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# Corporate Financing Effects of the ECB's CSPP: Evidence from Bond Spreads and Firm Leverage

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**REM Working Paper 0390-2025**

July 2025

**REM – Research in Economics and Mathematics**
Rua Miguel Lúpi 20,
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Portugal

ISSN 2184-108X



Fundação para a Ciência e a Tecnologia
U LISBOA | UNIVERSIDADE DE LISBOA
ISEG Lisbon School of Economics & Management Universidade de Lisboa
REM RESEARCH IN ECONOMICS AND MATHEMATICS

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# Corporate Financing Effects of the ECB's CSPP: Evidence from Bond Spreads and Firm Leverage[*]

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## Abstract

This study evaluates the impact of the ECB's Corporate Sector Purchase Programme (CSPP) on corporate bond spreads at issuance, as measured by Option-Adjusted Spreads (OAS), and on subsequent changes in firms' capital structures, as proxied by year-on-year changes in the debt ratio. Using a sample of 1,275 Eurozone corporate bonds issued between 2015:Q1 and 2018:Q4, we estimate a two-stage empirical model to evaluate. In the first stage, we find that the initial association between CSPP eligibility and lower spreads disappears once firm- and bond-level characteristics are controlled for, suggesting that observed differences reflect issuer and instrument features rather than programme eligibility. While the CSPP's effect does not vary systematically by firm or bond characteristics, the results indicate broader market effects, likely driven by the programme's signaling power and perceived credibility, which extended beyond the impact of direct bond purchases. In the second stage, we assess changes in leverage following the issuance of bonds. CSPP eligibility did not seem to affect the debt ratio in the issuance year. However, longer-maturity eligible bonds are associated with delayed increases in leverage, as firms expanded their debt ratios in the year following issuance. This pattern suggests that improved financing conditions under the programme may have encouraged firms to raise additional debt at a later stage.

**JEL:** C23, E52, E58, G12, G32
**Keywords:** ECB, CSPP, unconventional monetary policy, bond yields, corporate capital structure, corporate financing.

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The opinions expressed herein are those of the authors and do not necessarily reflect those of the authors' employers. Any remaining errors are the authors' sole responsibility.

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# 1. Introduction

In 2016, the European Central Bank (ECB) launched the Corporate Sector Purchase Programme (CSPP) as part of its Asset Purchase Programme (APP). The primary goal of this programme was to lower corporate financing costs and stimulate investment by purchasing investment-grade bonds issued by non-financial corporations in the Eurozone. Consequently, the CSPP represented a change in the ECB's approach by expanding its focus to the private corporate bonds.

Several studies have provided consistent evidence that CSPP contributed to a reduction in corporate bond spreads, particularly in the immediate period of its implementation. These effects are largely attributable to mechanisms such as increased demand for eligible securities and portfolio rebalancing by investors. However, most existing literature focuses on the impact of CSPP at the market level, particularly on the pricing of bonds at issuance or in secondary markets. In contrast, little focus was placed on how the CSPP affected corporate behavior over time, particularly in terms of firms' capital structure decisions. In this context, this study addresses this gap by analyzing the impact of the CSPP on both bond pricing and firm-level leverage. Specifically, we examine whether eligible bonds under the CSPP were priced differently in the primary market and whether firms that issued such bonds adjusted their debt ratios in the short and medium term. This study provides evidence of the broader and potentially longer-lasting effects of the CSPP on firms' financing decisions, an area that remains underexplored in empirical literature.

For our study, we use a sample of 1,275 Eurozone corporate bonds issued between 2015:Q1 and 2018:Q4 to assess the impact of the ECB's CSPP on primary market bond spreads and subsequent changes in firms' capital structures. We adopt a two-stage empirical approach: first, we analyze whether CSPP eligibility influenced bond pricing at issuance and then we assess whether eligible issuance translated into changes in firms' financial leverage during the issuance year and the year after. Our findings indicate that while CSPP eligibility is initially associated with lower bond spreads, this effect disappears once firm and bond characteristics are controlled for, suggesting broader market effects likely driven by signalling rather than direct pricing. Furthermore, we find no evidence of widespread increases in leverage among firms that issued eligible bonds. However, results suggest the programme may have eased financing constraints for more indebted issuers over time. The remainder of the paper is structured as follows. Section 2

provides a brief overview of the CSPP. Section 3 presents the literature review. Section 4 describes the empirical methodology. Section 5 discusses the results. Section 6 concludes.

## 2. ECB's CSPP

In March 2016, the ECB decided to extend its APP to include the CSPP. This program consisted of the purchase of European corporate bonds, both on the primary and secondary markets[1]. The main goal was to provide better funding conditions for firms across the euro area, encouraging them to increase investment and create additional jobs, thereby stimulating the economy of the Eurozone. The goal of these actions was to establish the necessary conditions for inflation to stabilize at levels near but below 2% in the medium term. The purchases under CSPP, coordinated by the ECB, were carried out by the national central banks (NBCs) acting on behalf of the Eurosystem.

In terms of eligibility, this program required that the issuers of the bonds be non-bank corporations established in the Eurozone. Their debt instruments needed to be denominated in euros, have a minimum credit assessment of BBB- (investment grade) and have a minimum remaining maturity of six months and a maximum remaining maturity of 30 years. Consequently, this program excluded credit institutions, investment firms, comparable banks, and asset management vehicles.

By launching CSPP, the ECB had two main objectives. The first was to signal their continuous commitment to stimulating the economy. The second goal was to impact the prices of assets. In the context of this last goal, the ECB aimed not only to lower the yields of the bonds eligible for the program but also to influence the prices of non-eligible corporate bonds through the portfolio rebalancing channel. By purchasing large amounts of bonds, the ECB generated a scarcity of eligible bonds in the market, which induced investors to reallocate their holdings to other, riskier bonds. The rising demand for these riskier non-eligible bonds led to higher prices and lower yields for these assets.

The total amount of CSPP holdings consistently increased from June 2016 to December 2019, reaching €184,505 million by the end of 2019. The secondary market holdings represented the majority of CSPP holdings during this period, despite primary market holdings increasing over time (Figure 1). The predominance of secondary market

[1] Under CSPP, the NCBs may purchase eligible corporate bonds in the primary and secondary markets, while public sector bonds may only be purchased in the secondary markets.

holdings suggests that the ECB actively purchased existing corporate bonds to influence market conditions and liquidity, thereby stabilizing their prices. In turn, the steady increase in primary market holdings, although smaller, also demonstrates the ECB's support for corporate issuers.

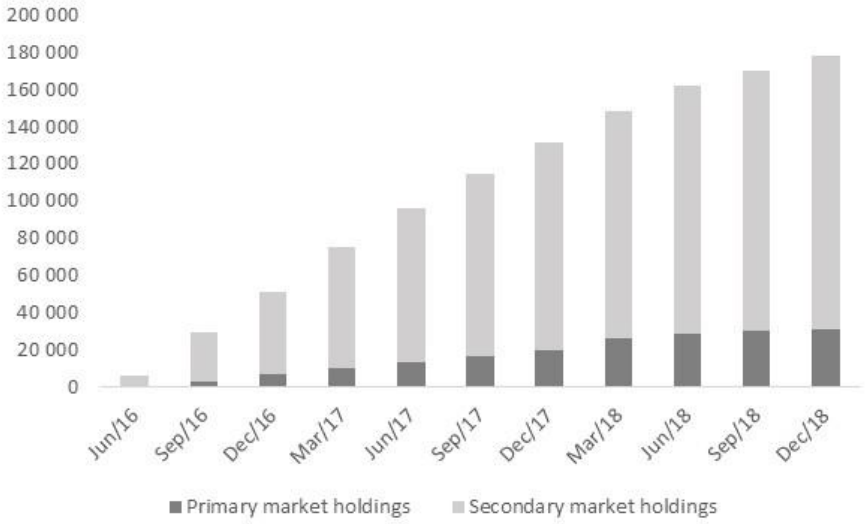


***Figure 1.*** The breakdown of holdings under the CSPP (€ Mn).
*Source: European Central Bank (ECB). Note: Holdings at amortised cost and figures reported net of redemptions.*

The data on CSPP holdings by country highlight a significant and steady concentration in France and Germany during the analysed period (Table A1). This concentration suggests a consistent investment strategy by the ECB, reflecting confidence in the economic and corporate stability of these countries. Sectors such as utilities, infrastructure and transportation, and automotive represent the primary shares of CSPP holdings (Table A2), reflecting the strategic focus on countries like France and Germany mentioned earlier. Additionally, the data on the credit rating distribution of CSPP holdings from 2017 to 2019 shows a shift toward higher-rated securities. The share of A-rated assets was 45% at the end of 2019 (Table A3), reflecting a growing focus on moderately secure investments. The share of BBB-rated assets, although trending downward from 2017 to 2019, remained significant, demonstrating the ECB's role in supporting lower-rated assets.

## 3. Literature Review

The CSPP targeted corporate bonds, which reflects a more direct approach by the ECB to promote private sector investment. While the broader effects of the APP have been extensively studied, research focusing on the CSPP remains limited, partly due to

its constraints in firm-level data availability. Although most CSPP-related studies focus on impacts at the market level, some recent work has begun to explore firm-level responses to unconventional monetary policy more generally. For example, Altavilla et al. (2022) examine how negative interest rates affect firm debt structures in the euro area, while Nocera and Pesaran (2023) study the impact of the Federal Reserve's large-scale asset purchases on the capital structure of U.S. non-financial firms. However, direct evidence on CSPP's effects at the firm level remains scarce.

A critical transmission mechanism of the CSPP is the portfolio rebalancing effect. By increasing the demand for CSPP-eligible bonds, the ECB not only reduced their yields but also incentivised investors to transfer funds to non-eligible or riskier bonds. This spillover effect, documented by Zaghini (2019) and Abidi and Miquel-Flores (2018), amplified the CSPP's effect by indirectly lowering yields across broader market segments. For example, Zaghini (2019) examined the impact of CSPP during its first year and found an indirect effect on non-eligible bond yields, in addition to a direct impact on eligible bond yields. This mechanism highlights the programme's ability to influence market conditions beyond its direct scope.

Further research by Rischen and Theissen (2021) found that the CSPP contributed to a reduction in underpricing in the Eurozone market bond, which had been high since the financial crisis. This suggests that the program has led to an improvement in market efficiency. Similarly, De Santis et al. (2018) reported that CSPP eased corporate financing conditions by reducing bond spreads and improving supply conditions in the primary market. Notably, they observed an increase in bank lending to corporates without access to the bond market, demonstrating the program's broader financial market effects. Additionally, Betz and De Santis (2019) found that CSPP increased the issuance of debt securities and encouraged banks to reallocate their loan supply toward corporates that had no access to bond markets.

