility, in some regressions, we control also for the change in the share of bonds having those characteristics. In particular, to be eligible, bonds need to satisfy an extensive set of criteria (see Appendix A.5.) Although we do not observe all the eligibility-relevant characteristics of a bond, we observe some key ones, which are also relevant for the liquidity and risk of the bond. In particular, we observe whether a bond is listed, non-subordinated, and investment-grade rated, which are necessary conditions for eligibility. We therefore say a bond *meets the requirements* if it satisfies these three criteria, with the caveat that they are a subset of the entire set of eligibility criteria. We then calculate the *meet-the-requirement share* as the fraction of gross issuance that meets the requirements and include it in some of the regressions.

Panel A of Table 8 shows that firms that timed the market more aggressively by increasing their eligible share were unable or unwilling to issue more than other firms. Similar considerations apply to firms that increased the share of their gross issuance meeting eligibility requirements. Hence, the change in total issuance among treated firms is not related to the market-timing activity of firms, both in terms of eligible issuance or in terms of issuance meeting eligibility requirements.

To confirm the change in eligible share is a valid measure of market timing, in Panel B, we show the change in eligible share is positively correlated with eligible substitution. Firms that increased their eligible share the most also substituted eligible for ineligible issuance most aggressively, even after controlling for the change in the share of gross issuance meeting requirements.

Taken together, the results so far suggest firms timed the market but failed to expand their bond issuance despite their market-timing activity. In particular, treated firms substituted eligible for ineligible issuance but did not increase total issuance relative to untreated firms. Treated firms whose bond market valuation improved attempted to time the market in the short run by shifting toward eligible issuance, but they eventually failed to increase their total issuance relative to other treated firms. Finally, treated firms that increased their propensity to issue eligible bonds did not expand total net issuance relative to less active market timers.

Table 8: Issuance and market-timing activity in treated firms. In Panel A, the dependent variable is the change in firms' total net issuance in the three (columns (1)-(3)) or 10 (columns (4)-(6)) months around the CSPP announcement. In Panel B, the dependent variable is the change in firms' eligible substitution in the three (columns (1)-(3)) or 10 (columns (4)-(6)) months around the CSPP announcement. ΔEligibleShare is the change in the share of eligible gross issuance in the three or 10 months around the CSPP announcement. ΔMeetReqShare is the change in the share of gross issuance meeting eligibility requirements in the three or 10 months around the CSPP announcement. The eligibility requirements are being listed, being senior, and being investment-grade rated. Regressions are weighted by the firms' initial outstanding amount of bonds. Standard errors are in parentheses and are clustered at the firm level.

PANEL A: TOTAL NET ISSUANCE

	Change in total net issuance (%)					
	3M			10M		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔEligibleShare (%)	−0.116		−0.122	−0.079		−0.237
	(0.168)		(0.205)	(0.140)		(0.177)
ΔMeetReqShare (%)		−0.053	0.026		0.534	0.694*
		(0.184)	(0.260)		(0.348)	(0.364)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78	78	78	101	101	101
R^2	0.338	0.331	0.338	0.172	0.199	0.213
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

PANEL B: ELIGIBLE SUBSTITUTION

	Eligible substitution (%)					
	3M			10M		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔEligibleShare (%)	0.268**		0.398***	0.361**		0.474***
	(0.129)		(0.139)	(0.153)		(0.151)
ΔMeetReqShare (%)		−0.293	−0.548**		−0.177	−0.496*
		(0.202)	(0.216)		(0.233)	(0.288)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78	78	78	101	101	101
R^2	0.591	0.567	0.647	0.294	0.251	0.320
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

4.5 How Did Firms Substitute?

So, how are firms able to ensure their bonds are eligible? That is, across which bond characteristics did firms substitute to time the market?

As we mentioned in section 2.1, a corporate bond needs to satisfy an extensive set of requirements to be eligible as collateral at the ECB. Among other requirements, to be eligible, a bond must be (i) listed on an eligible regulated exchange, (ii) non-subordinated, and (iii) investment-grade rated. A firm can choose to list its bonds on an exchange. A firm may also have some flexibility in deciding the seniority of new issues. Moreover, although ratings are assigned by external agencies, a firm may be able to provide collateral for a bond or obtain a credit guarantee from a third party.

However, by changing the seniority, collateral, and guarantees of a bond, an issuer also changes the risk profile of the bond. As we have seen in section 3, the announcement of the CSPP resulted in a substantial re-pricing of bonds more exposed to systematic risk. This finding suggests an increased risk appetite among investors. As a result, firms may have been tempted to shift toward junior, unsecured, or non-guaranteed bonds, to take advantage of lower risk premia.

Similar to our study of the substitution between eligible and ineligible issuance, we now study substitution across bond characteristics. Using monthly bond-issuance data, we run regressions analogous to (2). However, instead of considering whether the issuance is eligible, here we consider six different characteristics in six separate regressions: (i) whether net issuance meets eligibility requirements, (ii) whether it is listed, (iii) whether it is senior, (iv) whether it is investment-grade rated, (v) whether it is secured, and (vi) whether it is guaranteed. We always control for firm-month fixed effects.

Table 9 shows estimates of the coefficients on the IssuanceType$\times$Post interaction in the six regressions. In the short run, firms shifted their issuance toward bonds meeting eligibility requirements, including listed bonds, senior bonds, and investment-grade bonds. This substitution is driven primarily by treated firms, because untreated firms do not display any statistically significant pattern of substitution across these characteristics.

When considering the 10 months before and after the announcement, we find substitution patterns that are marginally statistically significant for issuance meeting eligibility requirements and listed issuance. For senior and investment-grade issuance, point estimates are positive as expected, although not statistically significant. In all these cases, estimates range between 0.297% and 0.595%, which are not negligible if compared with the weighted average of treated firms' total issuance after the announcement (0.58%, according to Table 4.)

A comparison of these results with Table 5 thus suggests treated firms must have also

Table 9: Net issuance by characteristics related to eligibility and riskiness around the CSPP announcement. We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the CSPP. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: MeetReq = 1 if the issuance is listed, senior, and investment-grade rated (row 1); Listed = 1 if the issuance is listed (row 2); Senior = 1 if the issuance is senior (row 3); InvGrade = 1 if the issuance is investment-grade rated (row 4); Secured = 1 if the issuance is secured (row 5); and Guaranteed = 1 if the issuance is guaranteed (row 6). A firm is treated if it had eligible bonds outstanding in the calendar year before the CSPP announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Regressions are weighted by firms' initial outstanding amount of bonds at the beginning of the sample period. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
MeetReq×Post	1.036**	0.324	1.973***	0.569*	−1.213*	−0.258
	(0.459)	(0.257)	(0.568)	(0.335)	(0.727)	(0.363)
Listed×Post	1.737***	0.559**	2.130***	0.595*	0.793	0.473
	(0.507)	(0.262)	(0.601)	(0.326)	(0.856)	(0.388)
Senior×Post	1.619***	0.139	2.156***	0.297	0.330	−0.234
	(0.496)	(0.264)	(0.592)	(0.333)	(0.800)	(0.358)
InvGrade×Post	0.955**	0.362	1.564***	0.408	−0.505	0.252
	(0.475)	(0.258)	(0.596)	(0.337)	(0.819)	(0.390)
Secured×Post	−1.863***	−0.385	−1.849***	−0.339	−1.897**	−0.493
	(0.496)	(0.261)	(0.613)	(0.327)	(0.824)	(0.390)
Guaranteed×Post	−1.084**	−0.220	−0.980	−0.248	−1.331*	−0.154
	(0.471)	(0.250)	(0.649)	(0.320)	(0.755)	(0.389)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,564	110,440	2,412	7,920	31,152	102,520
Notes:	$^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$					

substituted across other bond characteristics that we do not observe in our data. Appendix A.5 provides the list of eligibility requirements, some of which involve the form of the note, the indexation of the principal and coupons, and requirements regarding the trading and settlement of these bonds.

Finally, we find firms did not increase the issuance of secured or guaranteed bonds. Instead, in the short run, firms shifted toward unsecured and non-guaranteed bonds. This observation suggests firms took advantage of investors' higher risk appetite and

increased their issuance of riskier bonds, at least in the short run. Moreover, untreated firms also engaged in this kind of substitution: to take advantage of lower risk premia, firms do not need to issue eligible bonds.

4.6 Did Firms Try to Time the Market?

To conclude our analysis of firms' issuance response, we look for more direct evidence on whether firms tried to time the market after the announcement of the CSPP. Although we cannot observe managers' intentions, here we take a revealed-preference approach. We look for hints suggesting issuers preferred to seize the moment and issue bonds after the announcement rather than wait for future needs and investment opportunities to arise.

We consider four bond characteristics that may reveal a firm's preferences regarding the timing of its issuance. We study whether firms issued less commercial paper and fewer short-maturity bonds, thus indicating an intention to collect funds to be used over a longer period. We also explore if firms issued more fixed-coupon bonds, thus suggesting firms intended to lock in current borrowing rates. Then, we check whether firms increased the net issuance of bonds whose prospectus mentions "general corporate purposes" as the sole use of proceeds. We consider an increase in this lack of specificity as a hint that firms were seizing an opportunity, possibly in the absence of specific investment projects or financing needs. Finally, we assess whether firms took advantage of their issuance programs to issue bonds quickly after the CSPP announcement.

We run five separate regressions in the same form of (2). We consider whether bonds are commercial paper, whether they have maturity below one year, whether they have a fixed coupon, whether their issuance is justified by general corporate purposes (as opposed to specific investment and business needs), and whether their issuance is part of an issuance program.

Table 10 reports the estimated coefficients on the IssuanceType$\times$Post interaction in the five regressions. In all five cases, we find hints of market-timing behavior, especially in the case of treated firms. Treated firms moved away from commercial paper and short-maturity bonds, and shifted toward fixed-coupon bonds. These patterns indicate firms attempted to lock in current market rates by shifting toward bonds with longer maturity and fixed interest payments. Moreover, treated firms increased their issuance of bonds for general corporate purposes, suggesting an increased eagerness to issue after the CSPP announcement rather than wait for future needs to arise. Finally, in the short run, treated firms relied more heavily on issuance programs, with the effect lessening in the longer run, when firms may have sufficient time to issue bonds through other channels.