Several studies about the CSPP have focused mainly on its immediate impact on bond yield spreads, particularly during the initial years of the programme. This body of research consistently finds that the CSPP effectively lowered corporate bond yields, primarily through channels such as portfolio rebalancing. Despite some studies having started to explore the broader financial implications, the literature on the medium- and long-term effects of the CSPP remains limited. Additional research is needed to assess whether its impact on borrowing costs and, more generally, on corporate financing behaviour has

been maintained over time. Addressing this gap is essential for a more comprehensive understanding of CSPP's effectiveness and its role in supporting the firm's resilience and broader economic recovery. This study addresses that gap by examining the CSPP's effect on corporate bond spreads at issuance and its short- to medium-term influence on firms' capital structure decisions. Using a two-stage empirical approach, we assess both bond pricing at issuance and subsequent changes in corporate leverage, providing new evidence on the programme's broader implications for firm behaviour.

## 4. Methodology

For our study, we use a cross-sectional econometric approach to examine the impact of the ECB's CSPP on corporate bond spreads at issuance. Since the analysis focuses exclusively on the primary bond market, where each bond is observed only once at issuance, we adopt a pooled OLS estimation strategy. The model also includes firm-fixed effects ($\mu_i$) and quarter fixed effects ($\tau_t$) to control for unobserved heterogeneity across issuers and macroeconomic conditions over time. Additionally, the standard errors are clustered at the firm and quarter level to account for potential within-firm and within-quarter correlation of residuals. The baseline model equation is given by:

$$Spread_{ijt} = \alpha + \beta_1 CSPP_{eligible_{ijt}} + \beta_2 CSPP_{period_t} + \beta_3 \left( CSPP_{eligible_{ijt}} \times CSPP_{period_t} \right) + \eta F_{jt} + \theta I_{it} + \varphi W_t + \mu_i + \tau_t + \epsilon_{ijt} \quad (1)$$

where, $Spread_{ijt}$ represents the Option-Adjusted Spread (OAS) at issuance for bond *j* issued by firm *i* at quarter *t*. The OAS is defined as the difference between the yield on a corporate bond and the yield on a comparable maturity government bond, considering the value of any embedded options.[2] This study focuses only on the primary sovereign bond market.[3] The term $\eta F_{jt}$ includes the set of bond features, $\theta I_{it}$ is the set of issuing firm features, and $\varphi W_t$ is the set of variables about macroeconomic conditions. The error term is represented by $\epsilon_{ijt}$.

In this model, the impact of the CSPP on corporate bond spreads is assessed through dummy variables. The first dummy, $CSPP_{eligible_{ijt}}$, takes the value of 1 if the

[2] The OAS adjusts for the value of embedded options in bonds, providing a more accurate measure of yield spreads. Additionally, it allows for standardized comparisons across bonds with different options.

[3] By concentrating on primary market bonds, we can more clearly assess the CSPP's impact on bond yields at the time of issuance, thus reflecting the programme's effects without the noise of secondary market trading. Additionally, this approach ensures a more accurate evaluation of CSPP eligibility and the immediate pricing conditions of new bonds (Mäkinen et al., 2020).

bond is eligible for the programme and 0 otherwise. This variable captures the direct pricing effect of CSPP eligibility, isolating the impact on bonds that were explicitly targeted for purchase.[4] To determine eligibility, a bond must satisfy two primary conditions: (i) a minimum investment grade credit rating (BBB- or higher) and (ii) a maturity of between 6 months and up to 30 years. The other dummy variable is the $CSPP_{period_t}$, that assumes the value of 1 if the bond was issued during the active CSPP period and 0 otherwise. As bonds issued during the active CSPP period may have benefited from more favourable market conditions, such as lower interest rates and increased liquidity driven by the programme, we include this time dummy to capture the overall impact of the CSPP during its implementation phase. Additionally, we introduce an interaction between these two dummy variables to capture the direct effect of the programme on bonds that were both eligible for purchase and issued during the active CSPP window. This term isolates the additional impact of the CSPP beyond general market trends or differences between eligible and non-eligible bonds.

For the selection of control variables, we base our approach on the econometric framework initially proposed by Sironi (2003) and later extended by Zaghini (2016, 2019), which analyses the determinants of risk premia in the euro-area primary bond market. According to this approach, the spread of a bond relative to a risk-free rate is determined by three sources of risk: bond features, issuer characteristics, and market conditions.

Regarding the bond features, we include variables that reflect the characteristics that might influence their eligibility and attractiveness under the program. Based on Zaghini's (2019) approach, we consider the amount issued (logarithm of the bond issued amount in a single tranche) [5], the time of maturity at the origination (number of years)[6]

[4] The central identification assumption of this study is that CSPP eligibility is plausibly exogenous, conditional on bond and firm characteristics. Eligibility is determined by fixed ECB criteria (e.g., currency denomination, investment-grade rating, issuer incorporation), which firms cannot easily manipulate at the time of issuance. Moreover, the inclusion of firm and quarter fixed effects, together with detailed bond-level controls, helps mitigate concerns of omitted variable bias and reverse causality.

[5] It's expected that bond spreads are negatively related to the issued amount. Larger issuance sizes are typically associated with greater bond liquidity, which tends to lower the spread. Longstaff et al. (2005) found that the non-default component of bond spreads is negatively related to bond-specific liquidity measures, such as the outstanding principal amount. In turn, Chen et al. (2007), using several liquidity indicators, found that an improvement in liquidity generates a significant reduction in yield spreads.

[6] Longer maturities expose investors to more interest rates and credit risks, leading to higher spreads to compensate for these risks (Elton et al., 2002).

and the bond rating grade.[7] These features also cover the main criteria defined for CSPP eligibility. To construct the bond credit rating variable, we proceed in two steps. First, we include a dummy variable that distinguishes between rated and non-rated bonds, taking the value 1 if the bond is rated and 0 otherwise. Second, for rated bonds, we assign a numerical score reflecting the credit quality, with higher values indicating higher creditworthiness.[8] The final bond credit rating variable is the interaction between the rating dummy and the numerical score.[9]

In turn, the set of issuing firm features is designed to capture their financial health and structural features that may affect bond spreads. These factors include a firm's size, leverage, profitability and liquidity indicators. The natural logarithm of total assets is used to measure a firm's size, the debt ratio (total debt divided by total assets) is used to determine leverage, profitability is proxied by return on assets (ROA) and liquidity by current ratio (current assets divided by current liabilities). Each of these variables helps to reflect the firm's risk profile and its perceived creditworthiness.[10]

Finally, to control macroeconomic conditions, we include country-specific year-on-year (YoY) GDP growth and inflation rates, which directly capture domestic economic performance that may affect bond pricing at issuance.[11] Other broad measures of economic risk are excluded, as firm and time fixed effects already absorb common macroeconomic shocks and euro-area-wide monetary policy influences. This approach ensures that only relevant cross-country macroeconomic differences are explicitly controlled in the model.

To explore whether the impact of the CSPP on bond spreads varies across different types of firms and bond structures, we extend the baseline model (equation 1) by introducing triple interaction terms between CSPP eligibility, the programme period, and

[7] Investment-grade bonds, which are considered lower risk, are expected to have lower spreads than non-investment-grade bonds (Huang and Huang, 2012).
[8] Credit ratings are converted into numerical scores for the analysis, with the highest rating (AAA/Aaa) assigned a score of 22, followed by AA+/Aa1 as 21, AA/Aa2 as 20, and so on, decreasing sequentially down to D, which is assigned a score of 1.
[9] As a result, the variable will assume the value of 0 for non-rated bonds and a numerical score between 1 (D) and 22 (AA) for rated bonds.
[10] Larger firms are generally perceived as having lower credit risk (Titman and Wessels, 1988; Petersen and Rajan, 1994), while higher leverage suggests greater financial risk and consequently higher yield spreads (Myers, 1977; Nakashima and Saito, 2009). Higher profitability reduces the likelihood of financial distress, which lowers credit spreads (Campbell et al., 2008).
[11] Higher nominal GDP growth indicates stronger economic activity and tends to reduce default risk, thus narrowing bond spreads. In contrast, higher inflation can lead to higher interest rates, increasing borrowing costs and putting pressure on firm profitability, which can result in wider bond spreads.

key firm- and bond-specific characteristics. Specifically, we interact the CSPP variables with the logarithm of total assets, the debt ratio, the bond credit rating score and bond maturity at issuance. These extensions allow us to identify potential heterogeneity in the programme's effect based on underlying structural features. Firm size, proxied by log assets, reflects financial resilience, with smaller firms potentially benefiting more from central bank support. The debt ratio captures leverage-related risk, where more leveraged firms may experience greater spread reductions if the CSPP improves market access or reduces funding costs. The credit rating reflects perceived credit quality, with riskier firms possibly benefiting more from increased demand. Lastly, maturity, measured in years at issuance, reflects the bond's duration and interest rate sensitivity. As longer-term bonds are generally more exposed to market risk, the CSPP may have had a differentiated impact depending on the bond tenor.

In the second stage, we analyse the extent to which the CSPP impacted corporate capital structure, thereby assessing the real effects of the programme on firms' financing behaviour. We focus on leverage as it helps us understand whether firms are taking advantage of better market access and financing conditions to increase their debt, refinance existing obligations, or restructure their balance sheet. The way firms respond to leverage gives us valuable insights into whether the CSPP has impacted their risk-taking, financial flexibility, or ability to manage debt sustainably.

Since the leverage model is based on panel data, where firms are observed across multiple periods, we estimate the leverage equation using a fixed effects panel regression. This approach controls for time-invariant firm characteristics ($\lambda_i$), helping to isolate the causal impact of CSPP eligibility on leverage. The error term is represented by $\epsilon_{it}$. The leverage equation is given by:

$$\Delta Leverage_{it} = \alpha + \beta_1 CSPP_{elig._{it}} + \beta_2 CSPP_{period_t} + \beta_3 \left(CSPP_{elig._{it}} \times CSPP_{period_t}\right) + \gamma X_{ict} + \rho Z_{ct} + \lambda_i + \epsilon_{it} \quad (2)$$

where $\Delta Leverage_{it}$ is the year-on-year change of the firm's debt ratio of firm *I*, defined as the difference in the total debt-to-assets between year *t* and *t-1*. The debt ratio, calculated as total debt divided by total assets, is a broadly used measure of financial leverage in the corporate finance literature (Frank and Goyal, 2009; Rajan and Zingales, 1995) and provides a consistent basis for comparing a firm's dependence on external debt over time. We use the annual change in leverage as the dependent variable, in line with

studies that assess the determinants and effects of changes in leverage rather than static levels (Lemmon, Roberts, and Zender, 2008; Flannery and Rangan, 2006). The interaction term ($CSPP_{eligible}{}_{it} \times CSPP_{period}{}_{t}$) captures whether firms that issued CSPP-eligible bonds increased their leverage in comparison to non-eligible firms during the programme period. $CSPP_{eligible}{}_{it}$ takes the value 1 if firm *i* issued a CSPP-eligible bond in year *t* and $CSPP_{period}{}_{t}$ equals 1 if year *t* falls within the period during which the programme was active, based on the bond's issue date. This specification ensures that we capture the impact of CSPP precisely when the firm accesses bond markets.

As control variables, we include a set of firm-specific factors ($\gamma X_{it}$) including firm size (log of total assets), leverage (debt ratio), profitability (ROA) and liquidity (current ratio), all of which may affect capital structure decisions.[12] On the macroeconomic side ($\rho Z_{ct}$), we control for the nominal GDP growth and the inflation rate in the firm's country, to account for the broader financing environment.[13]

In addition to the baseline model, we extend the analysis to test for heterogeneous effects across different types of firms and bond features. Consistent with the first part of the study, we examine interactions with firm size, initial leverage, bond credit rating and bond maturity at issuance, to explore whether the real effects of the CSPP varied depending on firm- and bond-specific characteristics.

# 5. Empirical analysis

## 5.1. Data

The research covers the period between 2015:Q1 and 2018:Q4, which includes the programme's first phase of asset purchases that occurred between 8 June 2016 and 19 December 2018. To avoid distortions, we exclude both the reinvestment-only phase

[12] A firm's characteristics are expected to influence capital structure decisions. Larger firms are generally more diversified and face lower default risk, which allows them to maintain higher leverage ratios (Titman and Wessels, 1988; Rajan and Zingales, 1995). More profitable firms tend to rely more on internal financing and therefore have a lower leverage, in line with the pecking order theory (Myers and Majluf, 1984). Firms with higher liquidity usually use less external debt, as they can finance their operations internally. In contrast, higher leverage may reflect agency costs or constrained access to equity financing (Jensen, 1986).
[13] The interest rate is a key control, as it affects the cost of borrowing and thus firms' leverage decisions (Bernanke and Gertler, 1995). Inflation influences the real value of debt and may lead firms to adjust their capital structure accordingly (Fischer, 1993). Higher GDP growth typically signals better economic conditions and improved access to credit, which can support both increased investment and higher leverage. These conditions stimulate corporate expansion and make debt financing more attractive (Levine and Renelt, 1992; Korajczyk and Levy, 2003).

(January to October 2019) and the second phase of CSPP (November 2019 to June 2022). The last exclusion is necessary to ensure that our results accurately reflect conditions under normal circumstances, thereby avoiding any potential biases caused by the COVID-19 pandemic.

This study focuses exclusively on the primary market, where each bond constitutes a single cross-sectional observation. Our sample comprises 1,275 euro-denominated bonds issued by 531 firms incorporated in 18 Eurozone countries (Table A.5).[14] Table A.6 and Table A.7 provide further details on the sectoral classification and credit rating profile of the corporate bonds included in the sample. Following the CSPP eligibility criteria defined in Decision (EU) 2016/948, we exclude from the sample all securities that fall structurally outside the programme's scope, such as asset-backed securities (ABS), structured notes, convertible and covered bonds, as well as issues by credit institutions[15] and public sector entities.[16] To construct the CSPP eligible dummy, we also apply the programme's minimum credit quality and maturity requirements: the bonds must have a residual maturity of between 6 months and 30 years and be rated investment grade by at least one of the leading credit rating agencies. Unrated bonds are considered ineligible as they do not fulfil ECB's credit quality requirements.

The OAS information and the corresponding bond-level data were obtained from Bloomberg. In cases where the OAS data was not available on the issuance date, we use the first available observation within a short window after issuance (a frame of 30 days), to ensure that spreads still reflect early market pricing. This approach allows us to preserve a broader sample and avoid potential selection bias that could arise from excluding otherwise valid bonds due to temporary data limitations. We limit our sample to bonds with available OAS and firm-level information, excluding those issued by firms for which no financial data is available, as these controls are essential for our identification strategy. Additionally, we excluded a small number of bonds with negative

[14] The number of observations used in the regressions is lower than the total sample due to the inclusion of firm fixed effects, which drop firms with only one bond issuance and due to missing values in key firm-level financial data (primarily for calculating the debt ratio). While we cannot entirely rule out sample selection, the excluded observations appear to be randomly distributed across sectors and periods, which mitigates concerns about systematic bias.

[15] Credit institutions and entities supervised under the European banking supervision framework are not eligible under the CSPP and are therefore excluded from the sample.

[16] Issuers that are eligible under the PSPP are not eligible under the CSPP. We exclude all securities issued by public sector entities that structurally fall outside the programme's scope, such as government agencies, municipalities, and quasi-governmental institutions eligible under PSPP.

OAS values, as these likely reflect technical pricing distortions driven by exceptional demand rather than actual credit risk.

For our analysis, we use a quarterly frequency[17], which aligns with the availability of macroeconomic indicators and helps capture the market context at the time of bond issuance. Accordingly, for each bond, we apply the relevant indicators from the corresponding quarter to reflect the conditions at the time of issuance. In contrast, firm-level indicators are based on annual financial statements, using the most recently available annual data at the time of issuance, thus reflecting the information that would have been available to investors at that time. We focus on annual data to ensure consistency and comparability across firms, given the variation in reporting frequencies and disclosure practices across jurisdictions. For bonds issued by corporate treasury or financing subsidiaries, we use the consolidated financial data of the parent firm, as it more accurately reflects the issuer's overall credit profile and financial health. Finally, for the firm indicators, we obtained the data from Moody's Orbis database and from the firm's annual reports, when available. For macroeconomic variables, we collected data from various sources, including Bloomberg, the ECB Statistical Data Warehouse, and national statistical institutes.

Credit rating classification in this study follows a conservative methodology that aligns with typical market conventions. When multiple credit ratings are available from the leading agencies (Moody's, S&P, and Fitch), we use the lowest rating to determine a bond's status. This approach minimizes the possibility of overstating credit quality and aligns with the standard approach adopted by institutional investors when assessing credit risk. Bonds rated with a minimum rating of BBB- (investment grade) are classified as eligible for the programme and those rated BB+ or lower are ineligible.

For the second stage of the analysis, which examined the CSPP's impact on firms' capital structure, we focused on the same set of firms and bond issuances used in the bond spread analysis. If a firm issued bonds in multiple years, each issuance is treated as a distinct observation. Maintaining a consistent firm sample across both stages of the analysis ensures coherence in assessing the programme's pricing and real effects. The data sources for bonds, firm-level and macroeconomic controls are identical to those used

[17] Quarterly data is considered more appropriate for measuring the short-term impact of monetary policy changes over time.

in the first stage. The year-on-year change in the debt ratio, the dependent variable in this stage, is calculated using firm-level financial data from Moody's Orbis database, complemented by annual reports where available. The debt ratio is calculated as the sum of short-term debt and long-term debt divided by total assets. This standard leverage measure captures a firm's overall leverage in relation to its asset base, allowing for comparisons between firms over time.

## 5.2. Results

This section presents the results of the regression of Equation 1. The summary statistics of the data used are presented in Table A.8. According to the results presented in Table 1, the CSPP eligibility effect disappears when controls are introduced. The initial significant negative coefficient of CSPP eligibility suggests that eligible bonds show lower spreads before controls (Column I of Table 1). However, as this effect disappears after the introduction of controls, it may be an indication that the lower spreads were caused by the features of the eligible bonds or firms, rather than by eligibility itself. This finding aligns with Zaghini (2019) and De Santis (2018), who demonstrate that CSPP contributed to overall market liquidity, suggesting that eligibility status alone may not fully explain pricing advantages once bond and issuer fundamentals are controlled for.

Importantly, the interaction between CSPP eligibility and CSPP period is consistently positive and statistically significant. This result contradicts the initial expectation that the programme would lower primary market spreads through direct eligibility effects. Economically, the estimated coefficients imply that CSPP-eligible bonds issued during the active programme period were priced at approximately 52 to 78 basis points higher than their non-eligible counterparts, depending on the model specification. This contrasts with Abidi and Miquel-Flores (2018), who found a negative yield effect for eligible bonds.

Rather than indicating a failure of the CSPP, this result is likely reflecting indirect effects. One possible interpretation is that investors primarily prized the programme's liquidity support and implicit ECB backing, which generated a form of "premium pricing" where investors accept higher spreads in anticipation of secondary market liquidity. Alternatively, this result may reflect the strategic behaviour of issuers, who may have taken advantage of the programme window to issue riskier or longer-term bonds.

Investors, in turn, were willing to accept them at relatively higher spreads, given the expectation of sustained demand and liquidity under the programme.

Finally, the results from Column IV of Table 1 demonstrate lower spreads during the CSPP period. This suggests that the programme has improved general market conditions, even if not through direct eligibility.

Table 2 shows the results of Equation 1 with the triple interaction of firm- and bond-specific features. According to the results presented in Column II of Table 2, the triple interaction with the logarithm of the firm's total assets is not statistically significant. This suggests that CSPP did not have a differential effect on eligible bonds based on firm size during the programme period. This finding contrasts with Altavilla et al. (2022), who document heterogeneous firm-level responses to unconventional monetary policy tools, particularly among smaller and financially constrained firms.

However, the positive and significant interaction between CSPP eligibility and firm size suggests that eligible bonds issued by larger firms were associated with higher spreads. This may reflect a form of market "premium pricing," where investors, anticipating higher liquidity and ECB support, were more willing to accept bonds with higher spreads, particularly from well-known issuers. Alternatively, this result may reflect issuer behavior, where larger firms that issued CSPP-eligible bonds, regardless of timing, may have taken advantage of their eligibility status to place more complex or higher-risk instruments, as they knew that eligibility alone could increase market demand. Both arguments support the interpretation that the CSPP had indirect effects on issuance behavior and market segmentation, rather than uniformly reducing spreads of all eligible bonds.