Table 10: Net issuance by characteristics related to a willingness to time the market after the CSPP announcement.We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the CSPP. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: CommPaper = 1 if the issuance is commercial paper (row 1); ShortMaturity = 1 if the issuance's maturity is shorter than one year (row 2); FixedCoupon = 1 if the issuance has a fixed coupon rate (row 3); GeneralPurpose = 1 if the issuance prospectus indicates general corporate purposes as the only use of proceeds (row 4); and IssuanceProgram = 1 if the issue is part of an issuance program (row 5). A firm is treated if it had eligible bonds outstanding in the calendar year before the CSPP announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
CommPaper×Post	-1.671^{***}	-0.707^{***}	-1.790^{***}	-0.765^{**}	-1.383^{*}	-0.568
	(0.513)	(0.274)	(0.621)	(0.346)	(0.807)	(0.386)
ShortMaturity×Post	-1.463^{***}	-0.616^{**}	-1.500^{**}	-0.542	-1.375	-0.792^{*}
	(0.506)	(0.263)	(0.619)	(0.335)	(0.851)	(0.410)
FixedCoupon×Post	1.817^{***}	0.737^{***}	2.085^{***}	0.822^{***}	1.171	0.536
	(0.495)	(0.246)	(0.595)	(0.305)	(0.799)	(0.341)
GeneralPurpose×Post	0.914^{*}	0.626^{***}	1.413^{**}	0.917^{***}	-0.281	-0.067
	(0.466)	(0.241)	(0.548)	(0.309)	(0.790)	(0.326)
IssuanceProgram×Post	1.048^{**}	0.146	1.221^{**}	0.230	0.632	-0.056
	(0.412)	(0.185)	(0.506)	(0.223)	(0.694)	(0.321)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,564	110,440	2,412	7,920	31,152	102,520

Notes: $^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$

5 Investments and Shareholders' Payoff

Treated firms timed the market and substituted eligible for ineligible issuance. In this section, we ask two final questions. First, how did issuers use the additional funds? In particular, we investigate whether issuers expanded investments, cash holdings, or modified capital structure after the CSPP announcement. Second, did shareholders benefit from firms' market-timing activity? To answer this question, we focus on the stock per-

formance of bond issuers and their dividend payments.

5.1 How Did Issuers Use the Additional Funds?

We study whether treated firms and more active market timers expanded their investments and cash holdings relative to other issuers, and whether they modified their equity and liability composition. Grosse-Rueschkamp et al. (2019) and Ertan et al. (2020) show investment-grade issuers substituted bank loans for bond issues. Banks, in turn, increased the supply of bank loans to lower-rated firms, which used the loans to expand investment and employment. We add to this literature by studying how treated issuers, and bond issuers more generally, used the proceeds of their issuance.

To explore how firms changed their investments and capital structure, we use end-of-the-year detailed financial statements from Orbis. We are able to match 569 issuers from the CSDB to Orbis. Out of these, 113 are treated firms.

We consider changes in growth rates for seven quantities: (i) total assets; (ii) fixed assets, (iii) property, plant and equipment (PPE); (iv) intangible assets excluding goodwill; (v) employment; (vi) cash and equivalent instruments; (vii) book equity; and (viii) total liabilities. To limit the influence of outliers, we winsorize the top and bottom 1% of the observations. Tables A.3 and A.4 in the appendix show results when we winsorize at the 0.5% and 2.5% level.

We also consider changes in the ratio of cash and equivalent instruments to total assets, and the ratio of book equity to total liabilities. The former indicates whether firms increased reserves of liquid assets more than their balance sheet, whereas the latter indicates whether firms modified their capital structure.

Let quantity q_{it} represent either a growth rate for firm i during year t or a balance-sheet ratio at the end of year t. Let $\Delta q_{it} \coloneqq q_{it} - q_{it-1}$ represent the change in this quantity from year $t-1$ to year t. For the sample of all firms, we run regressions in the form

$$\Delta q_{i2016} = \beta^{T}\text{TreatedFirm}_i + \text{Controls}_i + \iota_{c(i)} + \iota_{s(i)} + u_i. \tag{3}$$

For the sample of treated firms, we run regressions in the form

$$\Delta q_{i2016} = \beta^{TI}\Delta\text{NetIssuance}_i + \beta^{TE}\text{EligSub}_i + \text{Controls}_i + \iota_{c(i)} + \iota_{s(i)} + u_i. \tag{4}$$

For the sample of untreated firms, we run a regression similar to (4), but where we omit eligible substitution as an explanatory variable. TreatedFirm_i is an indicator for whether firm i was treated. $\Delta\text{NetIssuance}_i$ is the firm's change in total net issuance around the

CSPP announcement, and EligSub_i is a firm's eligible substitution around the CSPP announcement. Both quantities were defined in section 4.4. We control for the log of total assets as of 2015 and log of liabilities as of 2015. By doing so, we implicitly control for size and leverage. The indicators $\iota_{c(i)}$ and $\iota_{s(i)}$ are, respectively, country and sector fixed effects.

In Table 11, we study the relation between the change in growth rates from 2015 to 2016, the treatment of the issuer, and firms' issuance activity. In Panel A, we consider both treated and untreated firms. In Panel B, we focus only on treated firms and explore whether changes in total issuance and issuance substitution were associated with changes in growth rates and balance-sheet ratios. In Panel C, we consider only untreated firms. We use changes in total net issuance and eligible substitution in the 10 months before and after the CSPP announcement. In this way, we include firms' issuance over all 10 months from the CSPP announcement to the end of the year 2016. The dependent variables, changes in total net issuance, and eligible substitution are all scaled by their standard deviation.

In Panel A, we find no evidence treated firms increased investment growth relative to untreated ones. However, we observe that treated firms accumulated more cash than untreated firms, suggesting that, as a group, treated firms set aside liquid resources for future business needs. We observe this pattern both in terms of cash growth rates and in terms of cash-to-assets ratio. This finding is consistent with the results in Table 10, where we observed treated firms shifting toward longer-term and general-purpose issuance.

In Panel B, we consider only treated firms and investigate whether more active issuers and more active market timers were able to increase their growth rates. For the sample in Panel B of Table 11, these two quantities have a correlation of 20.4%, thus allowing us to disentangle whether changes in growth rates and balance-sheet ratios are associated with changes in total net issuance or with substitution of eligible for ineligible bonds.

Treated firms that increased total issuance more than their peers were able to invest and grow faster. Changes in total net issuance are in fact positively correlated with changes in the growth rate of assets, fixed assets, PPE, and intangibles (excluding goodwill). In particular, a one-standard-deviation increase in total net issuance is associated with a 0.57-standard-deviation increase in total asset growth. Changes in total issuance are also positively associated with changes in the growth rate of shareholder equity and total liabilities. However, changes in the equity-to-liability ratio appear to be unrelated to changes in total bond issuance. These observations suggest firms with larger increases in total bond issuance expanded productive investment but eventually left leverage unchanged.

Table 11: Change in growth rates and capital structure from 2015 to 2016. In columns (1)-(8), the dependent variables are changes in the growth rates of total assets (A), fixed assets (FA), property, plant, and equipment (PPE), intangibles excluding goodwill (Intan), employees (Empl), cash (Cash), book equity (BkEq), and total liabilities (Liab). In columns (9) and (10), the dependent variables are changes in the ratios of cash to total assets (Cash/A) and book equity to liabilities (BkEq/Liab). TreatedFirm = 1 if the firm had eligible bonds outstanding at some point during 2015. ΔNetIssuance is the change in total net issuance from the 10 months before to the 10 months after the announcement. EligSub is the difference between the change in eligible net issuance and the change in ineligible net issuance. We control for country and industry fixed effects and lagged values of log-assets and log-liabilities. Dependent variables and issuance measures are expressed in units of standard deviation. Regressions are weighted by firms' outstanding amount of bonds. Standard errors are in parentheses and are clustered at the country-sector level.

PANEL A: ALL ISSUERS

	Change in growth rates								Change in ratios	
	A	FA	PPE	IA	Empl	Cash	BkEq	L	Cash/A	BkEq/L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TreatedFirm	−0.008	0.033	−0.012	−0.154*	−0.104	0.138**	0.021	−0.056	0.290***	0.018
	(0.084)	(0.115)	(0.048)	(0.082)	(0.265)	(0.055)	(0.076)	(0.086)	(0.109)	(0.024)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	487	483	475	462	426	482	459	487	493	469
R^2	0.225	0.228	0.103	0.341	0.506	0.129	0.274	0.212	0.279	0.234

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

PANEL B: TREATED ISSUERS

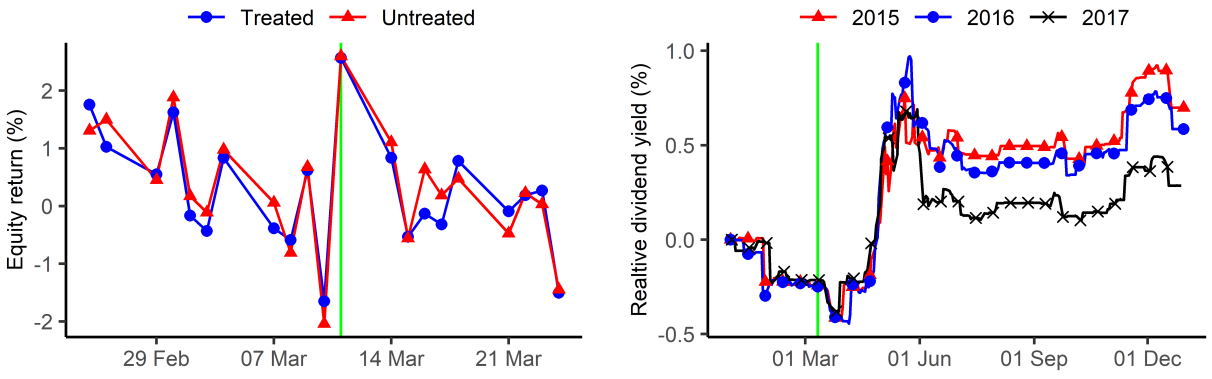
	Change in growth rates								Change in ratios	
	A	FA	PPE	IA	Empl	Cash	BkEq	L	Cash/A	BkEq/L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ΔNetIssuance	0.567**	0.509**	0.290**	0.242***	−0.167	0.165	0.479**	0.508*	0.138	−0.046
	(0.269)	(0.233)	(0.118)	(0.087)	(0.230)	(0.117)	(0.231)	(0.256)	(0.172)	(0.033)
EligibleSub	0.216	0.131	0.001	0.089	0.321	0.256	−0.073	0.346*	0.236	−0.075***
	(0.192)	(0.151)	(0.076)	(0.073)	(0.239)	(0.174)	(0.199)	(0.179)	(0.265)	(0.021)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108	108	106	106	100	107	104	108	108	104
R^2	0.596	0.585	0.319	0.647	0.633	0.266	0.532	0.564	0.427	0.495

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

PANEL C: UNTREATED ISSUERS

	Change in growth rates								Change in ratios	
	A	FA	PPE	IA	Empl	Cash	BkEq	L	Cash/A	BkEq/L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ΔNetIssuance	0.113	0.115	−0.127	0.061	−0.140	0.245***	−0.032	0.113	0.251***	0.051
	(0.101)	(0.131)	(0.079)	(0.068)	(0.142)	(0.067)	(0.122)	(0.117)	(0.064)	(0.055)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	347	343	341	327	302	344	324	347	353	334
R^2	0.256	0.344	0.184	0.224	0.343	0.175	0.357	0.309	0.231	0.297

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$



(a) Stock returns

(b) Difference in cumulative dividend yield

Figure 4: Stock returns and relative dividend yield of treated and untreated issuers. In Figure (a), we plot the daily equity returns of portfolios of treated and untreated issuers around the 2016 CSPP announcement. The vertical line marks the first trading day after the announcement of the 2016 CSPP. In Figure (b), we plot the difference between the cumulative dividend yield of the portfolio of treated firms and the portfolios of untreated firms as a function of the day of the year for three different years. The vertical line marks the day of the year corresponding, in 2016, to the first trading day after the announcement of the CSPP.