Columns III and IV of Table 2, show no evidence that CSPP differentially affected spreads based on the firm's prior leverage ratio or the bond's credit quality. These results indicate that the programme's impact did not systematically vary across different risk profiles or financial structures, further supporting the notion that CSPP effects operated through market-wide dynamics rather than issuer-specific channels.

In Column V of Table 2,, we see that the triple interaction term with the bond's maturity at issuance is not statistically significant. However, the negative and significant coefficient in the interaction between CSPP eligibility and bond maturity indicates that bonds with longer maturity benefited more from the programme's eligibility, regardless

of whether they were issued during the programme's active period. This finding may reflect credibility or signaling effect, suggesting that investors viewed eligible long-term bonds as safer or more liquid due to the expected backing from the ECB. This aligns with the findings of Elton et al. (2002) and Longstaff et al. (2005), who show that bonds with longer maturities typically exhibit higher spreads due to increased exposure to interest rate and liquidity risk, which can be mitigated by credible institutional backing. The fact of being eligible might have acted as a quality signal, increasing confidence and reducing the required risk premium even before or after the official purchase period began. Otherwise, issuers might have intentionally issued longer-dated bonds, knowing that their eligibility would attract stronger demand, based on the expectation of continued market support.

Overall, the findings indicate that the impact of the CSPP on the primary was not significantly influenced by firm- or bond-specific characteristics during the programme period. Instead, the evidence suggests that the programme may have influenced the market more broadly due to its signaling power and credibility, which appeared to surpass the effects of direct purchases.

**Table 1.** *Results of the Baseline Model*

| | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0,747*** | -0.233 | -0.309 | -0.334 |
| | (0.175) | (0.301) | (0.277) | (0.282) |
| $CSPP_{period_t}$ | -0.089 | -0.070 | -0.345 | -0.378* |
| | (0.262) | (0.207) | (0.204) | (0.205) |
| $(CSPP_{eligible_{ijt}} \times CSPP_{period_t})$ | 0.783*** | 0.426 | 0.524** | 0.538** |
| | (0.256) | (0.250) | (0.222) | (0.224) |
| $Issue\ amount_{jt}$ (log) | | -0.106 | -0.153 | -0.162 |
| | | (0.141) | (0.142) | (0.145) |
| $Coupon_{jt}$ | | 0.687*** | 0.684*** | 0.682*** |
| | | (0.065) | (0.057) | (0.057) |
| $Maturity_{jt}$ (years) | | 0.018*** | 0.020*** | 0.019*** |
| | | (0.006) | (0.005) | (0.005) |
| $Credit\ rating_{jt}$ | | 0.002 | 0.009 | 0.010 |
| | | (0.018) | (0.020) | (0.021) |
| $Total\ assets_{it}$ (log) | | | 0.050 | 0.046 |
| | | | (0.423) | (0.427) |
| $ROA_{it}$ | | | 0.003 | 0.004 |
| | | | (0.004) | (0.005) |
| $Debt\ ratio_{it}$ | | | -1.563 | -1.521 |
| | | | (1.171) | (1.165) |
| $Current\ ratio_{it}$ | | | -0.062 | -0.061 |
| | | | (0.052) | (0.050) |
| $GDP\ growth_t$ | | | | 0.021 |
| | | | | (0.013) |
| $Inflation_t$ | | | | 0.100 |
| | | | | (0.067) |
| Constant | 2.293*** | 1.099 | 1.905 | 1.845 |
| | (0.181) | (1.262) | (3.826) | (3.866) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes |
| No. of observations | 1,034 | 1,034 | 948 | 948 |
| $R^2$ | 0.9072 | 0.9461 | 0.9529 | 0.9531 |
| Within $R^2$ | 0.0514 | 0.4489 | 0.4879 | 0.4900 |

This table presents the regression results from the baseline model (Equation 1), assessing the impact of the Corporate Sector Purchase Programme (CSPP) on corporate bond spreads at issuance. The dependent variable is the option-adjusted spread (OAS). Column I includes only the main CSPP variables. In Column II, bond-specific controls are added. Column III introduces firm-level controls, while Column IV adds macroeconomic variables. All regressions include firm and quarter fixed effects, with standard errors clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and ***p < 0.01.

**Table 2.** *Results of the Baseline Model with Firm- and Bond-Level Triple Interactions*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.334 | -4.101** | -0.930* | -1.497* | 0.048 |
| | (0.282) | (1.519) | (0.478) | (0.761) | (0.282) |
| $CSPP_{period_t}$ | -0.378* | -2.159 | -0.145 | -0.476* | -0.391* |
| | (0.205) | (1.491) | (0.506) | (0.270) | (0.219) |
| $(CSPP_{eligible_{ijt}} \times CSPP_{period_t})$ | 0.538** | -0.112 | 0.275 | -0.184 | 0.221 |
| | (0.224) | (0.238) | (0.473) | (0.510) | (0.227) |
| $Issue\ amount_{jt}$ (log) | -0.162 | -0.186 | -0.136 | -0.163 | -0.185 |
| | (0.145) | (0.151) | (0.146) | (0.146) | (0.154) |
| $Coupon_{jt}$ | 0.682*** | 0.677*** | 0.688*** | 0.678*** | 0.691*** |
| | (0.057) | (0.054) | (0.062) | (0.057) | (0.061) |
| $Maturity_{jt}$ (years) | 0.019*** | 0.021*** | 0.015* | 0.021*** | 0.021** |
| | (0.005) | (0.005) | (0.007) | (0.005) | (0.007) |
| $Credit\ rating_{jt}$ | 0.010 | 0.009 | 0.010 | -0.019 | 0.008 |
| | (0.021) | (0.019) | (0.022) | (0.021) | (0.021) |
| $Total\ assets_{it}$ (log) | 0.046 | -0.353 | 0.181 | 0.142 | 0.145 |
| | (0.427) | (0.556) | (0.283) | (0.392) | (0.395) |
| $ROA_{it}$ | 0.004 | 0.005 | 0.005 | 0.004 | 0.004 |
| | (0.005) | (0.005) | (0.005) | (0.004) | (0.005) |
| $Debt\ ratio_{it}$ | -1.521 | -1.486 | -2.448 | -1.504 | -1.523 |
| | (1.165) | (1.170) | (1.465) | (1.169) | (1.166) |
| $Current\ ratio_{it}$ | -0.061 | -0.069 | -0.059 | -0.061 | -0.061 |
| | (0.050) | (0.051) | (0.056) | (0.050) | (0.049) |
| $GDP\ growth_t$ | 0.021 | 0.015 | 0.020 | 0.016 | 0.020 |
| | (0.013) | (0.014) | (0.013) | (0.014) | (0.015) |
| $Inflation_t$ | 0.100 | 0.115 | 0.120 | 0.099 | 0.089 |
| | (0.067) | (0.075) | (0.070) | (0.074) | (0.068) |
| $(CSPP_{eligible_{ijt}} \times Y)$ | | 0.529** | 1.681 | 0.103 | -0.035* |
| | | (0.194) | (1.351) | (0.061) | (0.019) |
| $(CSPP_{period_t} \times Y)$ | | 0.256 | -0.547 | 0.024 | 0.005 |
| | | (0.213) | (1.246) | (0.026) | (0.006) |
| $(CSPP_{eligible_{ijt}} \times CSPP_{period_t} \times Y)$ | | -0.112 | 0.678 | 0.030 | 0.032 |
| | | (0.238) | (1.177) | (0.035) | (0.019) |
| Constant | 1.845 | 4.837 | 1.050 | 1.252 | 1.305 |
| | (3.866) | (4.818) | (3.350) | (3.540) | (3.678) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 948 | 948 | 948 | 948 | 948 |
| $R^2$ | 0.9531 | 0.9540 | 0.9543 | 0.9535 | 0.9537 |
| Within $R^2$ | 0.4900 | 0.5007 | 0.5032 | 0.4954 | 0.4966 |

This table presents extended regression results based on the baseline model (Equation 1), which includes all bond-specific, firm-level, and macroeconomic controls. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating) and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and ***p < 0.01.

We now present the results of the second stage of the analysis, which examines whether the CSPP had real effects on corporate financing behavior, specifically on firms' leverage. The dependent variable is the annual change in the firm's debt ratio (*Δ debt ratio*), allowing us to capture adjustments in capital structure following bond issuance. Table 3 presents the results of the baseline model and its extensions. In this case, the dependent variable captures changes in the leverage during the year of bond issuance (*t*).

According to Column I of Table 3, CSPP eligibility did not affect changes in the debt ratio in the issuance year. This finding is consistent with the capital structure literature, which suggests that leverage adjustments tend to be gradual and influenced by firm-specific fundamentals rather than short-term policy shocks (Frank and Goyal, 2009; Flannery and Rangan, 2006). Additionally, the results suggest that the CSPP's impact on leverage did not vary by firm size or by bond credit rating (Columns II and IV, respectively of the Table 3).

Regarding the triple interaction with the initial debt level (Column III of Table 3), the coefficient is negative but statistically insignificant, indicating no robust evidence that the CSPP's impact on leverage varied depending on firms' prior leverage levels. However, the interaction between CSPP eligibility and the CSPP period is positive and marginally significant. The coefficient corresponds to an increase of approximately 0.09 percentage points in the debt ratio, suggesting a modest but measurable rise in leverage among firms issuing CSPP-eligible bonds during the programme's active period.

In contrast, the results from Column V show that the triple interaction with bond maturity at issuance is negative and statistically significant. This suggests that firms issuing eligible longer-maturity bonds experienced smaller increases in leverage during the issuance year compared to those issuing shorter-term bonds. These firms may not have used the CSPP as an opportunity to increase their debt. Instead, firms likely allocated liquidity to refinance short-term obligations, rebalance the debt maturity structure or maintain low financing costs over a longer horizon, without immediately increasing their overall debt levels. This finding is consistent with the agency-based view of capital structure, which suggests that firms aim to mitigate risk and maintain financial discipline under external monitoring (Jensen, 1986). This also relates to Rajan and Zingales (1995), who argue that leverage decisions reflect firm-specific trade-offs between risk, control, and access to capital markets. These findings support the notion that the CSPP had a supportive rather than a distortive impact on firms' behaviour.

Table 4 presents the results of the leverage model, where the dependent variable is the change in the firm's debt ratio in the year following bond issuance ($t+1$). This allows us to assess possible delays in the effects of CSPP eligibility on leverage.

As in the year of issuance, there are no statistically significant effects of CSPP eligibility on changes in leverage in $t+1$ (Column I of Table 4). This result suggests that CSPP did not induce a broad-based increase in leverage, even with a one-year lag. Additionally, the programme's impact does not appear to vary by firm size and bond credit rating in the following year (Columns III and IV, respectively, of Table 4), which is consistent with the results observed for the bond issue year.