Results flip when we consider treated firms' market-timing activity rather than total issuance. Treated firms that more aggressively timed the market did not grow faster than other firms. However, they increased their leverage. The first result is consistent with our findings in Table 8: active market timers did not expand total issuance and did not increase investment growth relative to less active firms. The second result is consistent with market timers substituting various forms of financing: active market timers not only substituted eligible for ineligible issuance, but also substituted debt for equity, thus increasing leverage.

In Panel C, we consider untreated issuers. Whereas treated issuers show a positive association between total net issuance and investment growth, untreated firms appear to have increased issuance for precautionary purposes. For untreated firms, a one-standard-deviation increase in the change in net issuance is associated with a 0.25-standard-deviation increase in cash growth and cash-to-asset ratio.

5.2 Did Shareholders Benefit?

To conclude, we explore whether equity holders of treated firms or active market timers benefited from the CSPP announcement and from firms' market-timing activity. We consider issuers' stock performance and their dividend payments, and we investigate their connection with firms' treatment status and changes in issuance around the CSPP announcement.

Using Orbis and Compustat data, we match issuers to their stocks. We obtain a sample

of 105 publicly traded treated firms and 534 publicly traded untreated firms. To begin with, we form value-weighted portfolios of treated and untreated firms and study their performance and cumulative dividend yield. Figure 4(a) plots daily returns around the CSPP announcement. Figure 4(b) plots the difference between the cumulative divided yield of the portfolio of treated firms and the portfolio of untreated firms in years 2015, 2016, and 2017. In Figure 4(b), a positive (negative) value at a given date indicates that, up to that day of the year, the dividend yield of treated firms was higher (lower) than untreated firms.

Figure 4(a) shows the two portfolios performed equally well after the CSPP announcement, suggesting equity investors did not expect higher future cash flows from a portfolio of treated firms. Figure A.3(a) in Appendix A.2 also shows that during the rest of the year, the portfolio of untreated firms overperformed the portfolio of treated firms. Figure A.3(b) illustrates that at the time of the announcement, the portfolio of untreated firms experienced higher abnormal returns than the portfolio of treated firms.[11]

Figure 4(b) shows treated firms increased their divided yields relative to untreated firms in the months after the announcement, as Todorov (2020) also observed. However, the pattern is typical for the time of the year. In fact, even in 2015 and 2017, treated firms sharply increased their divided yield relative to untreated firms starting in May.

We then run regressions analogous to (3) and (4), but on the left-hand side, we consider two other variables: the total stock return from the CSPP announcement to the end of the year ,and the difference between a firm's 2016 dividend yield and its 2015 divided yield.

Table 12 report the results, where the outcome variables and the issuance measures are expressed in units of standard deviation. After controlling for fixed effects, size, and leverage, we see treated issuers experienced analogous stock returns as untreated issuers after the CSPP announcement. Moreover, we find no relation between a firm's issuance activity and its stock performance. Treated firms lowered their divided yield in 2016 relative to untreated firms, consistent with Figure 4(b), but the difference is barely statistically significant. We observe no relation between issuance activity around the CSPP announcement and changes in divided yield. Overall, we find no evidence that equity holders benefited from firms' market-timing activity.[12]

[11] We measure abnormal returns similar to abnormal yield changes in section 3. For issuer i, let β_i be the beta of its stock with the aggregate portfolio of bond issuers in the euro area. If r_{it} is i's stock return on day t, we define the abnormal return as $r^A_{it} \coloneqq r_{it} - \beta_i r^P_{it}$, where r^P_{it} is the return of the aggregate portfolio of bond issuers.

[12] Because some observations are dropped when we control for lagged assets and liabilities due to missing data, in Table A.5 of Appendix A.2, we omit such controls and reach an analogous conclusion.

Table 12: Stock performance and change in dividend yield. In columns (1)-(3), the dependent variable is the issuer's stock return from the announcement of the CSPP to the end of 2016. In columns (4)-(6), the dependent variable is the issuer's change in dividend yield from 2015 to 2016. TreatedFirm = 1 if the firm had eligible bonds outstanding at some point during 2015. ΔNetIssuance is the change in total net issuance from the 10 months before to the 10 months after the announcement. EligSub is the difference between the change in eligible net issuance and the change in ineligible net issuance. We control for country and industry fixed effects and lagged values of log-assets and log-liabilities. Dependent variables and issuance measures are expressed in units of standard deviation. Regressions are weighted by firms' outstanding amount of bonds. Standard errors are in parentheses and are clustered at the country-sector level.

	Total stock return			Change in dividend yield		
	All	Treated	Untreated	All	Treated	Untreated
	(1)	(2)	(3)	(4)	(5)	(6)
TreatedFirm	0.000			-0.294^{*}		
	(0.025)			(0.158)		
ΔNetIssuance		-0.124	-0.003		0.206	0.229
		(0.133)	(0.022)		(0.197)	(0.226)
EligibleSub		-0.202			-0.219	
		(0.170)			(0.196)	
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	400	94	306	388	94	294
R^2	0.272	0.531	0.302	0.306	0.449	0.254
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

6 Conclusions

We used the announcement of the ECB's corporate QE program (the CSPP) as a quasi-exogenous variation in demand for eligible corporate bonds. Issuers of eligible bonds (treated firms) timed the market by substituting eligible for ineligible bond issuance for an amount corresponding to 55% of the ECB's monthly purchases. They also changed the characteristics of their issuance to meet the eligibility requirements. However, although treated firms timed the market, we find no evidence they increased total issuance, investment growth, or equity value by doing so.

Our results indicate firms choose the composition of their debt issues in response to market condition, and not only as a function of firm characteristics. In particular, firms act as arbitrageurs in their own bonds and issue bonds with characteristics that are in high demand. After the announcement, firms quickly shifted toward issuing bonds meeting eligibility requirements (listed bonds, senior bonds, and investment-grade bonds). They

also took advantage of lower credit risk premia by issuing riskier bonds (unsecured and nonguaranteed bonds). Finally, they also shifted toward more interest-rate-sensitive issuance (longer-term and fixed-coupon bonds) to lock in current market rates. We also show firms displayed eagerness to time the market. They issued more bonds that were not tied to specific business needs or opportunities, and they exploited their issuance programs to issue bonds quickly after the announcement.

Treated firms expanded productive investments after increasing total net issuance, whereas untreated firms accumulated cash reserves. For treated firms, we find no connection between firms' market-timing activity and changes in investment growth rates or equity holders' payoff. Our results thus suggest firms were unable to generate value by substituting eligible for ineligible issuance.

A.1 Market Timing with No Change in Relative Firm Value

We provide a framework to interpret our empirical analysis of issuance and valuation of corporate bonds around QE events. With the simple model in this section, we illustrate that firms may still time the market even in the absence of changes in total issuance of firm value.

A.1.1 Model

Firms. There is a unit measure of competitive firms, all of which can issue ineligible bonds. A measure η of firms can also issue eligible bonds (treated firms), and a fraction $1-\eta$ can issue only ineligible bonds (untreated firms). We might think of the difference between treated and untreated firms as driven by differences on whether firms are rated, or on whether firms are marginally rated more highly.

Firms operate a decreasing-returns-to-scale technology in their capital. Given total capital K, the firm's output is $AK - \frac{c}{2}K^2$, with $A > 0$ and $c > 0$. The yield the firm has to pay on ineligible bonds is Y. Treated firms can also issue eligible bonds at yield $Y - \Delta$. Issuing eligible bonds costs ψ per dollar issued. We may think of this cost as that of obtaining a credit rating and listing the bonds on a regulated market.

We can write the profit function of a treated issuer as

$$\pi_T(K_T, I_T, f; Y, \Delta) = \left[AK_T - \frac{c}{2}(K_T)^2 - I_T Y\right] + [1 + (\Delta - \psi)f]I_T - K_T,$$

where K_T is the capital of a treated firm, I_T is its total bond issuance, and f is the fraction of issuance that is eligible.

Treated firms may time the market by adjusting the relative supply of eligible bonds f in response to the relative yield Δ. Here, we assume firms may supply eligible bonds at constant marginal cost ψ. This assumption is different from models of market timing in Greenwood et al. (2010) and Stein (1996), who assume an increasing marginal cost.

The implications of our assumption, however, match the results of our empirical analysis remarkably well.

Untreated issuers have an analogous profit function, except that they are unable to issue eligible bonds at a cost ψ. Their profit function is

$$\pi_N(K_N, I_N; Y) = \left[AK_N - \frac{c}{2}K_N^2 - Y_j I_N\right] + I_N - K_N,$$

where K_N is the total capital of the treated issuer and I_N is the total issuance.

INVESTORS. Investors do not discount future payoffs and have a preferred habitat for eligible bonds. They face limits to arbitrage in the form of an increasing marginal cost of bond holdings. Their utility from a portfolio of B bonds, of which a fraction e is eligible, is given by

$$U(B, e; Y, \Delta) = B\left[Y - 1 - \Delta e - \frac{\tau}{2}(e - \bar{e})^2\right] - \frac{\gamma}{2}B^2,$$

where $\tau > 0$ and $\gamma \geq 0$. Investors value the expected net payoff of their bond holdings, and their preferred habitat for eligible bonds is $\bar{e}$.[13] The quantity e represents the percentage of eligible bonds in investors' portfolios, and investors suffer a disutility when e deviates from the target percentage $\bar{e}$.

Eligible bonds trade at a yield that is Δ lower than ineligible bonds, which reduces eligible bonds' payoff. We assume the habit demand for eligible bonds is strong enough; that is,

$$\bar{e} > \frac{\psi}{2\tau}. \tag{A.1}$$

Investors also face limits to arbitrage that are captured by the term $-\frac{\gamma}{2}B^2$, which introduces an increasing marginal cost of bond holdings.