Regarding prior leverage levels, while no significant effect of CSPP eligibility is observed in the issuance year (Column III of Table 3), the results indicate important delayed effects in the following year (Column III of Table 4). Specifically, during the CSPP period, firms with higher leverage tended to reduce their debt ratios. However, this deleveraging trend was inverted among firms with higher initial debt ratios that issued CSPP-eligible bonds during the programme period. These firms experienced a significant increase in leverage in $t+1$, which suggests that the CSPP may have eased financing constraints, particulary for more indebted firms. Although this contrasts with Nocera and Pesaran (2023), who find that large-scale asset purchases have greater effects on industries with available debt capacity, it still reflects their broader conclusion that unconventional monetary policy can lead to delayed and lasting increases in leverage by making it easier for firms to access financing. The estimated effect corresponds to an increase of approximately 0.56 percentage points in the debt ratio, indicating a moderate but economically meaningful effect.

Finally, the interaction between CSPP eligibility and bond maturity becomes slightly positive and significant in the year following the bond issuance (Column V of Table 4), whereas it was negative and significant in the year of issuance (Column V of Table 3). The evidence suggests that firms that issued longer-term CSPP-eligible bonds experienced greater increases in leverage in the period immediately following issuance. This change suggests that firms delayed their leverage expansion to benefit from improved financial conditions, consistent with the pecking order described in Myers and Majluf (1984), which suggests that firms turn to external financing when market conditions reduce information friction and the cost of borrowing is lower.

**Table 3.** *Effects of CSPP Eligibility on Changes in Leverage During the Year of Bond Issuance: Baseline Model with Firm- and Bond-Level Interactions*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.009 | 0.123 | -0.014 | 0.154 | 0.021 |
| | (0.010) | (0.165) | (0.030) | (0.146) | (0.025) |
| $CSPP_{period_t}$ | 0.012 | -0.040 | 0.009 | 0.014 | 0.014 |
| | (0.015) | (0.119) | (0.033) | (0.015) | (0.016) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | 0.012 | -0.008 | 0.087* | -0.005 | -0.009 |
| | (0.018) | (0.183) | (0.045) | (0.120) | (0.021) |
| $Issue\ amount_{jt}$ (log) | -0.009 | -0.009 | -0.012 | -0.010 | -0.011 |
| | (0.010) | (0.010) | (0.011) | (0.010) | (0.010) |
| $Coupon_{jt}$ | 0.002 | 0.002 | 0.003 | 0.002 | 0.004 |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.008) |
| $Maturity_{jt}$ (years) | -0.000 | -0.000 | 0.000 | -0.000 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Credit\ rating_{jt}$ | 0.001 | 0.001 | 0.001 | 0.002 | 0.000 |
| | (0.002) | (0.002) | (0.001) | (0.003) | (0.001) |
| $Total\ assets_{it}$ (log) | -0.046 | -0.029 | -0.053 | -0.045 | -0.040 |
| | (0.059) | (0.058) | (0.057) | (0.060) | (0.060) |
| $ROA_{it}$ | -0.001 | 0.001 | 0.000 | 0.001 | 0.001 |
| | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) |
| $Current\ ratio_{it}$ | -0.001 | -0.001 | -0.003 | -0.001 | -0.001 |
| | (0.006) | (0.006) | (0.005) | (0.006) | (0.006) |
| $Debt\ ratio_{it}$ | -1.016*** | -1.016*** | -0.924*** | 1.020*** | -1.016*** |
| | (0.121) | (0.157) | (0.129) | (0.124) | (0.121) |
| $GDP\ growth_t$ | -0.007 | -0.007 | -0.006 | -0.007 | -0.007 |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| $Inflation_t$ | 0.022** | 0.022** | 0.020** | 0.022** | 0.021** |
| | (0.008) | (0.008) | (0.009) | (0.009) | (0.009) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | -0.018 | 0.016 | -0.013 | -0.003** |
| | | (0.021) | (0.127) | (0.009) | (0.001) |
| $(CSPP_{period_t}$ x $Y)$ | | 0.008 | -0.006 | -0.001 | 0.000 |
| | | (0.017) | (0.079) | (0.002) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | 0.002 | -0.229 | 0.002 | 0.002 |
| | | (0.025) | (0.152) | (0.007) | (0.001) |
| Constant | 0.766 | 0.642 | 0.797* | 0.759 | 0.731 |
| | (0.445) | (0.450) | (0.425) | (0.452) | (0.457) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 887 | 887 | 887 | 887 | 887 |
| $R^2$ | 0.8315 | 0.8319 | 0.8424 | 0.8323 | 0.8324 |
| Within $R^2$ | 0.5351 | 0.5361 | 0.5653 | 0.5374 | 0.5375 |

This table presents extended regression results based on the leverage model (Equation 2), which examines the year-on-year change in the firm's debt ratio as the dependent variable. All specifications include bond-specific, firm-level, and macroeconomic controls. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05, and ***p < 0.01.

**Table 4.** *Effects of CSPP Eligibility on Changes in Leverage in the Year Following Bond Issuance: Baseline Model with Firm- and Bond-Level Interactions*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | 0.004 | 0.101 | -0.056 | -0.297 | -0.044 |
| | (0.036) | (0.297) | (0.089) | (0.262) | (0.032) |
| $CSPP_{period_t}$ | -0.001 | 0.203 | 0.103** | -0.004 | -0.012 |
| | (0.025) | (0.185) | (0.043) | (0.025) | (0.027) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | -0.013 | -0.090 | -0.212** | 0.147 | 0.007 |
| | (0.022) | (0.293) | (0.084) | (0.172) | (0.029) |
| $Issue\ amount_{jt}$ (log) | 0.015 | 0.015 | 0.024 | 0.016 | 0.019 |
| | (0.012) | (0.013) | (0.017) | (0.012) | (0.013) |
| $Coupon_{jt}$ | -0.004 | -0.003 | -0.004 | -0.003 | -0.008 |
| | (0.008) | (0.007) | (0.008) | (0.011) | (0.008) |
| $Maturity_{jt}$ (years) | -0.000 | 0.000 | -0.001 | -0.000 | -0.001 |
| | (0.002) | (0.003) | (0.001) | (0.001) | (0.001) |
| $Credit\ rating_{jt}$ | -0.000 | -0.000 | -0.001 | -0.003 | 0.000 |
| | (0.002) | (0.002) | (0.001) | (0.003) | (0.002) |
| $Total\ assets_{it}$ (log) | 0.358 | 0.339 | 0.356* | 0.343 | 0.357 |
| | (0.224) | (0.224) | (0.197) | (0.224) | (0.226) |
| $ROA_{it}$ | 0.002 | 0.003 | 0.003 | 0.002 | 0.002 |
| | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| $Current\ ratio_{it}$ | 0.007 | 0.008 | 0.010 | 0.008 | 0.008 |
| | (0.010) | (0.010) | (0.008) | (0.010) | (0.010) |
| $Debt\ ratio_{it}$ | -0.086 | -0.087 | -0.251 | -0.077 | -0.087 |
| | (0.367) | (0.405) | (0.356) | (0.377) | (0.369) |
| $GDP\ growth_t$ | 0.004 | 0.004 | 0.000 | 0.004 | 0.004 |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| $Inflation_t$ | -0.009 | -0.010 | -0.002 | -0.009 | -0.007 |
| | (0.015) | (0.015) | (0.017) | (0.015) | (0.015) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | -0.014 | 0.171 | 0.022 | 0.004** |
| | | (0.038) | (0.283) | (0.017) | (0.002) |
| $(CSPP_{period_t}$ x $Y)$ | | -0.030 | -0.258*** | 0.001 | 0.001 |
| | | (0.026) | (0.079) | (0.003) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | 0.013 | 0.564** | -0.011 | -0.002 |
| | | (0.040) | (0.263) | (0.010) | (0.002) |
| Constant | -2.642 | -2.506 | -2.631* | -2.552 | -2.645 |
| | (1.540) | (1.546) | (1.337) | (1.533) | (1.558) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 866 | 866 | 866 | 866 | 866 |
| $R^2$ | 0.5740 | 0.5757 | 0.6113 | 0.5767 | 0.5758 |
| Within $R^2$ | 0.0313 | 0.0351 | 0.1161 | 0.0374 | 0.0352 |

This table presents extended regression results based on the leverage model (Equation 2), where the dependent variable is the year-on-year change in the firm's debt ratio in the year following bond issuance (t+1). All explanatory variables, including CSPP eligibility and control variables, are measured at time t, corresponding to the year of bond issuance. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05, and ***p < 0.01.

## 5.3. Robustness checks

To address concerns about omitted variable bias and potential endogeneity, we initially included a broader set of controls in our specification. These included industry classification dummies[18], a country risk dummy[19] and several market and macroeconomic variables, namely the VSTOXX Index (implied market volatility), the Economic Policy Uncertainty (EPU) Index, the interbank interest rate and the Real Effective Exchange Rate (REER) of the euro.[20] However, these variables were excluded from the final model due to multicollinearity. This suggests that the firm and time-fixed effects, together with baseline controls, already absorb the key variation at both the firm and market levels. This outcome increases confidence that our estimates are not biased by unobserved heterogeneity or omitted macro-financial factors.

To ensure that extreme observations do not drive the baseline results, we perform a robustness check by excluding the top and bottom 1% of the dependent variable distribution. This is applied to both stages of the analysis, where the models are re-estimated using the exact specifications as in the baseline. In all cases, the main coefficients of interest remain stable in sign and significance, confirming that the results are not sensitive to outliers, which reinforces the robustness of our conclusions (Table A.9 to Table A.12).

Finally, we re-estimate the second-stage regressions using the level of the debt ratio as the dependent variable, instead of its year-on-year change. This alternative specification serves to confirm that the findings are not sensitive to the method used to measure leverage. The findings, presented in Table 5 and Table 6, remain qualitatively consistent with the baseline model, reinforcing our conclusions.

[18] For industry classification, we include dummy variables that indicate the industry to which the firm belongs (1 if firm i belongs to a specific sector and 0 otherwise).

[19] The country risk dummy captures firms legally incorporated in the Eurozone but classified by Bloomberg as exposed to non-Eurozone jurisdictional risk. It takes the value 1 for such firms and 0 for all others. While macroeconomic variables are based on the country of incorporation, this dummy controls for external risk exposures that may affect firm-level financial conditions.

[20] The VSTOXX Index reflects implied market volatility in the Eurozone and serves as a proxy for investor uncertainty. The EPU Index (Baker et al., 2016) captures economic policy uncertainty. Both are typically associated with higher risk premiums. The interbank interest rate influences short-term borrowing conditions, while the REER reflects euro competitiveness and may indirectly affect corporate bond pricing.

**Table 5.** *Robustness Check for Table 3: Using the Level of the Debt Ratio (Year of Bond Issuance)*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.009 | 0.122 | -0.014 | 0.151 | 0.021 |
| | (0.026) | (0.159) | (0.030) | (0.138) | (0.024) |
| $CSPP_{period_t}$ | 0.012 | -0.041 | 0.009 | 0.014 | 0.014 |
| | (0.013) | (0.116) | (0.033) | (0.014) | (0.014) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | 0.012 | -0.006 | 0.087* | -0.004 | -0.010 |
| | (0.018) | (0.161) | (0.045) | (0.118) | (0.021) |
| $Issue\ amount_{jt}$ (log) | -0.009 | -0.009 | -0.012 | -0.010 | -0.011 |
| | (0.010) | (0.009) | (0.011) | (0.009) | (0.010) |
| $Coupon_{jt}$ | 0.002 | 0.002 | 0.003 | 0.002 | 0.004 |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.008) |
| $Maturity_{jt}$ (years) | -0.000 | -0.000 | 0.000 | -0.000 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Credit\ rating_{jt}$ | 0.001 | 0.001 | 0.001 | 0.002 | 0.000 |
| | (0.002) | (0.002) | (0.001) | (0.003) | (0.001) |
| $Total\ assets_{it}$ (log) | -0.045 | -0.028 | -0.053 | -0.044 | -0.039 |
| | (0.062) | (0.061) | (0.057) | (0.063) | (0.063) |
| $ROA_{it}$ | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Current\ ratio_{it}$ | -0.001 | -0.001 | -0.003 | -0.001 | -0.001 |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| $GDP\ growth_t$ | -0.007 | -0.007 | -0.006 | -0.007 | -0.007 |
| | (0.005) | (0.005) | (0.005) | (0.004) | (0.005) |
| $Inflation_t$ | 0.022** | 0.022** | 0.020** | 0.022** | 0.021** |
| | (0.009) | (0.010) | (0.009) | (0.010) | (0.010) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | -0.018 | 0.016 | -0.012 | -0.003** |
| | | (0.020) | (0.127) | (0.009) | (0.001) |
| $(CSPP_{period_t}$ x $Y)$ | | 0.008 | -0.006 | -0.001 | -0.000 |
| | | (0.016) | (0.079) | (0.002) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | 0.002 | -0.229 | 0.001 | 0.002 |
| | | (0.021) | (0.152) | (0.007) | (0.001) |
| Constant | 0.751 | 0.626 | 0.797* | 0.741 | 0.716 |
| | (0.477) | (0.470) | (0.425) | (0.479) | (0.488) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 887 | 887 | 887 | 887 | 887 |
| $R^2$ | 0.9368 | 0.9370 | 0.9409 | 0.9371 | 0.9371 |
| Within $R^2$ | 0.0250 | 0.0271 | 0.0885 | 0.0295 | 0.0300 |

This table presents regression results from a robustness check based on the leverage model. Unlike the baseline specification (Equation 2), the dependent variable here is the level of the firm's debt ratio, rather than its year-on-year change. All specifications include the same bond-specific, firm-level, and macroeconomic controls as in the baseline model, except for the exclusion of lagged leverage, which is omitted to avoid endogeneity. Column I presents the base specification, while Columns II to V introduce triple interaction terms to test for heterogeneity by firm and bond characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05, and *p < 0.01.

**Table 6.** *Robustness Check for Table 4: Using the Level of the Debt Ratio (Year After Bond Issuance)*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | 0.007 | 0.294 | -0.105 | -0.118 | -0.010 |
| | (0.021) | (0.219) | (0.067) | (0.126) | (0.023) |
| $CSPP_{period_t}$ | 0.025 | 0.224 | 0.097** | 0.030 | 0.019 |
| | (0.019) | (0.135) | (0.044) | (0.023) | (0.022) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | -0.014 | -0.166 | -0.096 | 0.135 | -0.016 |
| | (0.016) | (0.192) | (0.061) | (0.114) | (0.024) |
| $Issue\ amount_{jt}$ (log) | 0.005 | 0.007 | 0.010 | 0.006 | 0.007 |
| | (0.009) | (0.009) | (0.011) | (0.010) | (0.009) |
| $Coupon_{jt}$ | -0.003 | -0.003 | -0.002 | -0.002 | -0.006 |
| | (0.005) | (0.005) | (0.005) | (0.006) | (0.005) |
| $Maturity_{jt}$ (years) | 0.000 | 0.000 | -0.000 | 0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Credit\ rating_{jt}$ | 0.000 | 0.001 | 0.000 | 0.001 | 0.001 |
| | (0.001) | (0.001) | (0.002) | (0.001) | (0.001) |
| $Total\ assets_{it}$ (log) | 0.279** | 0.296** | 0.293** | 0.259** | 0.283** |
| | (0.104) | (0.112) | (0.101) | (0.104) | (0.105) |
| $ROA_{it}$ | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| $Current\ ratio_{it}$ | 0.005 | 0.005 | 0.004 | 0.005 | 0.005 |
| | (0.005) | (0.005) | (0.004) | (0.004) | (0.005) |
| $GDP\ growth_t$ | -0.002 | -0.002 | -0.003 | -0.002 | -0.002 |
| | (0.005) | (0.005) | (0.005) | (0.006) | (0.005) |
| $Inflation_t$ | 0.010 | 0.009 | 0.013 | 0.010 | 0.011 |
| | (0.013) | (0.013) | (0.012) | (0.013) | (0.013) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | -0.041 | 0.316 | 0.008 | 0.001 |
| | | (0.029) | (0.198) | (0.008) | (0.001) |
| $(CSPP_{period_t}$ x $Y)$ | | -0.029 | -0.191 | -0.001 | 0.001 |
| | | (0.018) | (0.119) | (0.002) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | 0.023 | 0.222 | -0.009 | 0.000 |
| | | (0.026) | (0.176) | (0.008) | (0.001) |
| Constant | -1.665** | -1.796** | -1.693** | -1.538** | -1.702** |
| | (0.712) | (0.776) | (0.666) | (0.707) | (0.720) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 895 | 895 | 889 | 895 | 895 |
| $R^2$ | 0.9232 | 0.9240 | 0.9295 | 0.9238 | 0.9234 |
| Within $R^2$ | 0.0848 | 0.0951 | 0.1871 | 0.0924 | 0.0878 |

This table presents regression results from a robustness check based on the leverage model. Unlike the baseline specification (Equation 2), the dependent variable here is the level of the firm's debt ratio in the year following bond issuance (t+1), rather than its year-on-year change. All explanatory variables, including CSPP eligibility and the control variables, are measured at time t, corresponding to the year of bond issuance. Lagged leverage is excluded to avoid endogeneity. Column I presents the baseline specification, while Columns II to V introduce triple interaction terms to test for heterogeneity in the CSPP's effects across firm and bond characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and *p < 0.01.

## 6. Conclusion

This study examines the effects of the ECB's CSPP on corporate bond spreads at issuance and subsequent changes in firms' capital structure. Using a two-stage cross-sectional empirical approach and a sample of 1,275 Eurozone corporate bonds issued between 2015:Q1 and 2018:Q4, we estimate fixed effects regression models that account for firm and time variation.

Regarding the impact of CSPP on bond spreads, our results show that the programme's eligibility is initially associated with lower bond spreads at issuance. However, this effect is not observed when we control firm- and bond-specific characteristics, suggesting that pricing differences may reflect issuer and bond fundamentals rather than eligibility itself. Nonetheless, the results highlight the programme's broader market effects, likely driven by its signaling power and perceived credibility, rather than direct purchases.

Regarding leverage, we found no evidence of broad-based increases in the year of issuance. However, in the year following issuance, the highly indebted firms that issued CSPP-eligible bonds significantly increased their leverage, which suggests that the programme helped ease the financing constraints for these firms over time. Additionally, firms that issued longer-maturity eligible bonds showed an expansion of their balance sheet under improved financial conditions, after an initially more conservative leverage behavior.

Overall, our findings suggest that CSPP improved the firm's financing ability and market functioning without promoting excessive leverage or risk-taking. These results highlight that the credibility and structure of such programmes may influence investors' expectations and firms' behaviour, thus contributing to the growing literature on the transmission of unconventional monetary policy at the firm level. Future research could explore longer-term firm outcomes, such as investment, default risk, and employment, and compare the first phase of the CSPP with its second phase, which was launched as part of the ECB's response to the COVID-19 crisis.

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# Appendix

**Table A.1.** *Country of risk distribution of CSPP holdings*

| Sector | 2017:Q3 | 2018:Q1 | 2018:Q3 |
|---|---|---|---|
| France | 29% | 30% | 30% |
| Germany | 25% | 25% | 25% |
| Italy | 11% | 12% | 12% |
| Spain | 11% | 10% | 10% |
| Netherlands | 6% | 6% | 6% |
| Belgium | 5% | 5% | 5% |
| Switzerland | 3% | 4% | 4% |
| Other (euro area) | 6% | 6% | 6% |
| Other (non-euro area) | 3% | 3% | 3% |

*Source: European Central Bank (ECB).* It is based on internal classification of country of risk. Data as of end-Q3 2018. Holdings with maturity <6 months excluded. Totals may not sum to 100% due to rounding.

**Table A.2.** *Sector distribution of CSPP holdings*

| Sector | 2017:Q3 | 2018:Q1 | 2018:Q3 |
|---|---|---|---|
| Utilities | 16% | 15% | 15% |
| Infrastructure and transportation | 12% | 11% | 11% |
| Automotive and parts | 10% | 9% | 9% |
| Telecommunications | 9% | 9% | 9% |
| Energy and basic resources | 7% | 6% | 6% |
| Real estate | 6% | 6% | 6% |
| Construction & Materials | 6% | 6% | 6% |
| Beverages | 5% | 6% | 6% |
| Technology | 5% | 5% | 5% |
| Health care and life science | 5% | 5% | 5% |
| Chemicals | 5% | 5% | 4% |
| Food | 4% | 4% | 4% |
| Insurance | 3% | 3% | 3% |
| Other sectors | 8% | 9% | 9% |

*Source: European Central Bank (ECB).* It based on internal classification of economic sector. Nominal CSPP holdings as of end-Q3 201; excludes holdings with maturity <6 months. Totals may not sum to 100% due to rounding.