CENTRAL BANK. The central bank buys a quantity G of eligible bonds.

MARKET EQUILIBRIUM. We define a market equilibrium as follows.

DEFINITION (Equilibrium). *A market equilibrium is a vector of yields (Y^*, Δ^*), a vector of bond issues (I_T^*, f^*, I_N^*), a vector of firm sizes (K_T^*, K_N^*), and a vector of private bond holdings, (B^*, e^*), such that issuance, firm size, and holdings are optimal for the private sector; that is,*

$$(K_T^*, I_T^*, f^*) = \arg\max_{(K,I,f)\geq 0} \pi_T(K, I, f; Y^*, \Delta^*)$$
$$(K_N^*, I_N^*) = \arg\max_{(K,I)\geq 0} \pi_N(K, I; Y^*)$$
$$(B^*, e^*) = \arg\max_{(B,e)} U(B, e; Y^*, \Delta^*);$$

[13] Tobin (1969) and, more recently, Greenwood et al. (2010), Krishnamurthy and Vissing-Jorgensen (2012), and Vayanos and Vila (2009) have noted that investors may have a preferred habitat. In our model, the preferred habitat of investors is represented by $\bar{e}$, which is the fraction of eligible bonds that investors would hold if eligible bonds traded at the same price as ineligible bonds.

and such that markets clear; that is,

$$\eta f^* I^* = e^* B^* + G$$
$$I^* = B^* + G.$$

The following lemma characterizes some properties of the competitive equilibrium

LEMMA A.1. *The equilibrium yield differential between eligible and ineligible bonds is $\Delta^* = \psi$, and the equilibrium ineligible yield satisfies $Y^* \geq 1$. Treated and untreated firms issued the same total amount of bonds $I^* \coloneqq I_T^* = I_N^*$ and invest the same amount of capital $K^* \coloneqq K_T^* = K_N^*$. All issuance proceeds are invested; that is, $K^* = I^*$.*

In equilibrium, treated firms compete away any marginal gain from issuing eligible bonds; that is, $\Delta^* = \psi$. As treated firms compete away such marginal gains, they face the same cost of capital as untreated firms, which then implies both types of firms borrow and invest the same amount of capital. Finally, because borrowing is costly by $Y^* \geq 0$, firms choose to borrow only to make investments.

MARKET TIMING. As the central bank purchases eligible bonds, these bonds become scarce, absent any equilibrium adjustment in supply and prices. In our setting, however, we explicitly take into consideration the supply response of firms. When firms can switch between eligible and ineligible issuance, we obtain the following result.

PROPOSITION A.1 (Market Timing and No Gain in Firm Value)**.** *If the central bank increases the amount of eligible bonds purchased, treated firms time the market and shift their issuance toward eligible bonds; that is,*

$$\partial_G f^* > 0.$$

However, the cost of capital of treated firms does not decline relative to untreated firms. In particular, their total issuance changes in the same way and the yield of eligible and ineligible bonds change in the same way. That is,

$$\partial_G (I_T^* - I_N^*) = 0, \quad \partial_G \Delta^* = 0.$$

Moreover, all firms increase issuance, and all bond yields drop. That is,

$$\partial_G I^* > 0, \quad \partial_G Y^* < 0.$$

Because treated firms can substitute eligible for ineligible bonds, they compete away any partial-equilibrium effect that QE may have on eligible bond prices. Without firms' market-timing activity, yields of eligible bonds would drop relative to ineligible bonds after an increase in G; that is, Δ would increase. However, if $\Delta^* > \psi$, treated firms would obtain arbitrage profits by issuing more eligible bonds. Market equilibrium can be achieved only if treated firms adjust their issuance to the point that $\Delta^* = \psi$. Consequently, by timing the market, treated firms neutralized the demand effect of QE on eligible bonds.

Although treated firms substitute eligible for ineligible issuance, the total amount of bonds held by investors, B^*, drops as the central bank holds a larger amount of securities.

As investors are able to offload bonds, their marginal holding cost γB^* declines. Because the investors now face lower marginal holding costs, they bid up bond prices, prompting yields to drop, which in turn encourage firms to increase issuance.

Therefore, this model provides two key messages. First, we might observe market timing even in the absence of relative yield changes. Second, thanks to corporate market timing, QE uniformly affects the total issuance and firm value of all issuers, regardless of their treatment status.

A.1.2 PROOFS

INVESTORS' FIRST-ORDER CONDITIONS. The first-order conditions for investors are

$$e = \bar{e} - \frac{\Delta}{\tau} \tag{A.2}$$

$$Y - 1 - \bar{e}\Delta + \frac{\Delta^2}{2\tau} = \gamma B. \tag{A.3}$$

Equation (A.2) expresses the demand for eligible bonds as a decreasing function of their price premium. Equation (A.3) establishes that the net marginal benefit of holding bonds must equal the marginal cost of increasing bond holdings.

PROOF OF LEMMA A.1. To ensure markets for eligible bonds clear, the equilibrium is characterized by $\Delta^* \leq \psi$. Otherwise, treated firms would be able to realize unbounded profits by issuing an unbounded amount of bonds. However, if $\Delta^* < \psi$, investors would have a positive demand for eligible bonds because of assumption (A.1) and demand function (A.2), but treated issuers would be unwilling to supply them. Hence, in equilibrium, the premium of eligible bonds must match the cost of issuing them. That is,

$$\Delta^* = \psi.$$

Moreover, if $\Delta^* = \psi$, treated issuers have no advantage over untreated issuers in terms of cost of capital, and therefore,

$$I_T^* = I_N^* \quad \text{and} \quad K_T^* = K_N^*,$$

so that we can simply define I^* and K^* as the total issuance and investments of an arbitrary firm.

After using $\Delta^* = \psi$ and assumption (A.1) in equation (A.3), we also obtain $Y^* > 1$, and therefore, firms do not have any arbitrage gain from issuing bonds. Therefore, all the issuance proceeds are invested, that is, $K^* = I^*$, and the first-order condition for issuance is simply

$$A - cI^* = Y^*, \tag{A.4}$$

which also shows firms increase their bond issuance if bond yields decline. □

PROOF OF PROPOSITION A.1 Because $\Delta^* = \psi$ and $I_T^* = I_N^*$, it must be the case that $\partial_G(I_T^* - I_N^*) = 0$ and $\partial_G \Delta^* = 0$.

After combining investors' demand for bonds (A.3) with the market-clearing conditions and differentiating, we obtain

$$\partial_G Y^* = \gamma \partial_G I^* - \gamma,$$

whereas using firms' demand for capital (A.4), we obtain

$$-c\partial_G I^* = \partial_G Y^*.$$

Together, these equations imply

$$\partial_G I^* = \frac{\gamma}{\gamma + c} > 0 \quad \text{and} \quad \partial_G Y^* = -\frac{c\gamma}{\gamma + c} < 0.$$

Finally, combining the market-clearing conditions for eligible bonds and dividing by the total amount issued, we obtain

$$f^* = e^* + (1 - e^*)\frac{G}{I^*}.$$

Because $e^* = \bar{e} - \frac{\psi}{\tau}$ does not change with G, it suffices to show the ratio $\frac{G}{I^*}$ increases when G increases. Let us consider equation (A.3) and the equilibrium yield differential $\Delta_j^* = \psi$, thus obtaining

$$Y^* - 1 - \bar{e}\psi + \frac{\psi^2}{2\tau} = \gamma B^*.$$

Using the expression for $\partial_G Y^*$, we obtain

$$\partial_G B^* = -\frac{c}{\gamma + c} < 0.$$

Because $I^* = B^* + G$,

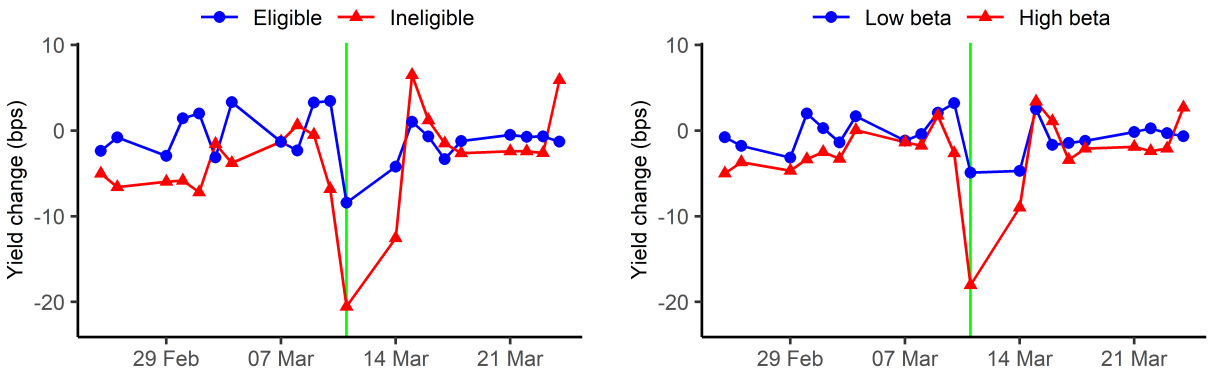
$$\partial_G \left(\frac{G}{I^*}\right) = -\partial_G \left(\frac{B^*}{I^*}\right) = \frac{c}{\gamma + c}\frac{1}{I^*} + \frac{\gamma}{\gamma + c}\frac{B^*}{(I^*)^2} > 0.$$

Hence,

$$\partial_G f^* = (1 - e^*)\partial_G \left(\frac{G}{I^*}\right) > 0.$$

□

A.2 ADDITIONAL FIGURES AND TABLES



(a) Yields by eligibility

(b) Yields by aggregate risk exposure

Figure A.1: Average change in yields of euro-denominated corporate bonds around the CSPP announcement. Bonds are sorted according to their eligibility and their exposure to aggregate risk. We measure a bond's aggregate risk exposure in terms of its beta before the announcement. The beta is the slope coefficient in a regression of the daily change in bond yields on the change in the aggregate bond market's yield. Bonds are classified as high beta if their beta is above the median of the cross-sectional distribution of betas. The vertical line marks the first trading day after the announcement of the CSPP.