**Table A.3.** *Credit rating distribution of CSPP holdings*

| Sector | 2017:Q3 | 2018:Q1 | 2018:Q3 |
|---|---|---|---|
| AA | 10% | 11% | 11% |
| A | 41% | 43% | 45% |
| BBB | 49% | 46% | 44% |

*Source: European Central Bank (ECB).* Note: According to data compiled by the ECB using credit ratings from Fitch, Moody's, and S&P, bonds are categorized based on first-best asset ratings, with classifications such as 'AA' (AA− or above), 'A' (A− to A+), and 'BBB' (BBB+ or below).

**Table A.4.** *Description of model's variables*

| Variable | Definition | Source data |
|---|---|---|
| $Spread_{ijj}$ | The bond's Option-Adjusted Spread (OAS) at issuance reflects the yield difference between the corporate bond and a comparable risk-free government bond, accounting for the value of any embedded options | Bloomberg |
| $CSSP_{eligible_{ijt}}$ | Binary variable indicating whether the bond meets the ECB's criteria for CSSP eligibility (1 = eligible, 0 = not eligible based on rating) | European Central Bank (ECB) |
| $CSSP_{period_t}$ | Binary variable indicating whether the bond was issued during the active CSPP period (1 = active CSPP period, 0 = otherwise) | European Central Bank (ECB) |
| **Control Variables** | | |
| **Bonds features** | | |
| $Issue\ amount_{jt}$ | The natural logarithm of the bond's issued amount | Bloomberg |
| $Maturity_{jt}$ | Bond's initial maturity period (in years) | Bloomberg |
| $Credit\ Rating_{jt}$ | | |
| $Rated_{jt}$ | Binary variable indicating whether the bond has a credit rating at issuance (1 = rated, 0 = not rated) | Bloomberg |
| $Rating_{jt}$ | A numerical score assigned to the bond based on its credit quality, with higher values indicating better creditworthiness | Bloomberg |
| **Issuing firm features** | | |
| $Total\ Assets_{it}$ | The natural logarithm of the firm's total assets at the end of the quarter | Bloomberg/Moody's Orbis |
| $Debt\ ratio_{it}$ | The firm's debt ratio, calculated as total debt divided by total assets, measured at the end of the quarter | Bloomberg/Moody's Orbis |
| $Return\ on\ Assets_{it}$ | The firm's return on assets (ROA), calculated as net income divided by average total assets, measured at the end of the quarter | Bloomberg/Moody's Orbis |
| $Current\ ratio_{it}$ | The firm's current ratio, calculated as current assets divided by current liabilities, measured at the end of the quarter | Bloomberg/Moody's Orbis |
| **Market and macroeconomic factors** | | |
| $GDP\ growth_t$ | Quarterly YoY GDP growth rate at market prices for the firm's country (seasonally adjusted) | Eurostat |
| $Inflation_t$ | Quarterly YoY percentage change in the Harmonised Index of Consumer Prices (HICP) for the firm's country | Eurostat |

**Table A.5.** *Number of Corporate Bonds in the Sample, Grouped by Issuer's Country of Legal Incorporation*

| Country of Incorporation | Nr. of Bonds |
|---|---|
| France | 365 |
| Netherlands | 197 |
| Germany | 184 |
| Italy | 135 |
| Spain | 119 |
| Luxembourg | 76 |
| Belgium | 49 |
| Finland | 44 |
| Austria | 27 |
| Portugal | 23 |
| Ireland | 18 |
| Greece | 8 |
| Malta | 8 |
| Slovenia | 8 |
| Slovakia | 6 |
| Estonia | 3 |
| Lithuania | 3 |
| Latvia | 2 |
| **Total** | **1,275** |

**Table A. 6.** *Number of Corporate Bonds in the Sample, Grouped by the Sector of the Issuing Firm*

| Sector of Activity | No. of Bonds |
|---|---|
| Industrials | 296 |
| Utilities | 254 |
| Consumer Discretionary | 174 |
| Materials | 152 |
| Communication Services | 113 |
| Consumer Staples | 111 |
| Healthcare | 67 |
| Information Technology | 49 |
| Energy | 41 |
| Real Estate | 18 |
| **Total** | **1 275** |

**Table A.7.** *Number of Corporate Bonds in the Sample, Grouped by Credit Rating*

| Rating Category | Nr. of Bonds |
|---|---|
| **Rated Bonds** | **915** |
| CCC+ | 19 |
| B- | 36 |
| B | 65 |
| B+ | 39 |
| BB- | 43 |
| BB | 50 |
| BB+ | 47 |
| BBB- | 100 |
| BBB | 153 |
| BBB+ | 120 |
| A- | 100 |
| A | 49 |
| A+ | 70 |
| AA- | 22 |
| AA | 2 |
| **Non-Rated Bonds** | **360** |
| **Total** | **1 275** |

***Table A.8.*** *Summary statistics*

| Variables | Obs. | Mean | Median | Std.Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| $Spread_{ijt}$ (OAS in %) | 1 275 | 2.218 | 1.523 | 2.032 | 0.016 | 18.578 |
| $Issue\ amount_{jt}$ (log) | 1 275 | 8.441 | 8.699 | 0.547 | 6.477 | 9.477 |
| $Coupon_{jt}$ (%) | 1 275 | 2.691 | 2.000 | 2.031 | 0.000 | 12.500 |
| $Maturity_{jt}$ (years) | 1 275 | 8.557 | 7.000 | 6.180 | 0.667 | 60.500 |
| $Credit\ rating_{jt}$ (numerical score) | 915 | 13.3 (BBB-) | 14.0 (BBB) | 3.3 | 6.0 (CCC+) | 20.0 (AA) |
| $Total\ assets_{it}$ (log) | 1 274 | 6.791 | 6.909 | 0.995 | 0.431 | 8.584 |
| $ROA_{it}$ (%) | 1 249 | 2.705 | 2.646 | 7.462 | -70.124 | 72.533 |
| $Debt\ ratio_{it}$ | 1 208 | 0.511 | 0.330 | 1.466 | 0.000 | 13.922 |
| $Current\ ratio_{it}$ | 1 243 | 1.577 | 1.113 | 3.571 | 0.004 | 55.568 |
| $GDP\ growth_t$ (%) | 1 275 | 3.283 | 3.100 | 2.025 | -0.570 | 36.240 |
| $Inflation_t$ (%) | 1 275 | 0.938 | 1.000 | 0.748 | -0.900 | 4.800 |
| $\Delta\ Debt\ ratio_{it}$ | 1 119 | 0,021 | 0.012 | 0.127 | -0.874 | 1.332 |
| $\Delta\ Debt\ ratio_{it+1}$ | 1 090 | 0.003 | -0.001 | 0.132 | -1.283 | 0.826 |

**Table A.9.** *Robustness Check for Table 1: Excluding Outliers from OAS at Issuance*

| | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.756*** | -0.205 | -0.199 | -0.230 |
| | (0.189) | (0.191) | (0.174) | (0.172) |
| $CSPP_{period_t}$ | -0.341 | -0.247 | -0.274* | -0.322* |
| | (0.249) | (0.159) | (0.154) | (0.158) |
| ($CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$) | 0.767*** | 0.364** | 0.352** | 0.364** |
| | (0.217) | (0.132) | (0.120) | (0.125) |
| $Issue\ amount_{jt}$ (log) | | -0.043 | -0.051 | -0.062 |
| | | (0.087) | (0.085) | (0.087) |
| $Coupon_{jt}$ | | 0.651*** | 0.652*** | 0.646*** |
| | | (0.053) | (0.005) | (0.051) |
| $Maturity_{jt}$ (years) | | 0.018*** | 0.019*** | 0.018*** |
| | | (0.006) | (0.005) | (0.005) |
| $Credit\ rating_{jt}$ | | 0.003 | 0.004 | 0.005 |
| | | (0.014) | (0.013) | (0.013) |
| $Total\ assets_{it}$ (log) | | | -0.408 | -0.395 |
| | | | (0.408) | (0.414) |
| $ROA_{it}$ | | | -0.002 | -0.003 |
| | | | (0.010) | (0.010) |
| $Debt\ ratio_{it}$ | | | -0.800 | -0.794 |
| | | | (0.797) | (0.816) |
| $Current\ ratio_{it}$ | | | -0.050 | -0.045 |
| | | | (0.057) | (0.051) |
| $GDP\ growth_t$ | | | | 0.066*** |
| | | | | (0.022) |
| $Inflation_t$ | | | | 0.131* |
| | | | | (0.062) |
| Constant | 2.135*** | 0.627 | 3.963 | 3.672 |
| | (0.193) | (0.652) | (2.914) | (2.989) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes |
| No. of observations | 821 | 821 | 816 | 816 |
| $R^2$ | 0.8942 | 0.9546 | 0.9549 | 0.9558 |
| Within $R^2$ | 0.0702 | 0.6010 | 0.6042 | 0.6117 |

This table presents the regression results from the baseline model (Equation 1), assessing the impact of the Corporate Sector Purchase Programme (CSPP) on corporate bond spreads at issuance. To ensure that extreme values do not drive the results, the analysis accounts for potential outliers in the option-adjusted spread (OAS) by excluding extreme values. The dependent variable is the OAS. Column I includes only the main CSPP variables. In Column II, bond-specific controls are added. Column III introduces firm-level controls, while Column IV adds macroeconomic variables. All regressions include firm and quarter fixed effects, with standard errors clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and ***p < 0.01.