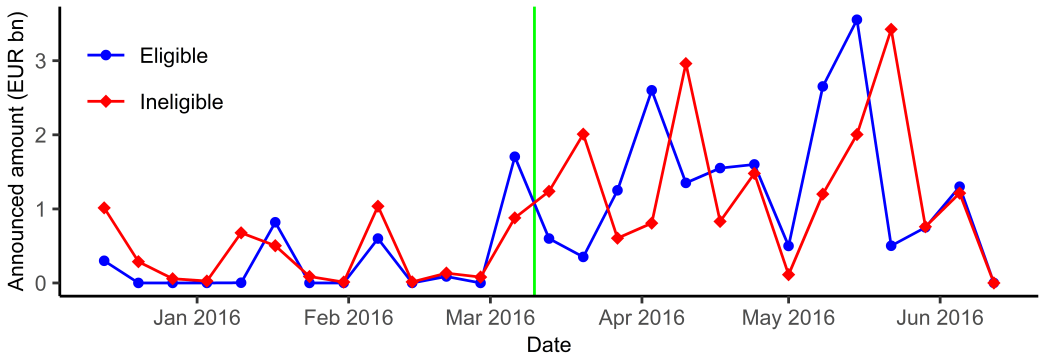
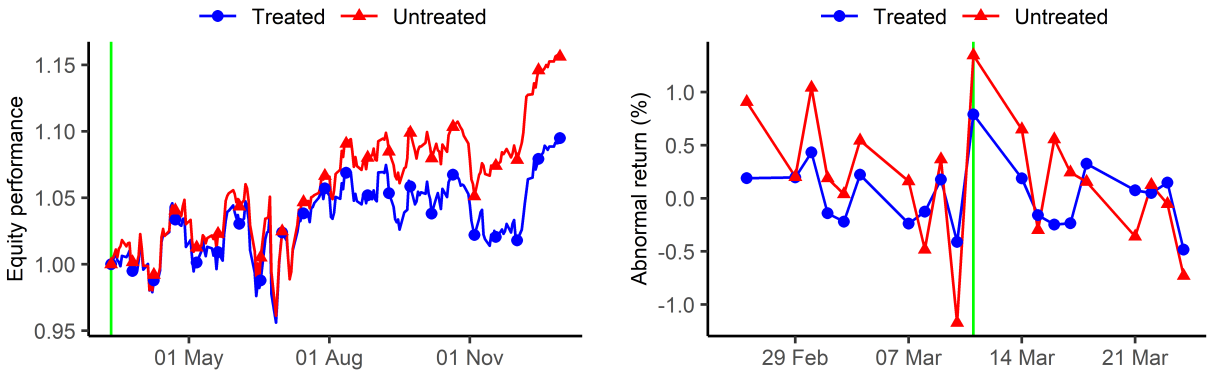


Figure A.2: Weekly announced bond issuance for the three months before and after the CSPP. All bonds are euro-denominated and issued by non-financial corporations domiciled in the euro area. The vertical line marks the announcement of the CSPP.



(a) Cumulative performance

(b) Abnormal stock returns

Figure A.3: Abnormal stock returns and cumulative performance of treated and untreated issuers. In Figure (b), we plot the daily abnormal returns of portfolios of treated and untreated issuers around the 2016 CSPP announcement. The vertical line marks the first trading day after the announcement of the 2016 CSPP. In Figure (a), we plot the the cumulative performance of the portfolio of treated firms and the portfolios of untreated firms starting from the CSPP announcement.

Table A.1: Changes in bond yield spreads after the CSPP announcement for the sample of bonds with price changes in at least half of the trading days in the three months before and after the announcement. We use bonds outstanding in the three months before and after the announcement of the CSPP. The dependent variable is the change in spread (columns (1)-(4)) and the abnormal change in spread (columns (5)-(8)). EligibleBond = 1 if the bond is eligible to be used as collateral at the ECB as of three months before the CSPP announcement. BidAsk is the bond's average bid-ask spread relative to the midpoint during the period starting three months before the announcement and ending two weeks before it. A firm is classified as treated if it had eligible bonds outstanding at some time during the calendar year before the announcement. Regressions are weighted by the bond's outstanding amount. Standard errors are in parentheses and are clustered at the country-industry level.

PANEL A: SPREAD CHANGES OVER ONE DAY

	One-day spread change (bps)				One-day abnormal spread change (bps)			
	All firms		Treated firms		All firms		Treated firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EligibleBond	8.042***	7.524**	8.937***	7.215***	−5.455*	−8.283**	−6.490**	−9.019**
	(2.489)	(2.937)	(2.681)	(2.601)	(2.799)	(3.969)	(2.739)	(4.106)
BidAsk	1.719	21.308**	−1.048	0.607	16.764**	20.388***	7.270***	4.044***
	(12.392)	(8.447)	(1.976)	(1.744)	(6.505)	(5.811)	(1.673)	(1.389)
Country-industry FE	Yes	No	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,483	1,220	917	889	1,483	1,220	917	889
R^2	0.213	0.724	0.556	0.645	0.314	0.740	0.666	0.547
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

PANEL B: SPREAD CHANGES OVER TWO DAYS

	Two-day spread change (bps)				Two-day abnormal spread change (bps)			
	All firms		Treated firms		All firms		Treated firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EligibleBond	8.210***	7.015**	8.427***	7.072**	−9.532***	−8.867**	−8.152***	−9.506**
	(2.685)	(3.486)	(3.151)	(3.055)	(3.517)	(3.815)	(3.038)	(3.852)
BidAsk	−7.027*	−1.058	−2.958	−0.870	2.288	3.604	6.763***	4.199*
	(3.643)	(2.490)	(2.935)	(3.210)	(6.798)	(8.898)	(2.115)	(2.325)
Country-industry FE	Yes	No	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,483	1,220	917	889	1,483	1,220	917	889
R^2	0.165	0.590	0.409	0.545	0.117	0.578	0.633	0.435
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

Table A.2: Net issuance and one-day changes in valuation. In columns (1) and (2), the dependent variable is the monthly difference between eligible and ineligible net issuance in the three and 10 months before and after the announcement. In columns (3)-(6), the dependent variable is the total monthly net issuance in the three and 10 months before and after the announcement. FirmBondBeta is the average beta of the firm's outstanding bonds in the three months before the CSPP announcement. $\Delta^A S^F$ is the average abnormal spread change in the firm's outstanding bonds in the first trading day after the announcement. Post = 1 after the announcement. Regressions are weighted by the firms' initial outstanding amount of bonds. Standard errors are in parentheses and are clustered at the firm level.

	Excess eligible iss. (%)		Total net issuance (%)			
	Treated firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
FirmBeta×Post	3.996**	0.387	1.819	−0.048	−0.253	−0.013
	(1.582)	(0.738)	(1.573)	(0.676)	(0.310)	(0.125)
$\Delta^A S^F$×Post (bps)	−0.296**	−0.027	−0.173	0.003	0.000	0.000
	(0.122)	(0.060)	(0.121)	(0.054)	(0.015)	(0.006)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,092	3,560	1,092	3,560	2,844	9,020
R^2	0.405	0.269	0.399	0.277	0.311	0.177
Notes:	$^*p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

Table A.3: Change in growth rates from 2015 to 2016 with a 0.5% winsorization. In columns (1)-(8), the dependent variables are changes in the growth rates of total assets (A), fixed assets (FA), property, plant, and equipment (PPE), intangibles excluding goodwill (Intan), employees (Empl), cash (Cash), book equity (BkEq), and total liabilities (Liab). TreatedFirm = 1 if the firm had eligible bonds outstanding at some point during 2015. ΔNetIssuance is the change in total net issuance from the 10 months before to the 10 months after the announcement. EligSub is the difference between the change in eligible net issuance and the change in ineligible net issuance. We control for country and industry fixed effects and lagged values of log-assets and log-liabilities. Dependent variables and issuance measures are expressed in units of standard deviation. Regressions are weighted by firms' outstanding amount of bonds. Standard errors are in parentheses and are clustered at the country-sector level.

PANEL A: ALL ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TreatedFirm	−0.008	−0.014	−0.025	−0.196*	−0.161	0.061**	0.014	−0.045
	(0.031)	(0.085)	(0.039)	(0.106)	(0.359)	(0.025)	(0.054)	(0.060)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	487	483	475	462	426	482	459	487
R^2	0.160	0.213	0.092	0.268	0.521	0.096	0.314	0.200
Notes:	$^*p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

PANEL B: TREATED ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔNetIssuance	0.567**	0.509**	0.290**	0.241***	−0.437	0.091	0.479**	0.508*
	(0.269)	(0.233)	(0.118)	(0.087)	(0.315)	(0.058)	(0.231)	(0.256)
EligibleSub	0.216	0.131	0.001	0.088	0.373	0.119	−0.073	0.346*
	(0.192)	(0.151)	(0.076)	(0.072)	(0.303)	(0.084)	(0.199)	(0.179)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108	108	106	106	100	107	104	108
R^2	0.596	0.585	0.319	0.650	0.635	0.248	0.532	0.564
Notes:	$^*p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

PANEL C: UNTREATED ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔNetIssuance	0.029	0.047	−0.158	0.080	−0.100	0.106***	−0.024	0.063
	(0.040)	(0.093)	(0.098)	(0.100)	(0.130)	(0.037)	(0.085)	(0.078)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	347	343	341	327	302	344	324	347
R^2	0.143	0.296	0.160	0.253	0.296	0.113	0.431	0.282
Notes:	$^*p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

Table A.4: Change in growth rates from 2015 to 2016 with a 2.5% winsorization. In columns (1)-(8), the dependent variables are changes in the growth rates of total assets (A), fixed assets (FA), property, plant, and equipment (PPE), intangibles excluding goodwill (Intan), employees (Empl), cash (Cash), book equity (BkEq), and total liabilities (Liab). TreatedFirm = 1 if the firm had eligible bonds outstanding at some point during 2015. ΔNetIssuance is the change in total net issuance from the 10 months before to the 10 months after the announcement. EligSub is the difference between the change in eligible net issuance and the change in ineligible net issuance. We control for country and industry fixed effects and lagged values of log-assets and log-liabilities. Dependent variables and issuance measures are expressed in units of standard deviation. Regressions are weighted by firms' outstanding amount of bonds. Standard errors are in parentheses and are clustered at the country-sector level.

PANEL A: ALL ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TreatedFirm	0.014	0.111	0.037	−0.193*	−0.088	0.184**	0.024	−0.023
	(0.093)	(0.142)	(0.083)	(0.106)	(0.189)	(0.078)	(0.096)	(0.096)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	487	483	475	462	426	482	459	487
R^2	0.207	0.241	0.160	0.297	0.485	0.132	0.282	0.203
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

PANEL B: TREATED ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔNetIssuance	0.580**	0.541**	0.290**	0.303***	0.079	0.216	0.534**	0.536**
	(0.267)	(0.249)	(0.118)	(0.111)	(0.171)	(0.158)	(0.259)	(0.264)
EligibleSub	0.239	0.147	0.001	0.126	0.268	0.287	−0.066	0.381*
	(0.202)	(0.156)	(0.076)	(0.085)	(0.193)	(0.203)	(0.218)	(0.196)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108	108	106	106	100	107	104	108
R^2	0.580	0.581	0.319	0.537	0.617	0.275	0.537	0.550
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

PANEL C: UNTREATED ISSUERS

	Change in growth rates							
	A	FA	PPE	IA	Empl	Cash	BkEq	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔNetIssuance	0.141	0.089	−0.061	0.066	−0.138	0.331***	−0.026	0.161
	(0.116)	(0.130)	(0.073)	(0.081)	(0.134)	(0.092)	(0.124)	(0.139)
FEs and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	347	343	341	327	302	344	324	347
R^2	0.249	0.401	0.326	0.206	0.364	0.223	0.365	0.312
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$							

Table A.5: Stock performance and change in dividend yield. In columns (1)-(3), the dependent variable is the issuer's stock return from the announcement of the CSPP to the end of 2016. In columns (4)-(6), the dependent variable is the issuer's change in dividend yield from 2015 to 2016. TreatedFirm = 1 if the firm had eligible bonds outstanding at some point during 2015. ΔNetIssuance is the change in total net issuance from the 10 moths before to the 10 moths after the announcement. EligSub is the difference between the change in eligible net issuance and the change in ineligible net issuance We control for country and industry fixed effects. Dependent variables and issuance measures are expressed in units of standard deviation. Regressions are weighted by firms' outstanding amount of bonds. Standard errors are in parentheses and are clustered at the country-sector level.

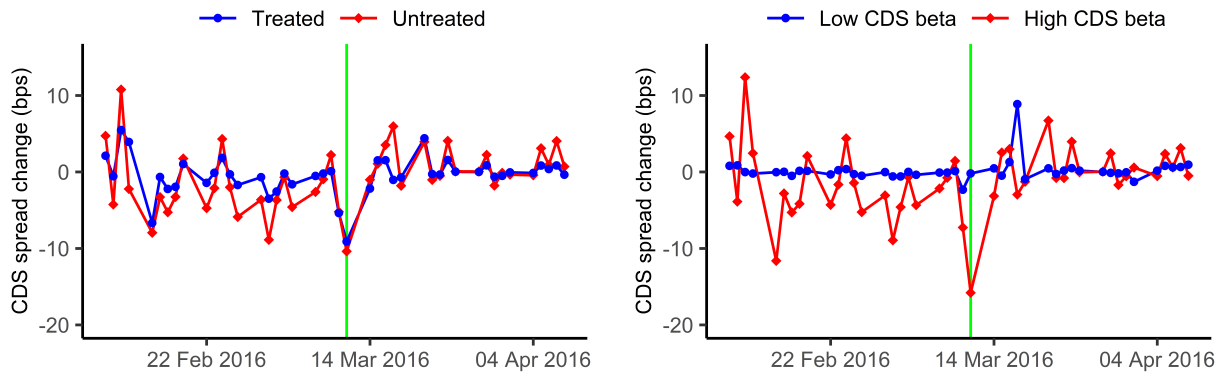
	Total stock return			Change in dividend yield		
	All	Treated	Untreated	All	Treated	Untreated
	(1)	(2)	(3)	(4)	(5)	(6)
TreatedFirm	-0.033^{*}			-0.047		
	(0.019)			(0.137)		
ΔNetIssuance		-0.030	-0.019		0.205	0.164
		(0.138)	(0.019)		(0.182)	(0.135)
EligibleSub		-0.302			-0.113	
		(0.205)			(0.173)	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	472	103	369	458	103	355
R^2	0.428	0.422	0.538	0.255	0.368	0.252

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

A.3 Additional Analyses

A.3.1 CDS Spreads and Default Risk Premia

We extend our analysis on valuation of credit risk by looking at CDS spreads and expected default frequencies (EDFs) around the announcement of the CSPP. We use CDS data from IHS Markit and EDF data from Moody's KMV. For CDS spreads, we find information on 133 of the issuers in our sample. We then match Markit's data with KMV's, resulting in a sample of 80 issuers for which we observe both CDS spreads and EDFs.



(a) Entities by treatment

(b) Entities by aggregate risk exposure

Figure A.4: Daily change in five-year CDS spreads of euro-area non-financial issuers around the announcement of the CSPP. Issuers are sorted according to treatment and exposure to aggregate risk. An issuer is classified as treated if it had eligible bonds outstanding at some time during the calendar year before the announcement. We measure an issuer's aggregate risk exposure in terms of its CDS beta before the announcement. The CDS beta is the slope coefficient in a regression of the change in the issuer's five-year spread on the change in the average five-year spread of the market. Issuers are classified as high CDS beta if their CDS beta is above the median. The vertical line marks the first trading day after the announcement of the CSPP.

CDS Spreads Figure A.4(a) plots the average five-year CDS spread of treated and untreated issuers, where an issuer is defined as eligible if it had eligible bonds outstanding in 2015. Consistent with our arguments so far, the spreads of eligible and ineligible issuers declined by a comparable amount when the CSPP was announced.

In Figure A.4(b), we sort reference entities on the basis of the beta of their CDS spread. Again, entities with the highest beta experienced the greatest improvement in the valuation of their credit risk. To compute the CDS beta, first we construct a CDS index as the cross-sectional average of the five-year spreads of non-financial issuers domiciled in the euro area. Then, we compute an entity's CDS beta as the slope coefficient in a regression of the daily change in the entity's five-year spread on the daily change in the index's five-year spread. We define an entity as having high CDS beta if its CDS beta is above the median.

As a first approximation, we can interpret the level of a CDS spread as a function of the entity's probability of default and of the correlation of the entity's default with the aggregate market. Entities whose default is more likely to happen during economic

Table A.6: Summary statistics for CDS spreads. The table reports the number of entities and summary statistics for the five-year and 30-year CDS spreads. Summary statistics are separately computed for the three months before and after the announcement of the CSPP using daily data.

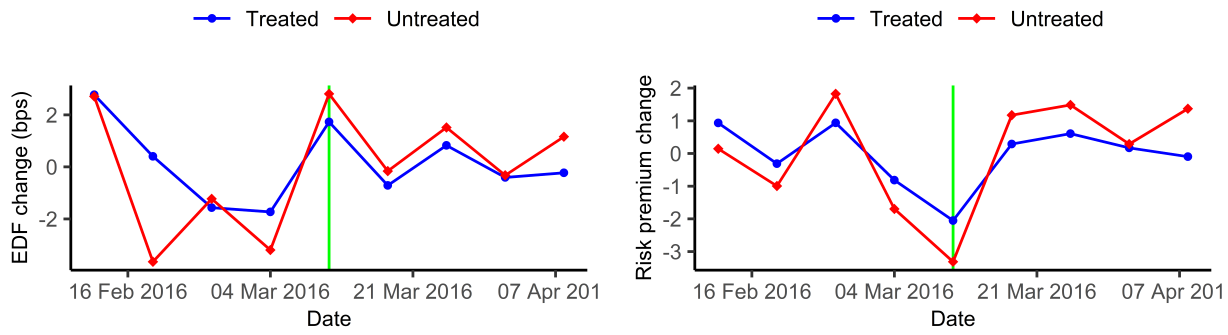
	5yr spread (%)			30yr spread (%)		
	All	Treated	Untreated	All	Treated	Untreated
N entities	133	80	53	121	73	48
Pre-CSPP: Mean (%)	1.531	0.942	2.415	1.950	1.377	2.863
Pre-CSPP: Median (%)	0.902	0.789	1.501	1.384	1.203	2.029
Pre-CSPP: St.Dev. (%)	1.894	0.612	2.667	1.780	0.718	2.458
Post-CSPP: Mean (%)	1.406	0.821	2.292	1.804	1.230	2.707
Post-CSPP: Median (%)	0.824	0.718	1.520	1.242	1.092	1.959
Post-CSPP: St.Dev (%)	1.815	0.455	2.582	1.707	0.560	2.383

downturns will have a higher spread for a given (unconditional) probability of default. The CDS beta measures the co-movement of a change in CDS spreads with a change in the aggregate market's spread, regardless of the level of the spread. The CDS beta therefore captures the entity's exposure to aggregate credit risk only, and not the entity's idiosyncratic risk.

Table A.6 shows summary statistics for CDS spreads before and after the announcement for all entities, for treated entities, and for untreated entities. We consider daily data for the five-year CDS contract, which is the most actively traded, and the 30-year CDS contract, which is the longest maturity in our data. Later, in Table A.7, we show summary statistics for the one-year contract for the subsample of entities for which we also have data on their probability of default. In general, we notice the same patterns we observed in Figure A.4: higher-beta entities experience a greater decline in CDS spreads after the announcement.

RISK PREMIA To obtain a measure of risk premia, we consider the ratio between the CDS spread and the expected default frequency (EDF) of bond issuers. We find EDF data for 80 of the 133 issuers in the CDS sample. The ratio between the CDS spread and the entity's EDF represents, approximately, the ratio between the risk-neutral expected default frequency and the default frequency under the physical probability measure. The ratio therefore captures a default risk premium. We focus on one-year EDFs and CDS spreads because we can directly interpret these quantities as annualized arrival rates of defaults under the physical and risk-neutral measure, respectively. We use weekly data to reduce microstructure noise in the daily estimates of the EDFs (Berndt et al., 2005).

Figure A.5 shows the announcement brought about a decline in risk premia. Table A.7 shows summary statistics for EDFs, one-year spreads, and risk premia before and after the announcement.



(a) Expected default frequency

(b) Risk premium

Figure A.5: Weekly changes in average one-year EDF and risk premium of euro-area non-financial issuers in the three months before and after the announcement of the CSPP. The vertical line marks the first trading day after the announcement of the CSPP.

Table A.7: Summary statistics for EDFs, one-year spreads, and risk premia. The table reports the number of entities and summary statistics for entities with EDF and CDS data available. Summary statistics are separately computed for the three months before and after the announcement of the CSPP using daily data.