**Table A.10.** *Robustness Check for Table 2: Excluding Outliers from OAS with Triple Interactions*

| | (I) | (II) *Y = Total assets (log)* | (III) *Y = Debt ratio* | (IV) *Y = Bond Credit Rating* | (V) *Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.230 | -3.389** | -0.145 | -1.689* | 0.022 |
| | (0.172) | (1.268) | (0.235) | (0.952) | (0.249) |
| $CSPP_{period_t}$ | -0.322* | -1.709 | 0.065 | -0.311 | -0.333 |
| | (0.158) | (1.212) | (0.372) | (0.200) | (0.192) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | 0.364** | 0.197 | -0.003 | -0.267 | 0.004 |
| | (0.125) | (0.167) | (0.372) | (0.542) | (0.007) |
| $Issue\ amount_{jt}$ (log) | -0.062 | -0.085 | -0.061 | -0.056 | -0.078 |
| | (0.087) | (0.086) | (0.090) | (0.086) | (0.088) |
| $Coupon_{jt}$ | 0.646*** | 0.646*** | 0.648*** | 0.639*** | 0.652*** |
| | (0.051) | (0.050) | (0.052) | (0.052) | (0.055) |
| $Maturity_{jt}$ (years) | 0.018*** | 0.019*** | 0.018** | 0.020*** | 0.019** |
| | (0.005) | (0.005) | (0.006) | (0.006) | (0.007) |
| $Credit\ rating_{jt}$ | 0.005 | 0.005 | 0.003 | -0.011 | 0.004 |
| | (0.013) | (0.012) | (0.014) | (0.021) | (0.013) |
| $Total\ assets_{it}$ (log) | -0.395 | -0.483 | -0.295 | -0.056 | -0.283 |
| | (0.414) | (0.405) | (0.364) | (0.086) | (0.423) |
| $ROA_{it}$ | -0.003 | -0.003 | -0.002 | -0.004 | -0.002 |
| | (0.010) | (0.011) | (0.009) | (0.010) | (0.010) |
| $Debt\ ratio_{it}$ | -0.794 | -0.699 | -0.401 | -0.745 | -0.846 |
| | (0.816) | (0.738) | (0.660) | (0.799) | (0.822) |
| $Current\ ratio_{it}$ | -0.045 | -0.048 | -0.044 | -0.043 | -0.046 |
| | (0.051) | (0.052) | (0.054) | (0.051) | (0.051) |
| $GDP\ growth_t$ | 0.066** | 0.059** | 0.064** | 0.059** | 0.067*** |
| | (0.022) | (0.024) | (0.024) | (0.023) | (0.022) |
| $Inflation_t$ | 0.131* | 0.142* | 0.142** | 0.124* | 0.122* |
| | (0.062) | (0.067) | (0.064) | (0.062) | (0.064) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | 0.441** | -0.196 | 0.115 | -0.023 |
| | | (0.170) | (0.463) | (0.074) | (0.017) |
| $(CSPP_{period_t}$ x $Y)$ | | 0.197 | -1.033 | -0.002 | 0.004 |
| | | (0.167) | (1.010) | (0.019) | (0.007) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | -0.047 | 0.914 | 0.043 | 0.021 |
| | | (0.218) | (1.156) | (0.037) | (0.019) |
| Constant | 3.672 | 4.439 | 2.819 | 3.651 | 2.998 |
| | (2.989) | (2.898) | (2.601) | (3.107) | (3.102) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 816 | 816 | 816 | 816 | 816 |
| $R^2$ | 0.9558 | 0.9570 | 0.9563 | 0.9565 | 0.9563 |
| Within $R^2$ | 0.6117 | 0.6225 | 0.6163 | 0.6179 | 0.6163 |

This table presents extended regression results based on the baseline model (Equation 1), which includes all bond-specific, firm-level, and macroeconomic controls. To ensure the robustness of the results, the analysis accounts for potential outliers in the option-adjusted spread (OAS) by excluding extreme values. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and ***p < 0.01.

**Table A.11.** *Robustness Check for Table 3: Excluding Outliers from Year-on-Year Change in Debt Ratio (Year of Bond Issuance)*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.008 | 0.173 | -0.048* | 0.090 | 0.019 |
| | (0.018) | (0.121) | (0.027) | (0.084) | (0.022) |
| $CSPP_{period_t}$ | 0.022* | 0.034 | 0.015 | 0.019 | 0.023* |
| | (0.011) | (0.088) | (0.026) | (0.013) | (0.011) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | 0.020 | 0.066 | 0.052* | -0.099 | -0.007 |
| | (0.013) | (0.142) | (0.028) | (0.116) | (0.019) |
| $Issue\ amount_{jt}$ (log) | 0.002 | 0.003 | 0.001 | 0.001 | -0.000 |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.007) |
| $Coupon_{jt}$ | -0.003 | -0.003 | -0.002 | -0.004 | -0.002 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| $Maturity_{jt}$ (years) | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| $Credit\ rating_{jt}$ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) |
| $Total\ assets_{it}$ (log) | 0.014 | 0.028 | 0.012 | 0.024 | 0.026 |
| | (0.065) | (0.062) | (0.062) | (0.060) | (0.062) |
| $ROA_{it}$ | -0.001 | -0.001 | -0.002 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Current\ ratio_{it}$ | 0.001 | 0.001 | -0.000 | 0.001 | 0.001 |
| | (0.005) | (0.005) | (0.004) | (0.005) | (0.005) |
| $Debt\ ratio_{it}$ | -0.920*** | -0.922*** | -0.962*** | -0.918*** | -0.925*** |
| | (0.090) | (0.087) | (0.101) | (0.093) | (0.088) |
| $GDP\ growth_t$ | -0.002 | -0.002 | -0.002 | -0.002 | -0.002 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| $Inflation_t$ | 0.016** | 0.016** | 0.017** | 0.016** | 0.015** |
| | (0.007) | (0.007) | (0.007) | (0.006) | (0.006) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | -0.025 | 0.114* | -0.006 | -0.003** |
| | | (0.017) | (0.061) | (0.005) | (0.001) |
| $(CSPP_{period_t}$ x $Y)$ | | -0.001 | 0.017 | 0.001 | 0.000 |
| | | (0.013) | (0.058) | (0.002) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | -0.006 | -0.098 | 0.007 | 0.003* |
| | | (0.020) | (0.062) | (0.008) | (0.001) |
| Constant | 0.211 | 0.094 | 0.240 | 0.151 | 0.133 |
| | (0.460) | (0.441) | (0.446) | (0.430) | (0.441) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 816 | 816 | 816 | 816 | 816 |
| $R^2$ | 0.8463 | 0.8477 | 0.8491 | 0.8487 | 0.8489 |
| Within $R^2$ | 0.4657 | 0.4704 | 0.4753 | 0.4740 | 0.4748 |

This table presents extended regression results based on the leverage model (Equation 2), which examines the year-on-year change in the firm's debt ratio as the dependent variable. To ensure that the extreme values do not drive the results, the analysis accounts for potential outliers in the dependent variable by excluding extreme values. All specifications include bond-specific, firm-level, and macroeconomic controls. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05, and ***p < 0.01.

**Table A.12.** *Robustness Check for Table 4: Excluding Outliers from Year-on-Year Change in Debt Ratio (Year After Bond Issuance)*

| | (I) | (II)<br>*Y = Total assets (log)* | (III)<br>*Y = Debt ratio* | (IV)<br>*Y = Bond Credit Rating* | (V)<br>*Y = Bond Maturity* |
|---|---|---|---|---|---|
| $CSPP_{eligible_{ijt}}$ | -0.001 | -0.042 | 0.010 | -0.268* | -0.049* |
| | (0.022) | (0.146) | (0.027) | (0.131) | (0.026) |
| $CSPP_{period_t}$ | -0.023 | 0.113 | 0.082** | -0.018 | -0.031* |
| | (0.016) | (0.089) | (0.037) | (0.017) | (0.017) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t})$ | -0.021 | -0.130 | -0.066* | 0.298 | 0.012 |
| | (0.018) | (0.165) | (0.035) | (0.196) | (0.027) |
| $Issue\ amount_{jt}$ (log) | 0.004 | 0.003 | 0.003 | 0.006 | 0.008 |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| $Coupon_{jt}$ | -0.002 | -0.002 | -0.003 | 0.001 | -0.005 |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| $Maturity_{jt}$ (years) | -0.000 | -0.000 | 0.000 | -0.000 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| $Credit\ rating_{jt}$ | 0.001 | 0.001 | 0.000 | 0.000 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) |
| $Total\ assets_{it}$ (log) | 0.039 | 0.016 | 0.045 | 0.013 | 0.029 |
| | (0.093) | (0.097) | (0.083) | (0.082) | (0.089) |
| $ROA_{it}$ | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| $Current\ ratio_{it}$ | -0.000 | -0.001 | -0.000 | -0.000 | -0.000 |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| $Debt\ ratio_{it}$ | -0.140* | -0.148 | -0.015 | -0.143 | -0.141 |
| | (0.080) | (0.085) | (0.101) | (0.083) | (0.081) |
| $GDP\ growth_t$ | -0.005 | -0.005 | -0.005 | -0.004 | -0.005 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| $Inflation_t$ | -0.003 | -0.003 | -0.004 | -0.002 | -0.001 |
| | (0.012) | (0.012) | (0.012) | (0.011) | (0.011) |
| $(CSPP_{eligible_{ijt}}$ x $Y)$ | | 0.005 | -0.227** | 0.018* | 0.004** |
| | | (0.021) | (0.283) | (0.009) | (0.002) |
| $(CSPP_{period_t}$ x $Y)$ | | -0.020 | -0.094 | -0.001 | 0.001 |
| | | (0.013) | (0.059) | (0.001) | (0.001) |
| $(CSPP_{eligible_{ijt}}$ x $CSPP_{period_t}$ x $Y)$ | | 0.016 | 0.123 | -0.020 | -0.003 |
| | | (0.023) | (0.075) | (0.013) | (0.002) |
| Constant | -0.224 | -0.053 | -0.306 | -0.065 | -0.172 |
| | (0.658) | (0.687) | (0.592) | (0.581) | (0.635) |
| Firm and Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| No. of observations | 816 | 816 | 816 | 816 | 816 |
| $R^2$ | 0.6086 | 0.6107 | 0.6156 | 0.6274 | 0.6139 |
| Within $R^2$ | 0.0453 | 0.0503 | 0.0623 | 0.0912 | 0.0581 |

This table presents extended regression results based on the leverage model (Equation 2), where the dependent variable is the year-on-year change in the firm's debt ratio in the year following bond issuance (t+1). To ensure that extreme values do not drive the results, the analysis accounts for potential outliers in the dependent variable by excluding extreme values. All explanatory variables, including CSPP eligibility and control variables, are measured at time t, corresponding to the year of bond issuance. Column I replicates the baseline specification. Columns II to V introduce triple interaction terms to explore the effects of the CSPP based on firm- and bond-specific characteristics. Specifically, Column II includes an interaction with firm size (log of total assets), Column III with financial leverage (debt ratio), Column IV with bond credit quality (credit rating), and Column V with bond maturity at issuance. All regressions include firm and quarter fixed effects, and standard errors are clustered at the firm and quarter level. The sample excludes firms with missing accounting data and firms with only one bond issue, which are dropped by the fixed effects estimator. Statistical significance is indicated by *p < 0.1, **p < 0.05 and ***p < 0.01.