	1yr EDF (%)			1yr spread (%)			Risk premium		
	All	Treated	Untreated	All	Treated	Untreated	All	Treated	Untreated
N entities	80	50	30	80	50	30	80	50	30
Pre-CSPP: Mean	0.184	0.185	0.182	0.599	0.372	0.996	8.669	8.404	9.134
Pre-CSPP: Median	0.050	0.040	0.060	0.280	0.244	0.357	5.652	5.143	6.941
Pre-CSPP: St.Dev.	0.421	0.456	0.352	1.346	0.457	2.090	15.178	15.627	14.351
Post-CSPP: Mean	0.192	0.183	0.207	0.481	0.268	0.854	7.863	6.850	9.631
Post-CSPP: Median	0.050	0.040	0.050	0.210	0.183	0.331	4.680	4.103	5.343
Post-CSPP: St.Dev	0.484	0.481	0.490	1.126	0.356	1.744	17.453	15.412	20.417

A.3.2 Regression Discontinuity Design for Spreads at Issuance

We provide additional analyses for the change in spreads at issue after the announcement of the CSPP. We adopt a regression discontinuity design using new bond issues in the six months before and after the announcement of the CSPP. Controlling for high-order polynomials, we estimate the discontinuity in spreads around the CSPP announcement. We view our discontinuity estimates as illustrations of a pattern rather than as measures of a causal effect of the CSPP on coupon rates. In fact, Gelman and Imbens (2019) encourage the use of local linear or quadratic regressions instead of higher-order polynomials. Unfortunately, our data are not dense enough near the discontinuity for us to implement their suggested approach. Moreover, firms changed the characteristics of their bond issues after the announcement, as we show in section 4.5, with firms shifting toward riskier bond issues.

We consider a regression in the following form:

$$s_{it} = a_0^0 + a_0^1 x^1 + \cdots + a_0^p x^p + \text{Post}_t \times (a_1^0 + a_1^1 x^1 + \cdots + a_1^p x^p) + \iota_{r(i)} + \iota_{m(i)} + \iota_{c(i)} + \iota_{s(i)} + u_{it}, \quad \text{(A.5)}$$

Table A.8: Estimates of the discontinuity in a regression of spreads at issue on issue date. In the first row, we control for a third-degree polynomial; in the second row, we control for a fourth-degree polynomial. We also control for rating, maturity, country, and sector fixed effects. Odd column show the results from unweighted regressions, whereas even columns show the results for regressions weighted by the amount issued. Standard errors are clustered at the firm level.

	Discontinuity in coupon spread (%)											
	Eligible		Ineligible		Investment grade		Non-invest. grade		Treated firms		Untreated firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
3rd degree poly.	0.627**	0.490	−3.914*	2.203	0.523**	0.558*	−3.952*	0.761	0.490	0.345	−1.605	2.317
	(0.286)	(0.302)	(2.044)	(2.718)	(0.247)	(0.330)	(2.033)	(2.645)	(0.525)	(0.303)	(2.063)	(2.468)
4th degree poly.	0.750*	0.425	−5.705**	−2.656	0.433	0.142	−5.580**	−3.807	0.551	0.352	−2.425	−0.921
	(0.441)	(0.446)	(2.532)	(2.147)	(0.366)	(0.455)	(2.558)	(2.678)	(0.740)	(0.501)	(2.627)	(2.626)
Weighted	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	134	134	396	396	155	155	375	375	163	163	367	367

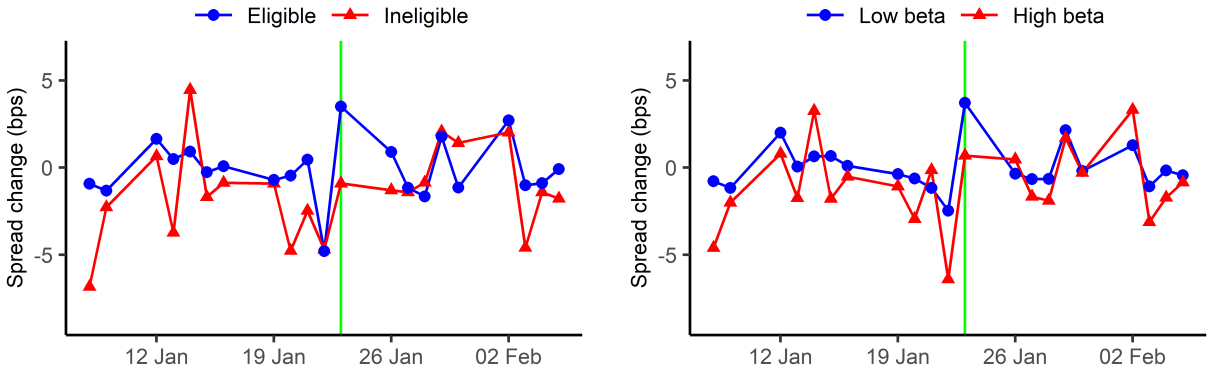
Notes: $^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$

where s_{it} is the spread of issue i at date t, x_{it} is the time difference in days between t and the first trading day after the announcement of the CSPP, $\iota_{r(i)}$ is a rating fixed effect, $\iota_{m(i)}$ is a maturity-bin fixed effect like the one used in (1), $\iota_{c(i)}$ is a country fixed effect, and $\iota_{s(i)}$ is a sector fixed effect.

The coefficient a_1^0 provides an estimate of the change in spreads immediately after the announcement. We report estimates in Table A.8. Here, we consider polynomials of the third and fourth degree. We include estimates obtained with and without weighting observations by the issued amount.

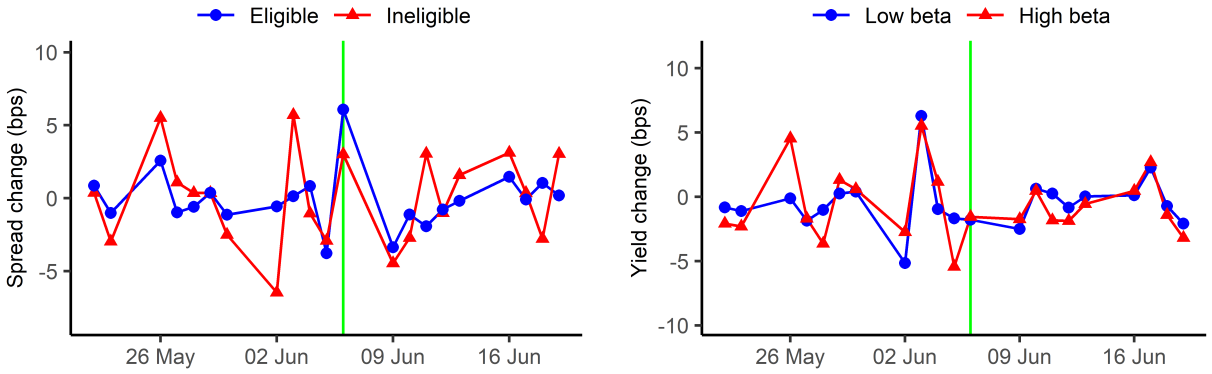
The CSPP announcement was followed by a decline in the spreads of smaller issues of ineligible and non-investment-grade bonds, as a comparison between unweighted and weighted regressions reveal, but not in the spreads of eligible bonds.

A.4 Placebos: Other ECB Programs



(a) Yield spreads by eligibility **(b)** Yield spreads by aggregate risk exposure

Figure A.6: Average change in yield spreads of euro-denominated corporate bonds around the PSPP announcement. Bonds are sorted according to their eligibility as collateral at the ECB and their exposure to aggregate risk. We measure a bond's aggregate risk exposure in terms of its beta before the announcement. The beta is the slope coefficient in a regression of the daily change in bond spreads on the change in the aggregate bond market's spread. Bonds are classified as high beta if their beta is above the median of the cross-sectional distribution of betas. The vertical line marks the first trading day after the announcement of the PSPP.



(a) Yield spreads by eligibility **(b)** Yield spreads by aggregate risk exposure

Figure A.7: Average change in yield spreads of euro-denominated corporate bonds around the 2014 TLTRO announcement. Bonds are sorted according to their eligibility as collateral at the ECB and their exposure to aggregate risk. We measure a bond's aggregate risk exposure in terms of its beta before the announcement. The beta is the slope coefficient in a regression of the daily change in bond spreads on the change in the aggregate bond market's spread. Bonds are classified as high beta if their beta is above the median of the cross-sectional distribution of betas. The vertical line marks the first trading day after the announcement of the 2014 TLTRO.

Table A.9: Net issuance by characteristics related to eligibility and riskiness around the PSPP announcement. We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the PSPP. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: Eligible = 1 if the issuance is eligible to be used at collateral at the ECB (row 1); MeetReq = 1 if the issuance is listed, senior, and investment-grade rated (row 2); Listed = 1 if the issuance is listed (row 3); Senior = 1 if the issuance is senior (row 4); InvGrade = 1 if the issuance is investment-grade rated (row 5); Secured = 1 if the issuance is secured (row 6); Guaranteed = 1 if the issuance is guaranteed (row 7). A firm is treated if it had eligible bonds outstanding in the calendar year before the PSPP announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Regressions are weighted by firms' initial outstanding amount of bonds at the beginning of the sample period. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible×Post			0.157	0.146		
			(0.631)	(0.266)		
MeetReq×Post	−2.064***	−1.510***	−2.630***	−2.009***	−0.720	−0.193
	(0.537)	(0.216)	(0.679)	(0.276)	(1.321)	(0.384)
Listed×Post	1.176**	0.188	0.861	0.287	1.924	−0.073
	(0.464)	(0.226)	(0.579)	(0.259)	(1.300)	(0.436)
Senior×Post	−2.772***	−2.330***	−2.723***	−2.141***	−2.889**	−2.829***
	(0.574)	(0.249)	(0.679)	(0.285)	(1.416)	(0.425)
InvGrade×Post	0.442	0.119	0.978	0.250	−0.832	−0.224
	(0.649)	(0.229)	(0.604)	(0.284)	(1.316)	(0.375)
Secured×Post	−0.841*	−0.322	−1.169**	−0.275	−0.061	−0.448
	(0.486)	(0.230)	(0.578)	(0.282)	(1.237)	(0.382)
Guaranteed×Post	−1.323***	−0.544**	−1.783***	−0.484*	−0.232	−0.700*
	(0.496)	(0.226)	(0.572)	(0.267)	(1.254)	(0.392)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,840	100,960	2,376	7,880	28,464	93,080

Notes: $^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$

Table A.10: Net issuance by characteristics related to eligibility and riskiness around the 2014 TLTRO announcement. We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the 2014 TLTRO. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: Eligible = 1 if the issuance is eligible to be used at collateral at the ECB (row 1); MeetReq = 1 if the issuance is listed, senior, and investment-grade rated (row 2); Listed = 1 if the issuance is listed (row 3); Senior = 1 if the issuance is senior (row 4); InvGrade = 1 if the issuance is investment-grade rated (row 5); Secured = 1 if the issuance is secured (row 6); Guaranteed = 1 if the issuance is guaranteed (row 7). A firm is treated if it had eligible bonds outstanding in the calendar year before the 2014 TLTRO announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Regressions are weighted by firms' initial outstanding amount of bonds at the beginning of the sample period. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible×Post			0.273	−0.624**		
			(0.650)	(0.295)		
MeetReq×Post	−0.765*	−0.156	−1.118*	−0.367	0.135	0.375
	(0.459)	(0.274)	(0.603)	(0.327)	(0.760)	(0.538)
Listed×Post	0.438	0.079	0.721	0.113	−0.282	−0.005
	(0.465)	(0.274)	(0.580)	(0.325)	(0.876)	(0.561)
Senior×Post	−0.877*	0.103	−1.138*	−0.168	−0.213	0.788
	(0.455)	(0.302)	(0.602)	(0.360)	(0.692)	(0.573)
InvGrade×Post	−0.130	0.008	−0.010	−0.005	−0.436	0.041
	(0.490)	(0.263)	(0.609)	(0.287)	(0.752)	(0.532)
Secured×Post	0.161	0.043	0.052	−0.078	0.438	0.348
	(0.459)	(0.261)	(0.608)	(0.304)	(0.805)	(0.552)
Guaranteed×Post	−0.383	−0.296	−0.769	−0.533	0.598	0.301
	(0.456)	(0.272)	(0.606)	(0.329)	(0.702)	(0.534)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,796	100,280	2,304	7,520	27,492	92,760

Notes: $^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$

Table A.11: Net issuance by characteristics related to a willingness to time the market after the PSPP announcement.We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the PSPP. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: CommPaper = 1 if the issuance is commercial paper (row 1); ShortMaturity = 1 if the issuance's maturity is shorter than one year (row 2); FixedCoupon = 1 if the issuance has a fixed coupon rate (row 3); GeneralPurpose = 1 if the issuance prospectus indicates general corporate purposes as the only use of proceeds (row 4); IssuanceProgram = 1 if the issue is part of an issuance program (row 5). A firm is treated if it had eligible bonds outstanding in the calendar year before the PSPP announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
CommPaper×Post	0.187	0.890***	0.749	0.920***	−1.149	0.811**
	(0.535)	(0.189)	(0.627)	(0.227)	(1.473)	(0.363)
ShortMaturity×Post	−0.038	0.413**	0.683	0.651**	−1.749	−0.214
	(0.522)	(0.209)	(0.651)	(0.255)	(1.331)	(0.391)
FixedCoupon×Post	0.241	−0.115	−0.388	−0.380	1.732	0.583
	(0.479)	(0.195)	(0.608)	(0.237)	(1.257)	(0.363)
GeneralPurpose×Post	0.030	0.177	0.147	0.120	−0.247	0.328
	(0.376)	(0.222)	(0.512)	(0.282)	(0.686)	(0.353)
IssuanceProgram×Post	0.592	−0.001	0.612	−0.030	0.546	0.078
	(0.414)	(0.200)	(0.507)	(0.248)	(0.648)	(0.305)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,840	100,960	2,376	7,880	28,464	93,080
Notes:	$^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$					

Table A.12: Net issuance by characteristics related to a willingness to time the market after the 2014 TLTRO announcement.We run separate regressions of net issuance of bonds with and without a certain characteristic on the interaction IssuanceType×Post and controls. IssuanceType = 1 if the issuance has the characteristic being considered. Post = 1 after the announcement of the 2014 TLTRO. We control for an IssuanceType×FirstMonth interaction, firm-month fixed effects, and firm-IssuanceType fixed effects. For each row, we report the coefficients on the interaction IssuanceType×Post for a different issuance type: CommPaper = 1 if the issuance is commercial paper (row 1); ShortMaturity = 1 if the issuance's maturity is shorter than one year (row 2); FixedCoupon = 1 if the issuance has a fixed coupon rate (row 3); GeneralPurpose = 1 if the issuance prospectus indicates general corporate purposes as the only use of proceeds (row 4); IssuanceProgram = 1 if the issue is part of an issuance program (row 5). A firm is treated if it had eligible bonds outstanding in the calendar year before the 2014 TLTRO announcement. Odd-numbered columns consider the three months before and after the announcement. Even-numbered columns consider the 10 months before and after the announcement. Standard errors are in parentheses and are double-clustered at the country-industry-month and firm level.

	Net issuance by type (%)					
	All firms		Treated firms		Untreated firms	
	3M	10M	3M	10M	3M	10M
	(1)	(2)	(3)	(4)	(5)	(6)
CommPaper×Post	0.454	1.058***	0.430	1.129***	0.515	0.878**
	(0.344)	(0.189)	(0.448)	(0.234)	(0.453)	(0.405)
ShortMaturity×Post	0.735	0.185	1.089	0.528*	−0.166	−0.679
	(0.542)	(0.255)	(0.684)	(0.294)	(0.801)	(0.537)
FixedCoupon×Post	−0.363	0.171	−0.545	0.096	0.101	0.358
	(0.508)	(0.264)	(0.643)	(0.315)	(0.883)	(0.548)
GeneralPurpose×Post	−0.286	−0.080	−0.266	−0.019	−0.338	−0.234
	(0.434)	(0.214)	(0.544)	(0.264)	(0.706)	(0.365)
IssuanceProgram×Post	0.014	0.121	0.152	0.307	−0.337	−0.348
	(0.351)	(0.199)	(0.464)	(0.248)	(0.516)	(0.288)
IssuanceType×FirstMonth	Yes	Yes	Yes	Yes	Yes	Yes
Firm-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-IssuanceType FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,796	100,280	2,304	7,520	27,492	92,760
Notes:	$^{*}p \leq 0.10$; $^{**}p \leq 0.05$; $^{***}p \leq 0.01$					

A.5 Eligibility Criteria

Here we report general eligibility criteria for marketable assets that are relevant for our sample of corporate bonds issued by euro-area nonfinancial corporations. We copy them verbatim from Part Four of Guideline (EU) 2015/510 of the European Central Bank of 19 December 2014 on the implementation of the Eurosystem monetary policy framework. Certain types of assets and non-marketable assets may be subject to specific criteria. For details, see the Guideline available at https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32014O0060.

Article 62: Principal amount of marketable assets

1. In order to be eligible, until their final redemption, debt instruments shall have:
   (a) a fixed and unconditional principal amount; or
   (b) an unconditional principal amount that is linked, on a flat basis, to only one euro area inflation index at a single point in time, containing no other complex structures.
2. Debt instruments with a principal amount linked to only one euro area inflation index at a single point in time shall also be permissible, given that the coupon structure is as defined in Article 63(1)(b)(i) fourth indent and linked to the same euro area inflation index.
3. Assets with warrants or similar rights attached shall not be eligible.

Article 63: Acceptable coupon structures for marketable assets

1. In order to be eligible, debt instruments shall have either of the following coupon structures until final redemption:
   (a) the reference rate is only one of the following at a single point in time:
      – a euro money market rate, e.g. EURIBOR, LIBOR or similar indices;
      – a constant maturity swap rate e.g. CMS, EIISDA, EUSA;
      – the yield of one or an index of several euro area government bonds that have a maturity of one year or less;
      – a euro area inflation index; and
   (b) f (floor), c (ceiling), l (leveraging/deleveraging factor) and x (margin) are, if present, numbers that are either pre-defined at issuance, or may change over time only according to a path pre-defined at issuance, where f and c are greater than or equal to zero and l is greater than zero throughout the entire lifetime of the asset. For floating coupons with an inflation index reference rate, l shall be equal to one.

2. Debt instruments with a floating coupon, as referred to in paragraph 1(b), shall be considered ineligible if at any time following the application of the coupon rate formula, the coupon rate results in a negative value.

3. Any coupon structure that does not comply with paragraphs 1 and 2 shall not be eligible, including instances where only part of the remuneration structure, such as a premium, is non-compliant.

4. For the purpose of this Article, if the coupon is either of a fixed multi-step type or of a floating multi-step type, the assessment of the relevant coupon structure shall be based on the entire lifetime of the asset with both a forward- and backward-looking perspective.

5. Acceptable coupon structures shall have no issuer optionalities, i.e. during the entire lifetime of the asset, based on a forward- and backward-looking perspective, changes in the coupon structure that are contingent on an issuer's decision shall not be acceptable.

ARTICLE 64: NON-SUBORDINATION WITH RESPECT TO MARKETABLE ASSETS

Eligible debt instruments shall not give rise to rights to the principal and/or the interest that are subordinated to the rights of holders of other debt instruments of the same issuer.

ARTICLE 65: CURRENCY OF DENOMINATION OF MARKETABLE ASSETS

In order to be eligible, debt instruments shall be denominated in euro or in one of the former currencies of the Member States whose currency is the euro.

ARTICLE 67: SETTLEMENT PROCEDURES FOR MARKETABLE ASSETS

1. In order to be eligible, debt instruments shall be transferable in book-entry form and shall be held and settled in Member States whose currency is the euro through an account with an NCB or with an SSS that has been positively assessed pursuant to the Eurosystem User Assessment Framework, so that perfection and realisation of collateral are subject to the law of a Member State whose currency is the euro.

2. If the CSD/SSS where the asset is issued and the CSD/SSS where the asset is held, are not identical, for the purposes of eligibility, the two must be connected by an eligible link positively assessed pursuant to the Eurosystem User Assessment Framework in accordance with Article 150.

ARTICLE 68: ACCEPTABLE MARKETS FOR MARKETABLE ASSETS

1. In order to be eligible, debt instruments shall be those which are admitted to trading on a regulated market as defined in Directive 2014/65/EU of the European Parliament and of the Council, or admitted to trading on certain acceptable non-regulated markets.

2. The ECB shall publish the list of acceptable non-regulated markets on its website and shall update it at least once a year.

3. The assessment of non-regulated markets by the Eurosystem shall be based on the following principles of safety, transparency and accessibility.

   (a) Safety refers to certainty with regard to transactions, in particular certainty in relation to the validity and enforceability of transactions.

   (b) Transparency refers to unimpeded access to information on the market's rules of procedure and operation, the financial features of the assets, the price formation mechanism, and the relevant prices and quantities, e.g. quotes, interest rates, trading volumes, outstanding amounts.

   (c) Accessibility refers to the ability of the Eurosystem to take part in and access the market. A market is considered accessible if its rules of procedure and operation allow the Eurosystem to obtain information and conduct transactions when needed for collateral management purposes.

4. The selection process for non-regulated markets shall be defined exclusively in terms of the performance of the Eurosystem collateral management function and should not be regarded as an assessment by the Eurosystem of the intrinsic quality of any market.

ARTICLE 71: CREDIT QUALITY REQUIREMENTS FOR MARKETABLE ASSETS

In order to be eligible, debt instruments shall meet the credit quality requirements specified in Chapter 2, except where otherwise stated.

Article 71 and Chapter 2 establish that, to be eligible, a bond needs to have a credit rating of BBB- or better from at least one of the four recognized rating agencies (S&P, Moody's, Fitch, DBRS.)

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